
Abstracts Presented at The International Neuropsychological Society, Finnish Neuropsychological Society, Joint Mid-Year Meeting July 29-August 1, 2009 Helsinki, Finland & Tallinn, Estonia

WEDNESDAY AFTERNOON, JULY 29, 2009

Presidential Address: Time, Language, and the Human Brain

INS President: Michael Corballis

4:45–5:30 p.m.

M. CORBALLIS. Time, Language, and the Human Brain.

Both brain imaging and studies of amnesia reveal extensive neural overlap in brain areas involved in remembering the past and imagining the future. Episodic memory can therefore be regarded as part of a more general system for mental time travel, involving the construction of fu-

ture episodes as well as past ones, and even fictional ones. Mental time travel provides us with many of the properties of mind we consider uniquely human, including a sense of self through time, the ability to plan in episodic detail, and perhaps even religion. The sharing of episodic information, whether past, planned, or imaginary, is also adaptive, helping establish group identity and common goals—we are slaves to stories, novels, plays, movies, television soaps, and gossip. Such sharing may explain the evolution of language itself, and why language exhibits such properties as symbolic representations of elements of non-present events, time and place markers, and combinatorial rules.

Correspondence: *Michael Corballis, Dept of Psychology, University of Auckland, Private Bag 92019, Auckland 92019, New Zealand. E-mail: m.corballis@auckland.ac.nz*

THURSDAY MORNING, JULY 30, 2009

Paper Session 1: Memory in Clinical Conditions

8:30–10:00 a.m.

R.P. KESSELS, M.J. HUIJBERS & M.G. OLDE RIKKERT. Source Memory for Emotional Pictures in Alzheimer Patients.

Objective: Emotional content facilitates subsequent recall, known as the emotional enhancement effect. In patients with memory impairment, there is also evidence for an emotional long-term memory enhancement effect, but it has been suggested that emotional content in working-memory paradigm reduces the encoding of contextual information, such as spatial location. In this study we examine source memory for emotional pictures in Alzheimer's dementia (AD), separating working-memory binding and long-term recall.

Participants and Methods: 23 AD patients and 23 matched, healthy older adults performed a picture relocation task, followed by an old-new recognition task (10 minute interval). Two repeated measures ANOVAs were conducted with relocation accuracy and recognition accuracy (d') as dependent variables, emotion (positive, negative, neutral) as within-subject variable and group as between-subject variable.

Results: AD patients were impaired on both tasks, compared to the healthy older subjects. Emotional content did not affect working memory for picture-locations in general, but AD patients performed better when pictures contained positive information ($p=0.056$). In addition, neutral pictures were more accurately recognized than negative pictures ($p<0.05$), and slightly better than positive pictures ($p=0.062$). This pattern of results did not differ between the groups.

Conclusions: Contrary to our expectations, AD patients benefited from positive content in the picture-relocation working memory task, while

healthy older adults did not show this effect. Long-term recognition was superior for neutral pictures in both groups. Our results are partially in accordance with socioemotional selectivity theory suggesting that older people and AD patients shift their attention away from negative information to promote their emotional well-being.

Correspondence: *Roy P. Kessels, PhD, Donders Centre for Cognition, Radboud University Nijmegen, Montessorilaan 3, Nijmegen 6525 HR, Netherlands. E-mail: r.kessels@donders.ru.nl*

P. SPAAN & J.G. RAAIJMAKERS. Episodic and Semantic Memory Decline in Very Old Age: The Impact of Processing Speed and Executive Functioning.

Objective: We investigated episodic and semantic memory within the aging spectrum from young-old to very old age. We specifically examined the interplay with processing speed and executive functioning. The central question was whether age-related episodic or semantic memory impairments were better explained by decline of processing speed and/or executive functioning, rather than directly in terms of memory components.

Participants and Methods: 234 cognitively healthy elderly persons of 55-96 years old ($M = 71.6$ years, $SD = 10.1$; $MMSE: M = 28.7$, $SD = 1.3$) were administered a computerized test battery, reflecting episodic memory (free and cued recall; recognition), semantic memory (fluency; naming accuracy and naming latencies), processing speed and executive functioning. To avoid large variances in reaction times due to physical limitations, no motor responses were required. Nested structural equation models (LISREL 8.72) were compared to determine best model fit ($p < .01$).

Results: Age-related variance was best explained by models of indirect episodic and semantic memory decline when processing speed and executive functioning were taken into account. Processing speed mainly

mediated age-related decline of semantic memory processes, fluency as well as naming. Executive functioning mainly mediated episodic memory decline. The most parsimonious model showed that processing speed and executive functioning influenced these memory components in parallel and independent from one another.

Conclusions: The results imply that in very old age, the impact of executive dysfunctions on episodic memory performance exceeds the influence of cognitive slowing. These findings contribute to the understanding of what is normal at very old age and what is not.

Correspondence: *Pauline Spaan, PhD, Psychonomics / Clinical Neuropsychology, University of Amsterdam, Roetersstraat 15, Amsterdam 1015 WB, Netherlands. E-mail: P.E.J.Spaan@uva.nl*

S. TAY, S. COLLINSON, E. LAU, A. MEYYAPPAN & B. ANG. Prospective Memory Functioning and its Underlying Cognitive Components in Mild Traumatic Brain Injury.

Objective: Prospective memory is crucial for independent living. Deficits in prospective memory are a significant impediment to good recovery following traumatic brain injury. Cross-sectional studies in severe TBI patients indicate that PM failures are associated with deficits in a variety of cognitive abilities, yet no studies have explored prospective memory capacity in Mild TBI and there is a lack of longitudinal evidence to elucidate the cognitive mechanisms involved.

Participants and Methods: 31 Mild TBI patients and matched controls were given a range of neuropsychological tests measuring multiple cognitive domains at two time points. The extent of recovery in each individual cognitive domain and its impact on prospective memory performance post-acutely are explored.

Results: MANOVAs showed that MTBI patients performed poorer than controls on all cognitive domains assessed within a month of their injury. However, at three months post injury, deficits remained only in prospective memory and the initial trials of RAVLT.

Conclusions: Prospective memory deficits form part of the acute cognitive sequelae of Mild TBI and while recovery occurs in other cognitive domains by three months, persistent deficits in prospective and immediate verbal memory remain. Close inspection of these deficits suggests that poor attention underlies reduced processing capacity and may explain prospective memory failures following TBI.

Correspondence: *S. Y. Tay, Singapore General Hospital, Blk 6 Level 8 The Brain Centre, Outram Road, Singapore 169608, Singapore. E-mail: szeyan@pacific.net.sg*

M. SEMKOVSKA, M. NOONE & D.M. MCLOUGHLIN. Distinctive memory profiles in depression remitters and nonremitters following electroconvulsive therapy: Preliminary findings.

Objective: Remitted depression has been associated with persistent memory dysfunction in pharmacologically treated patients. Retrograde amnesia following electroconvulsive therapy (ECT) is also frequently reported. Memory profiles of depression remitters following ECT have not been specifically studied. We compared memory function of depression remitters to nonremitters after ECT and explored possible relationships between retrograde and anterograde components.

Participants and Methods: Patients with Major Depressive Disorder referred for ECT were recruited if scoring ≥ 21 on Hamilton Rating Scale for Depression (HRSD). Remission was defined as HRSD score ≤ 10 . Pre- and post-ECT memory function was assessed with Digit spans, Buschke Selective Reminding Test (BSRT), Rey Complex Figures (ROCF), Autobiographical Memory Interview (AMI-SF), Impersonal Events Questionnaire (IEQ), and Semantic fluency. Remitters were compared to nonremitters on all variables using t-tests with Bonferroni corrections. Exploratory correlation analyses were conducted.

Results: Remitters ($n=10$) and nonremitters ($n=11$) showed comparable age and baseline HRSD scores. Remitters performed significantly better than nonremitters on baseline Semantic fluency ($p=0.008$) and on post-ECT AMI-SF ($p=0.016$). All IEQ scores correlated positively

with digit span backward ($p<0.05$). IEQ-previous-year correlated also with BSRT learning ($p<0.05$), while IEQ-5-, IEQ-10- and IEQ-15-previous-years correlated with both ROCF recalls ($p<0.05$) and Semantic fluency ($p<0.01$). AMI-SF performance correlated significantly only with Semantic fluency ($p<0.05$).

Conclusions: At both baseline and end of ECT, depression remitters and nonremitters showed comparable anterograde memory and retrograde memory for impersonal events. However, remitters demonstrated better baseline semantic memory and their autobiographical memory was less affected by ECT. Retrograde memory function after ECT appeared related to semantic and visual memory, but not to verbal episodic memory in depressive patients.

Correspondence: *Maria Semkowska, PH.D., Dept. of Psychiatry TCD, St. Patrick's Hospital, P.O. Box 136, James's Street, Dublin Dublin 8, Ireland. E-mail: semkovsm@tcd.ie*

J. EGELAND, S.N. JOHANSEN & T. UELAND. Do Low Effort Learning Strategies Mediate Impaired Memory in ADHD?

Objective: As a group, subjects with ADHD are impaired in academic school learning. This may be due to a mild intellectual impairment, impaired attention or inability to allocate sufficient effort, as hypothesized in the Cognitive-Energetic Model of ADHD. In the present study, we test the effort hypothesis by analyzing learning strategies applied in Children's Auditory Verbal Memory Test-2.

Participants and Methods: Four indices of learning strategy, considered to measure degree of effort, were analyzed from 67 subjects with ADHD and 67 age matched normal controls between 9 and 16 years of age.

Results: The subjects with ADHD were impaired with regard to semantic clustering, retroactive interference and percent items reported from the middle section of the list even when IQ was controlled for. Subjects with ADHD-C did not display the normal proactive interference-effect. The four effort indices explained 39 and 35 percent of the variance in free recall among subjects with ADHD-I and ADHD-C, respectively. IQ was still significant when the effect of strategy measures were accounted for, whereas diagnosis was no longer significant when entered into the regression analysis after the effort indices.

Conclusions: The study shows that subjects with ADHD do not employ effortful learning strategies, and that low effort accounts for a large degree of diagnosis related variance in memory performance.

Correspondence: *Jens Egeland, Ph.D, Dep. of research, Vestfold Mental Health Care Trust, P.O. Box 2267, Tonsberg 3103, Norway. E-mail: jens.egeland@piv.no*

**Symposium 1:
Neuropsychology of the Spectrum of Affective Disorders**

Chair: Thomas Beblo

8:30–10:00 a.m.

T. BEBLO & K. HENNING-FAST. Neuropsychology of the Spectrum of Affective Disorders.

Symposium Description: In recent years, neuropsychological deficits in mental disorders have been increasingly investigated. However, many questions still remain open. In the symposium "Neuropsychology of the spectrum of affective disorders" we address the questions how neuropsychological deficits are related to everyday functioning and whether neuropsychological findings are specific for different affective disorders. In patients with bipolar disorder, Dittmann et al found that some neuropsychological deficits are related to social adjustment. Finke and Bublak administered an experimental paradigm in patients with major depression in order to detect subtle deficits. They conclude a specific, right-hemisphere attentional impairment.

Kathmann et al. present evidence that patients with major depression and patients with obsessive compulsive disorder show similar deficits in motor sequence learning whereas patients with panic disorder are less impaired. Beblo et al. administered a comprehensive neuropsychological test battery in patients with major depression and patients with borderline personality disorder (BPD). They found no differences between both groups of patients. Hennig-Fast et al. found different neural activation patterns during emotional inhibition tasks in patients with BPD compared to patients with posttraumatic stress disorder (PTSD).

Correspondence: *Thomas Beblo, Department of Psychiatry, Ev. Hospital Bielefeld, Remterweg 69-71, Bielefeld 33615, Germany. E-mail: thomas.beblo@erkb.de*

S. DITTMANN, F. SEEMUELLER, W.E. SEVERUS, K. HENNING-FAST, R.R. ENGEL, M. RIEDEL & H.C. GRUNZE. Memory Predicts Social Adjustment in Bipolar Disorder.

Objective: Few studies have examined the association between neuropsychological functioning and social adjustment so far. Therefore this study was conducted to determine the effects of neuropsychological functioning, clinical and demographic variables on different domains of social adjustment in bipolar disorder.

Participants and Methods: 75 patients with bipolar disorder and 42 healthy controls participated in the study. Patients had to be euthymic for at least one month. Cognitive functioning was assessed using a neuropsychological battery, social adjustment with the Social Adjustment Scale (SAS). Clinical and demographic variables were collected with standardized rating scales. Multiple linear regression analyses were employed to investigate if neuropsychological, clinical or demographic variables were associated with 4 domains of social adjustment (global adjustment, work, household, social activities).

Results: Compared to healthy controls, patients had significant lower levels of social adjustment in all domains applied. Patients also performed worse on all cognitive domains tested. Stepwise regression analyses revealed a significant and independent association of memory measures with global adjustment, work performance and social activities. Performance in household activities was predicted by age and duration of euthymia.

Conclusions: This study confirms memory as a major predictor of social adjustment.

Correspondence: *Thomas Beblo, Department of Psychiatry, Ev. Hospital Bielefeld, Remterweg 69-71, Bielefeld 33615, Germany. E-mail: thomas.beblo@erkb.de*

K. FINKE & P. BUBLAK. Attentional capacity and top-down control changes in patients with major depression Evidence based on the theory of attention (TVA).

Objective: Previous research has repeatedly suggested predominantly right-hemispheric frontal and parietal anomalies in patients with major depression (MD). Target cognitive impairments that might reflect dysfunctions of a right frontoparietal network are reduced speed of processing due to lowered arousal, visual working memory deficits and alterations in the efficiency of task-related attentional control. These functions were assessed with an approach sensible for even subtle deficits as they can be expected in MD.

Participants and Methods: We assessed 20 patients with major depression with a parametric approach based on Bundesen's theory of visual attention (TVA). Using a whole and a partial report paradigm we were able to measure visual perceptual processing speed, visual short term memory (vSTM) storage capacity, and top-down control of attention within the same tasks, albeit independently.

Results: We found significant reductions in attentional capacity compared to an age-, gender, and education-matched control group. On average, processing speed was reduced about 25%. The slower their speed, the higher the patients' subjective ratings on "distractibility and slowing in mental tasks". vSTM storage capacity was also significantly

reduced. The lower their capacity, the more severe subjects rated their "lack of drive". With regard to top-down control, a lateralized performance was found with a specific ineffectiveness in filtering irrelevant information only in the left visual hemi-field. Lower top-down control was related to higher anxiety ratings (DASS).

Conclusions: These results implicate specific, right-hemisphere attentional impairments in MD that are related to symptom severity and thus highlight the need for their systematic assessment with sensitive tasks. Correspondence: *Thomas Beblo, Department of Psychiatry, Ev. Hospital Bielefeld, Remterweg 69-71, Bielefeld 33615, Germany. E-mail: thomas.beblo@erkb.de*

N. KATHMANN, A. BAUER, K. HOLZSCHNEIDER, E. GEISSNER & T. ENDRASS. Motor Sequence Learning In Patients with Obsessive-Compulsive Disorder, Panic Disorder, and Depression.

Objective: Motor sequence learning, as measured in the serial reaction time task (SRTT), depends mainly on intact fronto-striatal brain circuitry. Neuropsychological and brain imaging studies revealed that obsessive-compulsive disorder (OCD) may be associated with dysfunction in several regions of this circuitry (Saxena et al., 1998). Deckersbach et al. (2002) reported reduced performance of OCD patients in a dual task version of the SRTT requiring the concurrent performance of a memory task. We conducted two experiments to further address (1) the role of attentional demands in SRTT deficits in OCD, and (2) the specificity of this putative deficit.

Participants and Methods: Experiment 1 was run with 33 OCD patients and 27 healthy controls to investigate motor learning using a single task SRTT. In Experiment 2, using new samples of OCD patients (n=32) and healthy controls (n=32), a depressive control sample (n=24), and a panic disorder control sample (n=32), both single and dual task versions of the SRTT were administered.

Results: In experiment 1 OCD patients showed deficits that remained stable across time although symptoms remitted substantially (Kathmann et al., 2005). In experiment 2, OCD patients showed a deficit in each of the two tasks indicating that it is independent from strategy effects. Depressive patients were similarly impaired, whereas panic disorder patients had only slight deficits.

Conclusions: It is concluded that motor sequence learning is reliably affected in OCD. In addition, OCD and depression appear to share some pathology. The results support the fronto-striatal model of OCD.

Correspondence: *Thomas Beblo, Department of Psychiatry, Ev. Hospital Bielefeld, Remterweg 69-71, Bielefeld 33615, Germany. E-mail: thomas.beblo@erkb.de*

T. BEBLO, C. MENSEBACH & M. DRIESSEN. Are neuropsychological deficits specific in patients with Borderline Personality Disorder? A comparison with patients with Major Depression.

Objective: Patients with Borderline Personality Disorder (BPD) exhibit neuropsychological deficits in the different neuropsychological domains such as executive functions, memory, attention and visuo-spatial abilities. It is not clear yet, whether these deficits are specific for BPD or whether similar deficits also occur in other mental disorders. Since many BPD patients also suffer from Major Depression (MDD) the present study aimed at a comparison of neuropsychological functioning in BPD and MDD patients.

Participants and Methods: The study included 18 patients with BPD, 27 patients with MDD, 17 patients with BPD and MDD, and 76 healthy control subjects. A comprehensive neuropsychological test battery was administered covering the domains of attention, executive functions, construction and memory.

Results: Compared to the healthy control subjects, both patient groups showed only a very few impairments. Patients with BPD and patients with MDD were not distinguishable by the neuropsychological test results.

Conclusions: These data did not support the notion of specific neuropsychological profiles in BPD. It remains unclear whether the results point to common etiological pathways in BPD and MDD.

Correspondence: *Thomas Beblo, Department of Psychiatry, Ev. Hospital Bielefeld, Remterweg 69-71, Bielefeld 33615, Germany. E-mail: thomas.beblo@erkb.de*

K. FAST, T. MEINDL, C. AMRHEIN, F. MEISTER, N. WERNER, R. ENGEL, M. REISER & D. HUBER. Inhibition during affective and neutral information processing in posttraumatic stress disorder (PTSD) and borderline personality disorder (BPD) – neuropsychology and functional imaging.

Objective: Inhibitory dysfunction has been hypothesized to play a crucial role in both, posttraumatic stress disorder (PTSD) and borderline personality disorder (BPD). The purpose of the present study was to investigate how disorder-related affective stimuli influence the neuronal response during memory and inhibition in patients with PTSD and BPD.

Participants and Methods: In a “think/no-think” paradigm, participants learned word pairs of different emotional loads comprising disorder-related affect-laden as well as neutral words. After showing only the first word of the pair, they were asked to either think about the missing word (response condition) or to suppress any thought of it (suppress condition). Owing to the latter condition, this task accounts for the intentional inhibition. A second paradigm investigating the automatic manner of inhibiting negative and neutral words is the “emotional stroop paradigm”. In this task, participants had to indicate as fast as possible if the ink colour of the word corresponds to (congruent) or is different (incongruent) from the meaning of the nearby presented word indicating a colour.

Results: The results show that the BPD patients are better than previously expected in automatically and intentionally inhibiting disorder-related emotion-arousing words. In contrast, patients with PTSD show increased brain activation in parahippocampal/hippocampal regions during automatically and intentionally inhibiting disorder-related affect-laden words.

Conclusions: The results indicate different neural activation patterns during emotional inhibition tasks in patients with BPD compared to patients with posttraumatic stress disorder (PTSD).

Correspondence: *Thomas Beblo, Department of Psychiatry, Ev. Hospital Bielefeld, Remterweg 69-71, Bielefeld 33615, Germany. E-mail: thomas.beblo@erkb.de*

Invited Symposium: Theoretical and Clinical Contributions to the Social Neuroscience: a Developmental Perspective

Chair: Vicki Anderson

8:30–10:00 a.m.

V. ANDERSON. Theoretical and clinical contributions to the social neuroscience: a developmental perspective.

Symposium Description: Children who suffer brain injuries (e.g., traumatic brain injury, stroke, tumour, cerebral infections) are at risk of long-term consequences that span a range of domains, including physical disability, cognitive impairment and behavioural and social dysfunction. While much is now understood about physical and cognitive sequelae, social and behavioural sequelae remain less well defined, despite being the most commonly described complaints of children and families. Frequently families describe their child as ‘different’ after brain injury – more aggressive, impulsive, emotional as well as socially withdrawn and isolated.

With advances in neuroimaging, there is growing interest in the social neurosciences and the social consequences of brain injury in particular. Unfortunately, theoretical models and robust behavioural tools to measure, diagnose and treat these social problems are only just beginning to

emerge, with progress in the developmental field lagging even further behind. Such ‘tools’ are critical to: 1) take advantage of sophisticated brain imaging techniques; 2) to assist in understanding the nature and breadth of social dysfunction; and 3) to design effective interventions and treatments.

Taking a developmental focus, this symposium will consider current evidence for social difficulties following early brain insult, theoretical models of social function and dysfunction, and novel approaches to measurement and treatment.

Correspondence: *Vicki Anderson, Psychology, Royal Children’s Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vicki.anderson@rch.org.au*

M.H. BEAUCHAMP, J.J. DOOLEY & V. ANDERSON. New perspectives on the assessment of moral reasoning after childhood traumatic brain injury.

Objective: Paediatric traumatic brain injury (TBI) results in a number of cognitive and behavioural problems which have implications for social functioning and may result in socially maladaptive behaviours. In particular, difficulties with moral reasoning (MR) may lead to a failure to abide by society guidelines and are prominent in the rule-breaking behaviours that lead to criminality and violence. Despite this, little is known about MR capacities in adolescents with TBI, and existing measures of MR are seldom developmentally or clinically appropriate.

Participants and Methods: A new task (Socio-Moral Reasoning Aptitude Level, ‘So-Moral’), which takes into account developmental stages of MR and is adapted to adolescent reality, was designed and administered to adolescents with TBI and age-matched controls (12-18 years). Self-referential visual vignettes were developed to better reflect the first-person perspective and to incorporate more realistic social interactions.

Results: Normative data are presented showing the task is a valid, reliable and age-appropriate measure of MR in adolescents. Participants obtained progressive levels of moral maturity, indicating that the task is sensitive to development. Adolescents with TBI were able to complete the task; however, they obtained lower levels of moral maturity, suggesting they may experience difficulties when making moral decisions.

Conclusions: ‘So-Moral’ is a new tool which provides insight into the development of MR in adolescence and clinical populations. The task is sensitive to differences in moral maturity after TBI. Better identification of MR deficits is critical to our understanding of the relationship between poor decision-making and delinquent or criminal behaviour after childhood brain injury.

Correspondence: *Vicki Anderson, Psychology, Royal Children’s Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vicki.anderson@rch.org.au*

J.J. DOOLEY, V. ANDERSON, S. HEMPHILL & J. OHAN. Social cognition after paediatric traumatic brain injury: Mechanisms of aggression.

Objective: Traumatic brain injury (TBI) often results in cognitive, behavioural and social impairments. Of those commonly reported, aggressive behaviours are of particular concern given their association with poor long term outcome. Few have investigated the nature of aggression after TBI. However, recent evidence demonstrated that aggression after TBI is in response to frustration (i.e., reactive aggression). Evidence from developmental psychopathology suggests that cognitive mechanisms such as hostile intent attribution (HIA) drive reactive aggression and that identifying these mechanisms can aid intervention.

Participants and Methods: Eleven boys (Mean age = 15.7 yrs, SD = 1.3yrs) with moderate to severe TBI were compared to a matched non-injured sample (M = 14.7 yrs, SD = 1.4yrs). Participants were injured 2.2 to 13.2 years prior to assessment (M = 8.3 yrs, SD = 4.2yrs). All participants completed social cognitive processing and aggression measures.

Results: Results indicate that participants with TBI were more likely to attribute hostile intent in ambiguous social scenarios than were partic-

ipants without TBI. Attributing hostile intent was related to the generation of aggressive and socially inappropriate responses however this effect was only observed in participants without TBI. Overall, HIA did not explain much of the aggressiveness of responses generated by participants with TBI when compared to those without TBI.

Conclusions: In contrast to what has been reported in non-TBI populations, attributing hostile intent to protagonists in ambiguous social interactions did not appear to explain much of the aggressive behavior in participants with TBI. The implications for treatment protocols will be discussed.

Correspondence: *Vicki Anderson, Psychology, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vicki.anderson@rch.org.au*

H. WILLIAMS, G. CORDON, J. TONKS, A. MEWSE & C. BURGESS. The neuro-developmental risk of childhood head injury on later offending and the need for socially focussed early neuro-rehabilitation.

Objective: In the past few years there has been a marked increase in conviction rates for violent offences in the UK and USA for adolescents. An understanding of factors that increase risk for offending is required with urgency. Prevalence of Head Injury (HI) in prison populations is high. Criminal behaviour and brain injury may be coincidental due to underlying risk factors for both – such as high risk taking and drug and alcohol misuse. The influence of HI has not received much examination as an independent factor associated with crime or as an issue to be managed within forensic rehabilitation.

Participants and Methods: In this paper we review recent evidence from our studies with adult and adolescent offending groups related to type and time of injury and offending behaviour - particularly related to recidivism.

Results: We note relatively elevated levels of HI in both groups. In particular we report HI in childhood as a possible factor earlier in entry into custodial systems. We also report patterns of offending behaviour associated with HI. We also review recent studies on emotion processing post-brain injury in early childhood.

Conclusions: We propose that executive and socio-emotional processing deficits that occur in childhood may, in particular, contribute to offending behaviour in later life. We explore possible interventions for improving surveillance of HI in offender groups to assist in improved neurorehabilitation to reduce risk of crime and recidivism. We argue that socially focussed rehabilitation of offenders with HI – particularly regarding adolescence – is indicated for improved outcomes for ABI survivors and for society.

Correspondence: *Vicki Anderson, Psychology, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vicki.anderson@rch.org.au*

V. ANDERSON. Social and behavioural problems following acquired brain injuries in childhood.

Objective: Until recently, social and behavioural consequences of childhood brain injury have received little attention within the research literature. Despite this, children and their families frequently rank social and behavioural problems as persistent and debilitating problems. Frequently families describe their child as 'different' after brain injury – more aggressive, impulsive, emotional as well as socially withdrawn and isolated. These symptoms have been reported to increase with time since injury. With advances in the social neurosciences and increasing knowledge of brain-behaviour relationships we can begin to explore these problems and their causes.

Participants and Methods: This presentation will consider findings from a number of studies conducted in our lab. Research samples will include children with traumatic brain injury, those with developmental lesions and adult survivors of early brain insult.

Results: The results of these studies document the presence and nature of social and behavioural difficulties in children sustaining their brain injuries at various stages through childhood.

Conclusions: The discussion will explore the potential influences on these outcomes including injury-related impact, developmental parameters and environmental factors, in order to develop a model to explain these outcomes.

Correspondence: *Vicki Anderson, Psychology, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vicki.anderson@rch.org.au*

**Invited Symposium:
Aspects on Biological and Psychological
Determinants of Cognitive Plasticity**

Chair: Göran Horneman

8:30–10:00 a.m.

G. HORNEMAN, S. WINBLAD, H. WESTERBERG, A. STIGSDOTTER NEELY, R. CARLSSON & G. HORNEMAN. Aspects on biological and psychological determinants of cognitive plasticity.

Symposium Description: The phenomenon of brain plasticity occurs through a series of steps that are stimulated by gene expression but are also influenced significantly by environmental events through life. In theory, experience could alter the brain in two ways: by modifying existing circuitry or by creating novel circuitry. Evidence indicating that at least partial functional restitution is possible after cortical injury is accumulating. This symposium addresses different aspects on plasticity throughout the life span.

Correspondence: *Göran Horneman, Ph.D., Göteborgs universitet, Skeppspromenaden 5, Göteborg Se-41763, Sweden. E-mail: g.horneman@telia.com*

R. CARLSSON, H. NYMAN, G. GANSE, L. LINDBLOM & J. CULLBERG. Improvement of cognitive deficits in first-episode psychosis - An association to information processing speed.

Objective: Deficits in attention networks and cognitive abilities appear to be a related and relevant for the understanding of cognition in first episode psychosis (FEP). Longitudinal studies of FEP report that at least some aspect of cognition predicts course and outcome, although no specific cognitive profile yet has been found.

Participants and Methods: Most studies have examined the impact of specific cognitive domains such as memory, attention and executive functions on outcome, and only few have incorporated the IQ as a measure of general cognitive ability in this regard. Patients with FEP were studied.

Results: We found a significant improvement in general cognitive functioning at the three-year follow-up in almost all patients, and those in remission had significantly higher scores than the remaining patients in the Digit-Symbol subtest at illness onset.

Conclusions: Aspects on selective and executive attention networks and cognitive functions, and its relation to psychopathology, course and outcome in FEP will be discussed, and if measures of specific or general cognitive abilities are better in this regard.

Correspondence: *Göran Horneman, Ph.D., Göteborgs universitet, Skeppspromenaden 5, Göteborg Se-41763, Sweden. E-mail: g.horneman@telia.com*

G. HORNEMAN & I. EMANUELSON. Cognitive outcome after head injury in childhood.

Objective: The objective was to investigate the long-term effects on cognitive development after childhood traumatic brain injury (TBI).

Participants and Methods: The data is from a population-based longitudinal study of 165 survivors who suffered serious TBI ten years earlier. They had all been unconscious one hour or longer or had shown

neurophysiological, neuroradiological or neurological signs of brain contusion and/or brain haemorrhage. All traceable individuals (149) were invited to take part in a follow-up investigation. Of the traceable individuals, 109 answered a quality of life questionnaire and 53 accepted the invitation to take part in a neuropsychological and a neurological investigation ten years post injury.

Results: The TBI group produced a significantly poorer performance in tests of intellectual capacity, with considerably lower results in the verbal domain. The most impaired domain was verbal learning and memory. They also displayed impairments in executive function, especially in the areas of attention, working memory and mental flexibility.

Conclusions: From the results, it can be concluded that TBI in childhood has life-long consequences. There has been a longstanding belief that damage to the brain early in life leads to a better outcome than damage later on. It is thought that children's brains have a far better plasticity and therefore better potential for reorganisation. This study challenges this opinion. Brain injury in childhood not only disrupts established functions but will also affect functions that are in the process of developing or have yet to emerge.

Correspondence: *Göran Horneman, Ph.D., Göteborgs universitet, Skeppspromenaden 5, Göteborg Se-41763, Sweden. E-mail: g.horneman@telia.com*

S. WINBLAD, C. LINDBERG, A. EKSTRÖM & G. MEOLA. Cognition in myotonic dystrophy type 1 - general impact during different stages of the lifespan.

Objective: The objective is to investigate the association of the repeat expansion and brain and cognitive functions during different stages of the lifespan.

Participants and Methods: Myotonic dystrophy type 1 (DM1) is a disorder characterized by a variably expressed multisystem phenotype with core features of progressive muscle weakness and degeneration but also various cognitive deficits. The disorder is caused by an unstable CTC repeat expansion in the 3 untranslated region of the DMPK gene on chromosome 19q13.3. It is known that DM1 is associated with debut of the first symptoms of the disease during the whole lifespan, including severe cognitive impairment in childhood variants of the disease and contrastingly, a slowly progressive decline in attention, memory and executive functions as seen in the adult variant.

Results: We will present data on the association of the repeat expansion and brain and cognitive functions during different stages of the lifespan, including the presence of age-associated cognitive impairment.

Conclusions: Aspects of performance and plasticity will be discussed in relation to age-related factors.

Correspondence: *Göran Horneman, Ph.D., Göteborgs universitet, Skeppspromenaden 5, Göteborg Se-41763, Sweden. E-mail: g.horneman@telia.com*

A. STIGSDOTTER NEELY, E. DAHLIN, L. BÄCKMAN & L. NYBERG. Training of executive functions in young and old adults.

Objective: Executive functions are of critical importance to higher-order cognition, everyday functioning, and a prime factor underlying cognitive decline in old age.

Participants and Methods: Here we present data from a five-week computer-based training program investigating the modifiability of one executive process, updating of information in working memory, in young and old adults.

Results: Results showed that both young and old trained adults improved updating performance compared to controls. These gains were also maintained 13 months later. Transfer effects were slim and limited to the young participants who showed near transfer to an untrained task that required updating.

Conclusions: These data yield substantial and durable plasticity of executive functioning across the adult life-span, but rather limited transfer to untrained tasks.

Correspondence: *Göran Horneman, Ph.D., Göteborgs universitet, Skeppspromenaden 5, Göteborg Se-41763, Sweden. E-mail: g.horneman@telia.com*

H. WESTERBERG, Y. BREMER, N. D'HONDT, D. SÖDERLUND, S. MACDONALD, H. FISCHER & L. BÄCKMAN. Computerized training of working memory in aging - a controlled randomized trail.

Objective: Working Memory (WM) is the ability to hold and manipulate information for short periods of time. It draws on the integrity of the prefrontal cortex, an area which shows pronounced morphological alterations across the adult life span. Consequently, age-related decline is typically observed in WM tasks.

Participants and Methods: 45 persons (60-70y) were randomized for a treatment or a comparison condition. To compare age differences in baseline performance and training, a younger (20-30y) training- and comparison group were included. The treatment was intense and adaptive training on WM tasks for five weeks (CogmedQM). In the comparison condition the difficulty level was non-adaptive. Participants trained at home and reported the results via the internet. Performance during training was continuously recorded for compliance monitoring and feedback. A cognitive test battery and a self rating questionnaire (CFQ) were administered before and after the training period, and at follow up three months later. The test leaders were naive to the training method and blinded to condition. The test battery included non-trained tasks assessing WM (Span-board and Digit span), attentional functions (CRT, PASAT, Stroop), episodic memory (RAVLT) and reasoning (RAVEN). The CFQ was used to measure cognitive functioning in daily living.

Results: Significant improvements on the trained WM tasks, on the non-trained WM- and attention tasks and for the CFQ were found in both age groups. At follow-up three months later most of the training effects were still significant.

Conclusions: The generalization to non-trained tasks exceeds what is commonly observed in cognitive training interventions.

Correspondence: *Göran Horneman, Ph.D., Göteborgs universitet, Skeppspromenaden 5, Göteborg Se-41763, Sweden. E-mail: g.horneman@telia.com*

**Poster Session 1:
Intervention, Psychopathology, Traumatic Brain Injury, ADHD**

10:00–11:00 a.m.

ADHD/ADD

E. ESKOLA, J. TORSTI, N. REIMAN, L. PIHLAKOSKI, J. LÄHDETIE, H. HÄMÄLÄINEN & T. KORHONEN. The Effect of Long-Term Methylphenidate Treatment on Test-measured Executive Functions in Children with ADHD.

Objective: Methylphenidate (MPH) is known to decrease the cardinal symptoms of ADHD. However, there are controversial results of its effects upon executive functions (EF). The majority of the studies have investigated short-term effects of MPH. In this study, long-term (6 months) MPH treatment was hypothesized to enable the improvement of test-measured EF of children with ADHD.

Participants and Methods: 16 children (15 male, 1 female) aged between 6 and 12 with a primary diagnosis of ADHD and 16 gender- and age-matched controls participated in this study. The selected neurocognitive measures of EF (CPT-II, subtests of Tea-Ch, subtests of NEPSY, Wisconsin Card Sorting Test, Rey-Osterrieth Complex Figure) measured inhibition, shifting, planning and organizing, working memory, and monitoring. Assessments were done prior to the MPH treatment and repeated after 6 months of regular medication. The performance of the control group was analyzed to evaluate the effects of test repetition and normal development during the follow up period.

Results: Medication effect was significant only in tests of the shift mode. The medication did not show significant effects on planning and organizing, working memory, and monitoring. Even on MPH treatment children with ADHD still showed more deficits than controls.

Conclusions: The used neurocognitive tests are not sensitive enough to reveal the effects of MPH on metacognition skills and working memory. Behavioral measures may be needed in studies of the effect of MPH in children with ADHD.

Correspondence: *Eeva Eskola, University of Turku, Yliopistonkatu 9 b 31, Turku 20100, Finland. E-mail: epesko@utu.fi*

C. HAAPARANTA, L. HETTA, T. HIRVIKOSKI, M. NORDELL, A. MATSSON & M. TALVIK. Dialectical Behavioral Therapy-based skills training in group for adult substance abusers with attention deficit hyperactivity disorder (AD/HD).

Objective: In the context of a Swedish out patient dependency disorder clinic the feasibility, efficacy and acceptability of a Dialectical Behavioral Therapy (DBT)-based method developed in Freiburg, Germany (Hesslinger, Philippen, & Richter, 2004; Hesslinger, et al., 2002; Philippen, et al., 2007) was evaluated. An estimated third of all substance abusers suffer from attention deficit hyperactivity disorder (AD/HD) (Schubiner et al. 2000; Tims et al. 2002). A rather similar study has been conducted at a Swedish out patient psychiatric clinic (Hirvikoski et al., poster to be presented at INS Mid Year Meeting, 2009) for non-abusers.

Participants and Methods: Thirtytwo adult substance abusers with AD/HD who had been without illicit substances for a minimum of three months and on stable medical treatment or with no medical treatment for the same duration of time were included to a structured skills training program. The group was led by two professionals educated in cognitive behaviour therapy. The participants received coaching between sessions to aid them in their homework. Self-rating scales of psychiatric symptoms were completed before inclusion and after treatment. "Treatment satisfaction scale" from the manual was completed after treatment. The results from the Hirvikoski et al study, once published, will be used as comparative data to this study.

Results: The preliminary analyses of those individuals who completed the treatment, remained drug free and stayed on stable medical treatment (n = 15) showed that the skills training was associated with a significant reduction in AD/HD symptoms. Indication was found that skills training had positive effect on comorbid symptoms, such as mood disorder. Participants assign great value to the between sessions coaching.

Conclusions: Skills training in groupformat based on DBT is an effective and well tolerated complement to the medical treatment of AD/HD in adult substance abusers. The current study also indicates that skills training may have positive effects on comorbid symptoms.

Correspondence: *Cecilia Haaparanta, MSc, Neuropsykiatriska mot-tagningen, Beroendecentrum Stockholm, Karolinska Universitetssjukhuset, Stockholm 171 76, Sweden. E-mail: cecilia.haaparanta@sll.se*

P. HELENIUS, M. LAASONEN, L. HOKKANEN, R. PAETAU & M. NIEMIVIRTA. Neural Markers of Detecting Infrequent Visual Events in ADHD.

Objective: Recent model of Attention Deficit Hyperactivity Disorder (ADHD) suggests a link between deficit in learning to detect regularities or irregularities in the environment and impaired behavioral adjustment. We used magnetoencephalography (MEG) and event-related potentials (ERPs at Fz, Cz, Pz) in ADHD adults to investigate the neural processes related to successful response inhibition after infrequent events.

Participants and Methods: Our stimuli were visual arrays composed of 5 items (apples and animals). The relative position of items varied between successive stimuli presented once every 2 seconds. The 10 ADHD and 13 control participants were instructed to make a rapid manual response to a target stimulus (wolf facing a pig) and avoid responding to a non-target stimulus (17%) (wolf facing an apple).

Results: The infrequent non-target stimuli elicited an ERP component that was more negative 390 ms after stimulus onset and more positive around 530 ms (late positive component, LPC) compared to the target stimuli. In ADHD, the difference between non-targets and targets was

reduced during the LPC. The LPC was coupled with functionally and temporally equivalent activation in the MEG channels. This activation was localized bilaterally in the posterior temporal cortex. Activation of the left and right temporal regions was enhanced after infrequent non-target stimuli in both subject groups. Detailed comparison of the dynamics of the signals are in progress.

Conclusions: The superior temporal cortices and the LPC have been associated with exploration of object-related information and memory updating triggered by incoming stimuli. Our results will help to characterize the hemispheric balance of visual processing in ADHD.

Correspondence: *Päivi Helenius, PhD, docent, Brain Research Unit, Helsinki University of Technology, PO BOX 5100, TKK, Espoo 02015, Finland. E-mail: paivi@neuro.hut.fi*

T. HIRVIKOSKI, T. LINDHOLM, A. NORDENSTRÖM, A. NORDSTRÖM & S. LAJIC. High self-perceived stress in everyday life, and a heightened risk for poor recovery after a cognitive stressor in adults with ADHD (attention-deficit/hyperactivity disorder).

Objective: The management of normal daily tasks may be complicated for adults with ADHD due to the problems of executive functioning and time management. ADHD may thus increase the risk of chronic stress in everyday life.

Participants and Methods: We compared adults with a DSM-IV ADHD diagnosis (n=28) with healthy controls (n=28) regarding subjective stress and amounts of stressors in everyday life, diurnal salivary cortisol in the everyday environment and salivary cortisol before and after cognitive stress in a laboratory setting. The association between cortisol concentrations and impulsivity was also investigated.

Results: Individuals with ADHD reported significantly more self-perceived stress than controls, and subjective stress correlated with the amount of stressors in everyday life. The two groups were comparable with respect to overall diurnal cortisol levels and rhythm. Post-stress cortisol (but not baseline cortisol) concentration was positively correlated with impulsivity. To explore the association between impulsivity and post-stress cortisol levels, we performed a median-split of all participants into a high versus low post-stress cortisol group. The group with high post-stress cortisol reported not only more symptoms of ADHD, but also more symptoms of depression and anxiety, as well as higher self-perceived stress and more stressors in every-day life. The diagnosis of ADHD significantly increased the risk of belonging to the group with high post-stress cortisol levels, indicating that the risk for an impaired recovery from cognitive stressors may be heightened in ADHD.

Conclusions: The results warrant a focus on stressors and subjective stress in adults with ADHD, as well as support comprising stress management and coping skills.

Correspondence: *Tatja Hirvikoski, MSc, Dept of Psychiatry, Karolinska University Hospital, NPE (R5), Karolinska University Hospital, Stockholm 17176, Sweden. E-mail: tatja.hirvikoski@sll.se*

L. HUMPHREY, N.L. HORTON, T. TERTTU, A. TAANILA, S. LOO, M. JARVELIN, I. MOILANEN & S. SMALLEY. Rey Osterreith (RO) Performance in Finnish Adolescents With and Without Attention Deficit Hyperactivity Disorder (ADHD).

Objective: The RO has been used successfully to distinguish ADHD subjects from controls, but the scoring procedures used are unwieldy. Based on other research we suspected that simpler RO scoring methods could discriminate ADHD subjects, thereby saving time and improving reliability for the clinician. To test this idea we are performing a comprehensive evaluation of easily-measured ways of drawing the RO to identify ones that distinguish ADHD from control adolescents. One such approach, discussed below, is whether subjects perceive the base rectangle (BR) of the figure as a single unit, evidenced by drawing it with four successive strokes.

Participants and Methods: We examined RO drawings from non-medicated adolescents aged 16-17 from the Northern Finland Birth Cohort, a population sample. Positive SWANN and KSADS results identified the ADHD sample; controls were negative on both. Copy and delay RO productions (n=231) were scored for BRs drawn with four successive strokes.

Results: There were no differences between ADHD subjects' and controls' BR drawing styles on the copy. Conversely, when drawing the figure from memory immediately after copying it, control subjects more frequently drew the BR as a single unit than did those with ADHD ($X^2=9.045$; $p<.01$).

Conclusions: These results indicate that adolescents without ADHD were more likely to draw the BR as a single unit than did their age-peers with ADHD, but only in the delay condition. We speculate that controls' perception of the figure benefited more from the copy task because they were more attentive and therefore better able to experience incidental learning while copying the design.

Correspondence: *Lorie Humphrey, PhD, Psychiatry and Biobehavioral Sciences, UCLA, 11340 West Olympic Blvd, Suite 250, Los Angeles, CA 90064. E-mail: loriehumphrey@yahoo.com*

S.E. LEHTONEN & M.K. MORRIS. Do the Behavioural and Emotional Characteristics Related to AD/HD in Adults Predict Attention Network Efficiency?

Objective: The aim for this study was to identify the cognitive correlates of the behavioural and emotional characteristics related to AD/HD in adults, utilizing a computerized attention task, the Attention Network Test (ANT). ANT components have been found to activate brain areas linked to the functioning of alerting, orienting and executive attention, and have the potential to provide an indication of the efficiency of these brain networks.

Participants and Methods: The participants were 99 university students. In addition to the ANT, a brief interview pertaining to demographic characteristics and medical information, and three questionnaires (BDI-II, BAI, and CAARS-S-L) were administered.

Results: An ANCOVA revealed that individuals reporting high levels of impulsivity/emotional lability had poorer executive attention efficiency in comparison to those reporting less of these problems. Hierarchical regression analyses revealed that gender was the most consistent predictor of ANT performance, high levels of self-reported inattention and hyperactivity-impulsivity predicted poorer alerting efficiency with increasing age, and depression and/or anxiety did not predict the efficiency of attention networks.

Conclusions: High level of impulsivity/emotional lability was related to poorer executive attention efficiency. This finding is consistent with prior studies investigating the relationship between ANT performance and borderline personality disorder characteristics, and raises the possibility of an association among emotion regulation difficulty and weak executive attention network efficiency. Further, female gender was related to poorer executive attention efficiency. Finally, high levels of self-reported inattention and hyperactivity-impulsivity may be a risk factor for poorer alerting efficiency with increasing age.

Correspondence: *Sanna E. Lehtonen, PhD, Neurology, South Karelian Central Hospital, Valto Käkelänkatu 1, Lappeenranta 53130, Finland. E-mail: sanna_lehtonen@hotmail.com*

S.M. PALMA, S. RIZZUTTI, L.C. SCARAMUZZA, D. PINHEIRO, R. STUQUE, D.A. DIAS, K.P. RODRIGUES, D.X. GOUVÊA, D.L. BARBOSA, R.A. FIGARO, M. MUSZKAT & O.A. BUENO. Comorbidities in a sample of Brazilian Children with Attention Deficit Hyperactivity Disorders (ADHD).

Objective: The aim of this study was to evaluate clinical aspects related to ADHD in particular the ones concerning the association with comorbidities.

Participants and Methods: The assessment involved 150 children aged 7 to 14 referred to NANI at UNIFESP with complaints of attention difficulties and/or hyperactivity.

They were assessed by a multidisciplinary team and a battery of neuropsychological tests. The neuropsychological protocol included: Intellectual Level Assessment (Scale WISC-III abbreviated), EACI-P Scale, Computerized Attention Test, Rey Figure, CBCL Scale and screening for delimitation of comorbidities.

Results: 75 children (55 M and 20 F) fulfilled the criteria for ADHD, among which 35 were of the inattentive type, 28 of combined type and

12 were hyperactive/impulsive. Out of the 75 children who met the criteria for inattentiveness and/or hyperactivity according to DSM-IV, 33 cases (44%) had complaints of comorbidities, whereas 22 cases (66.6%) presented anxiety disorder, 8 patients (24.2%) had oppositional defiant disorder and 3 cases had conduct disorder (9%). With regards to mood disorders, it was observed bipolar disorder in 3 cases (9%) and 3 cases met the criteria for severe depression (9%). The association of ADHD with several comorbidities such as oppositional defiant disorder, anxiety disorder, depression and learning disabilities also depend on a more comprehensive multidisciplinary assessment. In our study we found that, although the children met the symptomologic ADHD criteria, after completing the assessment with a detailed protocol in 39.5% of the cases they did not meet broader neuropsychological and clinical criteria.

Conclusions: Such finding emphasises the importance of global assessment. The risk of basing ADHD diagnosis on behavioural scales which are not totally precise for the detection of the 3 subtypes, even the behavioural scales answered by the teachers. The impact of comorbidities may modify the therapy, rehabilitation strategies and prognosis. Correspondence: *Sonia Maria M. Palma, Medicine, Psychobiology, Universidade Federal de São Paulo, Av. Miguel Estefano, 350- apto. 63, Rua Napoleão de Barros, 925, São Paulo 04301-000, Brazil. E-mail: soniammpalma@hotmail.com*

R. MARTÍN, S. HERNÁNDEZ, P.A. GONZÁLEZ-PÉREZ, A. MACHADO, E. VERCHE, I. QUINTERO & J. BRAVO. Neuropsychological Evaluation of Memory in Children and Adolescents with Attention-Deficit Hyperactivity Disorder (ADHD): a Lifespan Perspective.

Objective: Introduction: Neuropsychological studies have shown memory deficit in ADHD associated with poor executive performance. Few researches have studied this topic across lifespan. Objective: Study the memory performance evolutionary pattern in ADHD.

Participants and Methods: Participants: 31 controls and 31 ADHD, grouped in two age ranges (7-12, 13-17 years); normal IQ and without other neurological/psychiatric disorders. The protocol assessed Verbal Working Memory (VeWM; Sentences Span Task and Digit-Span); Visual Working Memory (ViWM; Visual-Tapping), Verbal Memory (VM; AVLT-Rey), Visuoperceptual Memory (VpM; CFT-Rey), and Procedural Memory (PM; Tower of Hanoi).

Results: Interaction Group x Age was found in backward visual tapping span. Post-hoc analysis showed significant differences between ADHD-Controls in Adolescents; and between children and adolescents in the Control-Group. Main effect of Group was found in VeWM, forward visual span, VM, VpM and PM. These results indicated a worse performance in ADHD-group. Main effect of Age was found for VeWM; forward visual span; and VpM; showing an improvement of performance with Age. Both groups evidenced similar verbal and procedural learning curves.

Conclusions: Results suggest a deficit in the evaluated memory modalities in ADHD. However, in both groups VeWM, forward visual span and VpM performance increase similarly across the lifespan. ViWM span improves across childhood in Controls. This profile is not replicated in ADHD. Moreover differences between the groups exist only in adolescence. Results could be interpreted in terms of a delay in the maturation of cortical and subcortical systems associated with memory. More research should be made to elucidate the role of executive functions in this memory profile in ADHD. Correspondence: *Raquel Martín, Bachelor, Psychobiology & Methodology of Behavioural Sciences, University of La Laguna, School of Psychology, Campus of Guajara, La Laguna 38205, Spain. E-mail: rmarting@ull.es*

N. REIMAN, J. TORSTI, E. ESKOLA, L. PIHLAKOSKI, J. LÄHDETIIE, H. HÄMÄLÄINEN & T. KORHONEN. Assessing executive functions in children with ADHD: A comparative study of results of the Behavior Rating Inventory of Executive Functions (BRIEF) and neuropsychological tests.

Objective: This study describes the relationship between results of the Behavior Rating Inventory of Executive Functions (BRIEF) and neuropsychological tests when assessing executive functions (EF) in children with ADHD.

Participants and Methods: 20 children with ADHD and 20 healthy gender, age and parental education matched control children were evaluated at the age of 6 to 10 years. The methods included BRIEF-questionnaires for parents and teacher and neuropsychological tests selected to roughly correspond the BRIEF subscales: inhibition, shifting, working memory, planning and organizing and monitoring.

Results: Children with ADHD had difficulties in the EF based on both the BRIEF and the test results. However the difficulties occurred more severe in the BRIEF which also specified difficulties in separate functions better. Quite strong correlation between the BRIEF and the test results was found when analysing the global EF. In more specific level the correlations were inconsistent. A group of children exhibited severe EF difficulties in the BRIEF but only modest or none in the tests. These children also had more problems in peer relationships, which indicates a relation between social skills and the behavioural level of the EF.

Conclusions: Compared to the tests, the BRIEF was more sensitive to executive dysfunction in children with ADHD. This can be explained by the differences in the assessment environments. The BRIEF also takes into account the social and emotional aspects of the EF. In clinical assessment the BRIEF is useful together with cognitive measures to give more data of the EF in children with ADHD.

Correspondence: *Nina Reiman, University of Turku, Varusmestarintie 6-S i 67, Turku 20360, Finland. E-mail: nina.reiman@gmail.com*

S. RIZZUTTI, E.G. SINNES, L. SCARAMUZZA, L. FREITAS, D. PINHEIRO, S.M. PALMA, C.B. MELLO, M.C. MIRANDA, O.F. BUENO & M. MAURO. Clinical and Neuropsychological profile in a sample of Children with Attention Deficit Hyperactivity Disorders (ADHD).

Objective: The aim of this study was to evaluate clinical and neuropsychological findings in children with suspicion of ADHD

Participants and Methods: The assessment involved 150 children aged 7 to 14 referred to NANI at UNIFESP with complaints of attention difficulties and/or hyperactivity. They were assessed by a multidisciplinary team and a battery of neuropsychological tests

Results: 75 children (55 M and 20 F) fulfilled the criteria for ADHD, among which 35 were of the inattentive type, 28 of combined type and 12 were hyperactive/impulsive. There was negative correlation between the digit score and the Corsi test, especially in reverse order. Children with high scores for hyperactivity and impulsivity had a low performance for functional memory. Children with oppositional defiant disorder presented pattern changes in adaptability when there was a change in the rhythm the stimuli were presented and lower adaptation to time variability (Hit RT), in addition to higher rates of omission in the CPT.

Conclusions: This study suggests multiple interrelations between the scores of neuropsychological battery, which are useful for a more detailed delimitation of the clinical profile of children with ADHD in order to select better approaches in a cognitive rehabilitation program.

Correspondence: *Sueli Rizzutti, Departamento de Psicobiologia, UNIFESP, R. Embau, 54, São Paulo 04039060, Brazil. E-mail: surizzutti@ig.com.br*

J. TORSTI, E. ESKOLA, N. REIMAN, L. PIHLAKOSKI, J. LÄHDETIE, H. HÄMÄLÄINEN & T. KORHONEN. Long-Term Methylphenidate Treatment Improves the Every-day Executive Functions of Children with ADHD.

Objective: Methylphenidate (MPH) medication has been associated with improvement in executive functions (EFs) of children with ADHD. Enhancement has varyingly been reported in inhibition, behavior regulation, monitoring and working memory. This study, using behavioral questionnaires, investigated how long-term (6 months) MPH treatment effects EFs in children with ADHD.

Participants and Methods: Participants were 16 children with ADHD, aged 6-11 years, and 16 typically developed gender- and age- matched controls. Assessments were done prior to MPH treatment and again after 6 months of regular medication. The behavior rating scales were

parent and teacher- completed ADHD-RS-IV (measure of symptoms) and BRIEF (Behavior Rating Inventory of Executive Function). BRIEF consists of 8 domains of EF: inhibition, shift, emotional regulation, initiate, plan/organize, working memory, organization of materials and monitoring.

Results: Long-term MPH treatment improved EFs in the ADHD-group. The medication effect was significant on all the domains of BRIEF. According to the total score of ADHD-RS-IV the ADHD -symptoms were significantly reduced.

Conclusions: Long-term MPH medication of ADHD had positive effects on children's executive skills in their everyday life. The children learned to control their impulses and emotions better and to organize their tasks more competently. However, even on MPH treatment the children with ADHD still showed more deficits than the children in the control group. The BRIEF-questionnaire is efficient to reveal deficits and improvements in EFs in children with ADHD.

Correspondence: *Jutta Torsti, MPs, Child Psychiatry, Turku University Hospital, PL 52, Turku 20521, Finland. E-mail: juttor@utu.fi*

T. TUOMINEN, T. KORHONEN, S. TEMONEN, H. SALO, H. HÄMÄLÄINEN, J. KATAJISTO & H. LAUERMA. ADHD Traits in Finnish Male Prisoners.

Objective: ADHD (Attention-Deficit/Hyperactivity Disorder) begins in early childhood and continues into adulthood. It is clearly associated with a greater risk of antisocial and criminal activity. This study evaluates the number and quality of neurocognitive ADHD traits in Finnish male offenders. No ADHD diagnose was made in this study.

Participants and Methods: The participants were 78 male offenders from the Prison of South Western Finland, ages 19-61 years, who were examined neuropsychologically. The selection of neuropsychological tests was based on the theoretical model of attention of Mirsky and his colleagues (1991). The main tests were The Continuous Performance Task, The Wisconsin Card Sorting Test, The Purdue Pegboard and The Wechsler Adult Intelligence Scale-III.

Results: The results suggest high prevalence (46.5%) of marked ADHD traits in prison inmates. These subjects had significantly more deficits in focusing and shifting attention and in memory functions than the group with no ADHD traits. Moreover, ADHD traits and combined disorders such as reading and spelling disorders were common among offenders.

Conclusions: The findings stress the need for greater awareness and examination of ADHD and its comorbid disorders in prison inmates.

Correspondence: *Taina Tuominen, M.A., Psychology, University of Turku, Vekarakatu 1, Turku 20900, Finland. E-mail: tituomi@utu.fi*

T. HIRVIKOSKI, E. WAALER, J. ALFREDSSON, P. BOTHÉN, A. HOLMSTRÖM, C. HAAPARANTA, A. JOHNSON, C. WIWE, J. RÜCK & A. NORDSTRÖM. Dialectic Behavioural Therapy-based skills training in group for adults with attention deficit hyperactivity disorder (ADHD).

Objective: We evaluated feasibility, efficacy and acceptability of a Dialectical Behavioural Therapy (DBT) -based method developed in Freiburg, Germany (Hesslinger, Philipsen, & Richter, 2004; Hesslinger, et al., 2002; Philipsen, et al., 2007) in a Swedish out patient psychiatric context.

Participants and Methods: Fifty adults with ADHD on stable medical treatment since at least three months or with no medical treatment were randomized to a structured skills training program (n = 26) or a loosely structured discussion group (n = 24), both led by two psychologists. The ADHD Symptom Scale was completed before randomization and after treatment. Treatment Credibility Scale (TCS) was completed during sessions 1, 5, 10 and 14. "Treatment satisfaction scale" from the manual was completed after treatment.

Results: Approximately 80 % of participants in both groups completed the group program. The preliminary analyses of those individuals who completed the treatment and stayed on stable medical treatment (n = 19 in skills training; n = 17 in control group) showed that the skills training was associated with a significant reduction in ADHD symptoms,

while there were no changes in ADHD symptoms in the control group. There were no differences in treatment satisfaction between the two groups. However, the participants in the skills training group scored significantly higher on Treatment Credibility Scale. Background variables such as age, gender or full scale IQ were not significant predictors of the treatment outcome in the skills training group.

Conclusions: Group-therapy based on DBT is an effective and well-tolerated complement to the medical treatment of ADHD in adults.

Correspondence: *Tatja Hirvikoski, MSc, Dept of Psychiatry, Karolinska University Hospital, NPE (R5), Karolinska University Hospital, Stockholm 17176, Sweden. E-mail: tatja.hirvikoski@sll.se*

Traumatic Brain Injury (Child)

L. CROSSLEY, M. CHEVIGNARD, M. BEAUCHAMP, C. CATROPPIA & V. ANDERSON. Script Generation of Everyday Activities: An Ecological Measure of Executive Skills in Children with Traumatic Brain Injury.

Objective: Traumatic brain injury (TBI) disrupts executive skills in children. Traditional tests of executive function do not always reflect the context and demands of everyday challenges. The use of script generation tasks has been proposed as a more ecologically valid measure of executive skills in adults. However, it is unclear if these tasks can be utilized in pediatric populations. This study investigated whether script generation tasks are sensitive to executive dysfunction in children with TBI.

Participants and Methods: Nineteen children with mild/moderate TBI (12 male, mean age = 7.6, SD = 0.9) were compared to eleven children with severe TBI (7 male, mean age = 7.6, SD = 0.9) on two script generation tasks, at 12-months post injury. Participants were asked to generate a script of a familiar routine activity (e.g. 'How to make a sandwich') and an age appropriate game (e.g. 'Guess Who' or 'Snap'). Two independent examiners blind to injury severity rated the scripts on a number of variables including core steps, total actions, and level of prompting using a task-specific coding system.

Results: On the routine script task, severely injured patients generated less overall core steps and total actions than mild/moderate patients. On the game script task, severely injured patients generated less spontaneous core steps and required more prompts than mild/moderate patients.

Conclusions: The results demonstrate that children with TBI present with executive deficits in everyday activities, and suggest that script generation tasks are a useful ecological tool for measuring executive function in children with TBI.

Correspondence: *Louise Crossley, Psychology, Murdoch Childrens Research Institute, Flemington Road, Parkville, VIC 3052, Australia. E-mail: louise.crossley@mcri.edu.au*

M. DENNIS, K. SINOPOLI, C. KING, D. SAMMLER & S. KOELSCH. Implicit Judgment of Music Syntax in Children with Traumatic Brain Injury.

Objective: Musical sequences, like linguistic sequences, follow grammatical rules that combine notes and chords according to a musical syntax (Patel, 2003, 2008). Grammatical and ungrammatical musical sequences can be created by varying the chord progression that marks the end of a harmonic sequence. Both non-musicians and young children show implicit understanding of music grammar (Koelsch et al., 2003, 2005; Tillmann et al., 2006). We studied how children with traumatic brain injury (TBI) make implicit judgments of music syntax.

Participants and Methods: Typically developing children (N=20, mean age 12.4 years) and children with TBI (N=20, mean age=12.0 years) were presented with 6-chord sequences. Half of the sequences were grammatical (ending in a tonic chord), and the other half were ungrammatical (ending in a dominant-to-dominant chord; adapted from Koelsch et al., 2008). The children's task was to judge the timbre of the final chord (i.e. to decide whether it had been played on a trumpet or an electric piano).

Results: Overall, judgment of musical timbre was equally fast in grammatical and ungrammatical chord progressions, but less accurate in the ungrammatical condition ($t=2.08$, $df=39$, $p=0.04$). Age-related improvements in accuracy and reaction time were noted in both conditions (reaction time: grammatical, $r=-0.599$, $p<0.0005$; ungrammatical, $r=-0.579$, $p=0.0005$). While the TBI children were as accurate in judging musical timbre as controls, they were significantly slower than controls in identifying timbre in the ungrammatical condition ($F=4.31$, $df=1$, $p=0.045$). Older age at injury was associated with better accuracy in the ungrammatical condition ($r=0.644$, $p=0.002$).

Conclusions: Childhood TBI affects the implicit judgment of music syntax.

Correspondence: *Katia Sinopoli, MSc, Psychology, The Hospital for Sick Children, 555 University Ave, Toronto, ON M5G 1X8, Canada. E-mail: katia.sinopoli@utoronto.ca*

T. HEINKS-MALDONADO, A.H. WOERNER, S. JOURDAN & M. STEINLIN. Prognostic Factors in Pediatric Traumatic Brain Injury: Correlation of Clinical Parameters and Neuropsychological Outcome.

Objective: Traumatic brain injury (TBI) is the most common cause of mortality in childhood and has a high morbidity in survivors. During recent years, it became more and more evident that neuropsychological problems occur even after minor or moderate traumatic brain injury. Clinical symptoms during the acute phase are prognostic for later neurological outcome. However, their significance for neuropsychological outcome has been less well documented.

Participants and Methods: 131 patients aged 2 months to 16 years at the time of TBI were included into this retrospective analysis that comprised data of the last seven years. Children with non-accidental trauma or a preexisting neuropsychological diagnosis were excluded. Clinical parameters such as Glasgow coma scale [GCS], duration of coma and intubation, duration of impaired consciousness, intracranial pressure, vegetative symptoms, focal neurological symptoms and seizures were recorded. These data were analysed in correlation to data from neuropsychological assessment at 2-12 months after TBI.

Results: Initial GCS was 13-15 in 61 patients, 9-12 in 30 patients and 3-8 in 40 patients. Mean duration of coma ($GCS \leq 8$) was 48.9 hours (range 1-560). Focal neurological signs were present in 23 children. Mean IQ at follow up assessment was 100.6 (45-125). Initial low GCS (≤ 8), duration of coma and intubation were negatively correlated with neuropsychological outcome, especially IQ scores. A score of focal neurological symptoms, consisting of cranial nerve dysfunction, decerebration symptoms, ataxia and paresis of limbs correlated most significantly with later adverse neuropsychological performance.

Conclusions: The initial clinical course provides important prognostic information for later neuropsychological outcome. This information will help to identify children at risk for neurodevelopmental long-term sequelae and will enable clinicians to choose the optimal treatment strategy at a very early stage.

Correspondence: *Theda Heinks-Maldonado, PhD, Neuropediatrics, University Children's Hospital Berne, Kinderklinik, Inselspital Bern, Bern 3010, Switzerland. E-mail: theda.heinks-maldonado@insel.ch*

M.K. KERMINEN. Parental Distress and Child's Executive Function Skills among Families attending Holistic Pediatric Rehabilitation Program for Brain-Injured Children (HOPE).

Objective: According to the literature, a bi-directional influence exists between brain injured child's behaviour and parental distress level. Additionally, child's executive function deficits affect his/her every-day functioning and increase parental distress.

The purpose of the study was to investigate the connection between executive function skills of the brain-injured children and parental distress among Finnish families attending Holistic Pediatric Rehabilitation Program for Brain-Injured Children (HOPE) during the years 2005-2008.

HOPE is a comprehensive outpatient rehabilitation program for brain-injured children and their families. The goals of the program are to increase the child's and his/her family's functioning and quality of life along with increasing collaboration with local authorities.

Participants and Methods: The study group consisted of 20 families. Ages of the children varied between 6 and 16 years.

The background information was gathered using basic neuropsychological tests, Five to fifteen-scale and BRIEF and HIBS questionnaires. Classroom performance was evaluated by the teacher of the child.

Results: Correlations between parental distress and children's executive function skills were significant at the .05 level in the beginning and six months after rehabilitation program. Child's female gender predicted higher parental distress level and more EF deficits than male gender.

Conclusions: The bi-directional influence between children's executive function skills and parental distress reported in this paper should be considered in developing new rehabilitation interventions for brain-injured children and their families.

Correspondence: *Mari K. Kerminen, MA (in psych.), Rehabilitation and Development Center, The Mannerheim League for Child Welfare, Foundation for the Children and Young People, Valasrannantie 465, Yläne 21900, Finland. E-mail: mari.kerminen@mll.fi*

K. SINOPOLI & M. DENNIS. Impaired Awareness of Deficits in Children with Traumatic Brain Injuries.

Objective: Traumatic brain injury (TBI) often leads to poor self-awareness of motor, cognitive, behavioral, and social deficits in adults (Prigatano, 1992; Stuss & Anderson, 2004). Although children with TBI seem unable to evaluate their own abilities (Hanten et al., 2004), it is not known whether they also exhibit poor insight into their difficulties in attention, social competence, and behaviour.

Participants and Methods: We examined self-awareness following childhood TBI using the Conners 3 multi-informant rating scales (Conners, 2008). Twenty-six children with mild to severe TBIs (mean age 14.0 years) and 27 normal controls (mean age 13.8 years) completed the Conners 3 Self-Report questionnaires, and one parent of each child completed the Conners 3 Parent Report.

Results: In comparison to controls, children with TBI reported clinically significant impairments on the Inattention Content Scale ($f=5.86$, $df=1$, $p=0.02$), as well as endorsing more items on the Aggression Content Scale ($f=7.84$, $df=1$, $p=0.008$) and ADHD Inattention ($f=4.59$, $df=1$, $p=0.038$) and Conduct Disorder ($f=7.22$, $df=1$, $p=0.01$) DSM-IV-TR Criteria Symptom Scales. Neither age at assessment nor injury severity moderated these effects. In contrast, parents of TBI children endorsed more items on the Inattention ($f=6.13$, $df=1$, $p=0.017$), Hyperactivity/Impulsivity ($f=7.06$, $df=1$, $p=0.01$), Aggression ($f=4.19$, $df=1$, $p=0.04$) and Global index ($f=10.89$, $df=1$, $p=0.02$) Content Scales, and rated their children as exhibiting significantly greater symptoms on the DSM-IV-TR ADHD Hyperactive/Impulsivity Symptom Scale ($f=9.7$, $df=1$, $p=0.003$).

Conclusions: These data suggest that although children with TBI identify some long-lasting sequelae of their injury, they underestimate the range and severity of their own deficits.

Correspondence: *Katia Sinopoli, MSc, Psychology, The Hospital for Sick Children, 555 University Ave, Toronto, ON M5G 1X8, Canada. E-mail: katia.sinopoli@utoronto.ca*

C. SOO, R.L. TATE, L. WILLIAMS, S. WADDINGHAM & M. WAUGH. Validity of the Paediatric Care and Needs Scale (PCANS) for assessing support needs of children and adolescents with acquired brain injury.

Objective: The Paediatric Care and Needs Scale (PCANS) is a newly developed instrument for measuring support needs following childhood acquired brain injury (ABI). This study aimed to investigate the concurrent and construct validity of the PCANS.

Participants and Methods: Participants were 32 parents/caregivers of children with ABI (5-18 years) recruited from the Rehabilitation De-

partments of the Children's Hospital at Westmead and Sydney Children's Hospital, Australia. Concurrent validity was examined by comparing the PCANS with other measures currently used for children with ABI - Functional Independence Measure for Children (WeeFIM) and Vineland Adaptive Behavior Scales (VABS). WeeFIM and VABS subscales that tap similar and dissimilar constructs to the PCANS were further used to investigate convergent and divergent validity respectively. Discriminant validity analysis comprised comparing PCANS scores between groups dichotomised by adaptive functioning and overall outcome.

Results: Concurrent validity was shown with moderate correlation coefficients found for PCANS support intensity scores with most WeeFIM and VABS variables ($r_s = -.46$ to $-.77$, $p < .01$). Some evidence for convergent and divergent validity was also found. For example, correlation coefficients between PCANS self-care items against WeeFIM self-care and mobility subscales were moderately high ($r_s = -.64$ and $-.63$, $p < .01$); whereas the coefficient between PCANS psychosocial and WeeFIM self-care items was low ($r_s = -.29$, ns). For discriminant validity, PCANS support intensity scores were able to distinguish groups dichotomised by adaptive functioning and overall outcome ($p < .01$).

Conclusions: These findings provide preliminary support for the validity of the PCANS for measuring support needs following childhood ABI and form a promising basis for further work on its assessment properties.

Correspondence: *Cheryl Soo, Australian Centre for Child Neuropsychology Studies, Murdoch Childrens Research Institute, Royal Children's Hospital, Flemington Road, Melbourne, VIC 3052, Australia. E-mail: cheryl.soo@mcri.edu.au*

Traumatic Brain Injury (Adult)

R.P. REDDY, J. RAJAN, I. BAGAVATHULA & T. KANDAVEL. Effects of Neurofeedback on Memory and Quality of Life in Traumatic Brain Injury.

Objective: The objectives of the study were to examine the effects of Neurofeedback in

1. Learning and Memory
2. Quality of Life in patients with TBI.

Participants and Methods: Research design:

Pre-post Interventional study design was adopted.

Ten patients, with the diagnosis of TBI in the age range of 18-49 years were assessed on Edinburgh Handedness Inventory, Rivermead Post Concussion Symptoms Questionnaire, Rivermead Head Injury Follow up Questionnaire, Quality of Life Scale, Visual Analog Scale and NIMHANS Neuropsychological Battery (Auditory Verbal Learning and Memory, Complex Figure Test) and WHO - QOL. after obtaining the informed consent. Patients were given 20 sessions of neurofeedback, 5 sessions per week. Training focused on theta inhibition and enhancement of alpha waves frequency. Data were analyzed individually to evaluate the deficits and changes in the performance of the training using the standardized manual procedure.

Results: Patients showed improvements in learning and memory and quality of life post intervention on neuropsychological measures and QOL scale.

Conclusions: Results are encouraging for the incorporation of neurofeedback into treatment programs for patients with TBI.

Correspondence: *Rajakumari P. Reddy, Ph.D scholar, NIMHANS, Department of MH & SP, NIMHANS, Hosur Road., #001, Staff Hostel, NIMHANS, Hosur Road., Bangalore 560029, India. E-mail: rajakumari.pampa@gmail.com*

R.P. REDDY, J. RAJAN, I. BAGAVATHULA & T. KANDAVEL. Executive Functions and Quality of Life in Traumatic Brain Injury.

Objective: The objective was to study the

1. Executive Functions and
2. Quality of Life in patients with Traumatic Brain Injury (TBI).

Participants and Methods: Thirty patients, with the diagnosis of mild to moderate TBI in the age range of 18-49 years were assessed on Edinburgh Handedness Inventory, Rivermead Post Concussion Symptoms

Questionnaire, Rivermead Head Injury Follow up Questionnaire, Quality of Life Scale and NIMHANS Neuropsychological Battery, after obtaining the informed consent. The executive functions were measured Animal Name Test, Verbal N Back, Tower of London, Wisconsin Card sorting Test, Stroop Test. Data were analyzed to evaluate the deficits and the performance of the training using the standardized manual procedure.

Results: Patients showed deficits category fluency, working memory, planning, set shifting, planning and response inhibition. The study also indicated involvement of poor quality of life

Conclusions: Results imply the need for the incorporation of neuropsychological rehabilitation treatment programs for patients with TBI. Correspondence: *Rajakumari P. Reddy, Ph.D scholar, NIMHANS, Department of MH & SP, NIMHANS, Hosur Road., #001, Staff Hostel, NIMHANS, Hosur Road., Bangalore 560029, India. E-mail: rajakumari.pampa@gmail.com*

K.M. ADAMS, K.A. WHITNEY, J.J. DAVIS, P.H. SHEPARD & D.M. BERTRAM. Digit Span Age Scaled Score in Middle-Aged Military Veterans at Risk for TBI: Comparative Utility in Confirmation of Incomplete Effort.

Objective: Soldiers returning from modern combat may have been exposed to multiple events involving risk for head trauma from blunt blows, acceleration/deceleration accidents, and blasts from explosive devices/munitions. Neuropsychologists typically must evaluate milder severity cases, often equivocal in nature. To advance the accuracy of neuropsychological determinations of incomplete effort and/or deliberate underperformance, more than single test or task paradigms are required. We surveyed available published sensitivity values for Digit Span (DS) parameters in search of a way to use DS to improve positive and negative predicted value outcomes. We examined some retrospective outpatient data

to evaluate the comparative efficiency of DS embedded test indices in identifying incomplete effort and suspected feigning.

Participants and Methods: An outpatient sample of returning veterans (n=46; M age 49.1; M education 9.8) was administered the Test of Memory Malingering (TOMM) and DS, among other measures. Established indices of DS and TOMM performance were evaluated utilizing correlation, regression and ROC methods. Positive and negative predictive values (PV) were calculated.

Results: DS age Scaled Score (SS) alone differentiated patients who passed the TOMM (n=26) and those who failed (n=20). Relative regression contribution was greatest for DS Age SS. ROC analysis enabled adjustment to maximize positive and negative PV. Area under the curve of .71 for DS age SS was higher than for other variables. Various trade-offs for using cutoff scores for 4-7 on this index are presented.

Conclusions: Sole reliance on stand alone tests to identify incomplete effort can produce occasional errors in clinical judgment with adverse effects on patients. The use of parameters of embedded tests and tasks can produce better results. Cross validation of these results is needed; but in the context of exploring the performance of multiple indices. Algorithms can and should be derived that are robust and not dependent on single tests or tasks.

Correspondence: *Kenneth Adams, VA Ann Arbor Healthcare System & University of Michigan, 2464 Newbury Court, Ann Arbor, MI 48103. E-mail: kmadams@umich.edu*

L.A. BIELIAUSKAS, R.J. SPENCER, L.J. DRAG & S.J. WALKER. Self-reports of Cognitive Function Are Not Predictive of Neuropsychological Test Performance among Returning Combat Veterans.

Objective: Clinicians often rely on patients' self-report to assess cognitive functioning, particularly when time and resources are limited. However, the subjective nature of self-report may limit its clinical utility in the absence of objective corroboration. This study examined whether self-report of cognitive functioning predicts neuropsychological test performance in a combat veteran population.

Participants and Methods: Patients used five-point Likert scales to rate attention and concentration, memory, processing speed, and executive functioning as part of a standardized mental health screen administered to combat veterans seen in the Polytrauma Support Clinic at the VA Ann Arbor. As part of a standard protocol within VA hospitals, all returning combat veterans reporting blast exposure and/or possible head injury receive this screen. Individuals also completed a 30-minute screening battery, including questionnaires of psychiatric symptoms and neuropsychological tests assessing attention and concentration, memory, processing speed, and executive functioning.

Results: Correlational analyses were used to examine the relation between self-report of cognitive symptoms and performance on corresponding neuropsychological measures. Self-report of cognitive symptoms was not associated with performance on objective cognitive measures but was significantly associated with psychiatric symptoms.

Conclusions: Data from patients' self-report and objective neuropsychological assessments can provide distinct and sometimes divergent information regarding cognitive functioning. This study illustrates the importance of using objective cognitive measures, particularly among patients with comorbid psychiatric complaints. In veteran populations with cognitive and psychiatric risk factors, including a brief cognitive screen that provides objective performance data can significantly improve the accuracy of cognitive assessment beyond self-report.

Correspondence: *Linas A. Bieliauskas, Ph.D., Neuropsychology, University of Michigan, 2101 Commonwealth Blvd., Suite C, Ann Arbor, MI 48105. E-mail: linas@umich.edu*

C. BRADBURY, E. PANO & R. GREEN. Traumatic brain injury in people with spinal cord injury: prevalence and clinical consequences.

Objective: To illustrate the emotional and economic consequences of traumatic brain injury (TBI) in people with spinal cord injury (SCI)

Participants and Methods: 30 patients with SCI plus TBI and SCI-only.

Results: Those with dual diagnosis had longer lengths of stay and cost more due to increased nursing costs as well as length of stay

Conclusions: TBI is underdiagnosed in people with SCI, yet it has significant implications.

Correspondence: *Cheryl Bradbury, TorontoRehab, 550 University Ave, Toronto, ON M6A2G2, Canada. E-mail: bradbury.cheryl@torontorehab.on.ca*

R.M. CAMILLERI, S. CARTON, M. DELARGY, I.H. ROBERTSON & P.M. DOCKREE. Investigating Cognitive And Electrophysiological Mechanisms Of Task-Switching Deficits In Traumatic Brain Injury (TBI).

Objective: Patients with Traumatic Brain Injury (TBI) frequently experience problems redeploying attention from one course of action to another described as cognitive flexibility. In this study performance during the Switching Attention Task (SWAT) was compared in TBI patients and controls in order to elucidate behavioural and electrophysiological mechanisms that are dysfunctional in TBI patients

Participants and Methods: Twenty TBI patients and twenty neurological-healthy controls volunteered. The task (Wylie et al., 2003) requires participants to alternate between different task-sets after every four consecutive trials. The stimuli comprise letter-number pairs (for example "G7") presented in one of two different colours (green or red). For one colour pair participants categorized the letter as a vowel or a consonant and, for the alternative colour pair, participants categorized the number as odd or even. Electrophysiological recordings (EEG) are acquired during the task

Results: Behavioural results are analysed in terms of switch cost and error differences between TBI patients and controls. Moreover, electrophysiological (Event Related Potentials) markers underlying these switch costs in TBI patients and controls are also compared. Mixed factorial ANOVAs examine differences as a function of Group (TBI, control) and Trial type (Switch, Neutral, Pre-Switch).

Conclusions: Results are discussed in terms of a competition model in which preparing to switch task is understood in terms of increased competition in the network of areas underlying the performance of two tasks (Wylie et al., 2003). This analysis approach has implications for identifying cognitive and electrophysiological biomarker that underlie disabling and persisting cognitive deficits following brain injury.

Correspondence: *Paul M. Dockree, PhD, School of Psychology and Institute of Neuroscience, Trinity College Dublin, Aras an Pharsaigh, Trinity College Dublin, Dublin D6, Ireland. E-mail: dockreep@tcd.ie*

E. DE GUISE, N. GOSSELIN, J. LEBLANC, M. CHAMPOUX, C. COUTURIER, J. LAMOUREUX, J. DAGHER, J. MARCOUX, M. MALEKI & M. FEYZ. Clock Drawing and the Mini-Mental State Examination in Patients with Traumatic Brain Injury.

Objective: To compare the performances of patients with mild, moderate and severe TBI on the Clock Drawing Test (CDT) and the Mini-Mental State Examination (MMSE) and correlate these measures with outcome assessed by the Extended Glasgow outcome scale (GOS-E).

Participants and Methods: A study was conducted in an early rehabilitation setting on 110 patients with mild, 30 with moderate and 30 with severe TBI.

Results: Moderate and severe TBI patients showed more impairment on the CDT compared to those with mild TBI. A proportion of 59.1% of the mild group had a score of 7 or more compared to 43.3% in the moderate group and 30% in the severe group ($\chi^2_{2df} = 8.880, p = 0.012$). Similar results were obtained on the MMSE ($F(2,165df) = 4.611, p = 0.011$) but despite the difference among groups, no impairment per se was observed in any of the groups of patients on the MMSE (cut-off of 24). In addition, a higher level of impairment noted on the CDT was related to a less favorable outcome. A ROC-analysis indicated that a cut-off value of 8.5/10 would be better (sensitivity of 70% and specificity of 64%) to differentiate between good (0 or 1 for GOS-E) and bad (GOS-E of 2 or more) outcome in TBI patients.

Conclusions: The CDT is a useful tool for cognitive screening in TBI patients and adds prognostic information but the MMSE does not seem to be sensitive enough to identify impairment in TBI patients of all severities.

Correspondence: *Elaine de Guise, Ph.D., TBI Program, McGill University Health Centre, 1650 Cedar Ave. D13-124, Montreal, QC H3G 1A4, Canada. E-mail: elaine.deguise@muhc.mcgill.ca*

E. DE GUISE, N. GOSSELIN, J. LEBLANC, M. CHAMPOUX, C. COUTURIER, J. LAMOUREUX, J. MARCOUX, J. DAGHER, M. MALEKI & M. FEYZ. Neuroanatomical Correlates of the Clock Drawing Test in Patients with Traumatic Brain Injury.

Objective: The clock drawing test (CDT) is a quick and easily administered test that has traditionally shown parietal lobe dysfunction. The aim of this study was to correlate performance on CDT with presence of cerebral injuries sustained after traumatic brain injury (TBI).

Participants and Methods: A retrospective study was conducted on 170 TBI patients of all severities admitted to an acute care setting. These patients have sustained different sites of cerebral injuries (frontal, temporal, parietal, occipital) as well as different types of injuries (epidural hematoma, subdural hematoma, subarachnoid haemorrhage, parenchymal/intraparenchymal hematoma, intracranial swelling, and diffuse axonal injury). The CDT was administered at bedside in the first two weeks after TBI.

Results: TBI patients who had sustained a parietal haemorrhage showed significantly more impairment on the CDT than those who did not have injury in this area. They showed more difficulty in capturing the integrity of the clock face in their drawing ($r = -0.165, p = 0.031$) and in drawing the numbers ($r = -0.196, p < 0.010$) and hands ($r = -0.192, p = 0.012$) accurately. The same pattern of results was obtained for patients with subarachnoid haemorrhage (respectively $r = -0.314, r = -0.331,$

$r = -0.273$, all $p < 0.001$), with subdural hematoma (respectively $r = -0.175, p = 0.023, r = -0.257, p = 0.01, r = -0.240, p = 0.002$) as well as with brain swelling (respectively $r = -0.302, r = -0.283, r = -0.347$, all $p < 0.001$). Patients with other sites or types of TBI injuries did not show systematic significant impairment.

Conclusions: This study supports the predominant contribution of the parietal lobe to performance on the CDT and the negative consequences of subarachnoid haemorrhage, subdural hematoma and brain swelling to cognition after TBI.

Correspondence: *Elaine de Guise, Ph.D., TBI Program, McGill University Health Centre, 1650 Cedar Ave. D13-124, Montreal, QC H3G 1A4, Canada. E-mail: elaine.deguise@muhc.mcgill.ca*

J. DOUGLAS, C. BRACY & P. SNOW. Social Communication Outcome Following Severe Traumatic Brain Injury: Comparing the Perspectives of Injured Adults and their Relatives at Different Stages of Recovery.

Objective: This study investigated social communication outcome as perceived by adults with severe TBI and their relatives at 3 time postinjury (TPI) intervals (early < 2 years, middle 2-4 years, late > 4 years).

Participants and Methods: Participants were 64 adults with TBI and 64 relatives in early ($n = 21$), middle ($n = 22$) and late ($n = 21$) stages postinjury. The 3 groups were matched on gender, injury severity and age and education at the time of injury. The La Trobe Communication Questionnaire (LCQ) was used to measure social communication ability. The LCQ is a 30-item questionnaire based on universal principles underlying social discourse; self-report and close other versions of the LCQ are available in English, Spanish and Norwegian.

Results: Mixed 2x3 ANOVA (within factor: perception - self versus relative; between factor: TPI group - early, middle, late) revealed a significant interaction ($p = .04$). Planned comparisons revealed: early stage TBI participants reported themselves to have significantly fewer social communication problems than did their relatives ($p = .002$) and significantly fewer problems than middle ($p = .009$) or late ($p = .035$) stage TBI participants. Perceptions of middle and late stage TBI participants and their relatives were similar.

Conclusions: Results reflect the presence of impaired self-awareness of communication deficits early postinjury, but not in the longer term. They also indicate that social communication difficulties associated with TBI do not readily resolve with time/natural recovery. Services to address these deficits continue to be required over a long time frame and in community settings. Correspondence: *Jacinta Douglas, PhD, Human Communication Sciences, La Trobe University, Kingsbury Drive, Bundoora, VIC 3086, Australia. E-mail: J.Douglas@latrobe.edu.au*

S. HAGEL-SØRENSEN, L. SIERT & A. NORDENBO. Length of PTA is Not a Predictor for Discharge to Psychiatric Ward after Subacute Rehabilitation of Severe TBI.

Objective: Patients with TBI are known to have a high risk of developing psychiatric disorders. The objectives are to determine the frequency of patients discharged to a psychiatric ward after severe TBI and to demonstrate the influence of PTA.

Participants and Methods: All participants were inpatients at the Traumatic Brain Injury Unit, Hvidovre Hospital, which is a specialist facility for subacute intensive rehabilitation. Data have been prospectively collected on all patients since the unit opened in October 2000. PTA was assessed during hospitalization and at follow-up one year after TBI using Galveston Orientation and Amnesia Test administered by neuropsychologists. $N = 280$ patients (age 16-87 years) with TBI admitted from October 2000 to January 2008 participated.

Results: For 81 % of the patients the PTA was above 28 days. Of all patients 3,2 % ($n = 9$) were discharged to a psychiatric ward. The average length of PTA for this group was 84,2 days (range 21-300 days), whereas the average PTA for the remainders was 91,0 days (range 1-365 days). The difference was not statistically significant. Of the 9 patients 2 had a known psychiatric diagnosis and further 2 had drug or alcohol abuse prior to TBI.

Conclusions: For this group of patients the length of PTA does not seem to be a valid predictor of whether patients with severe TBI after subacute rehabilitation are discharged to a psychiatric ward or not.

Correspondence: *Susanne Hagel-Sørensen, MSc, Afdeling for neurorehabilitering, Hvidovre Hospital, Kettegård alle 30, Hvidovre 2650, Denmark. E-mail: susanne.hagel-soerensen@hvh.regionh.dk*

B.J. MAINLAND, T.J. ORNSTEIN & K. LARSON. The Influence of Depression and Anxiety on TOMM Performance in Patients with Mild TBI at Six-Months and Two-Years Post-Injury.

Objective: Increasing attention has been devoted to the development and validation of objective measures for the detection of feigned cognitive deficits. The Test of Memory Malingering (TOMM), a forced-choice technique for the detection of poor effort, is widely utilized and has been shown to be sensitive to incomplete effort in patients with traumatic brain injury (TBI). Less clear is the effect of psychological factors on TOMM performance and whether time since brain injury influences affective states. The goals of this novel study are to determine whether the TOMM is influenced by self-report symptoms of depression and anxiety in TBI, and whether this relationship varies according to time-since injury.

Participants and Methods: Archival data of 75 mild TBI patients (mTBI) referred for a comprehensive neuropsychological evaluation and 35 healthy controls were analyzed. The mTBI patients were assessed at 6-months or 24-months post-injury. All study participants completed the TOMM, BDI-II and the BAI.

Results: Factorial ANOVA controlling for education level revealed that the mTBI patients performed worse on the TOMM and showed elevated levels of anxiety and depression at 6-months post-injury compared to healthy controls. TOMM performance was also negatively correlated with BDI at 6-months post-injury only. Time since injury did not affect TOMM performance.

Conclusions: Earlier in the course of injury, mTBI patients show poorer TOMM performance and elevated psychological problems. At 6-months post-injury only, greater depression severity predicts poorer TOMM performance. The TOMM appears to be a rather reliable effort measure regardless of time since injury.

Correspondence: *Brian J. Mainland, B.Sc., Psychology, Ryerson University, 350 Victoria Street, Department of Psychology, Toronto, ON M5B 2K3, Canada. E-mail: bmainland@arts.ryerson.ca*

T. MALOUF, R. LANGDON, E.A. SHORES & M. COLTHEART. A Comparison of the Insight Interview and Other Measures of Awareness Deficits.

Objective: Lack of awareness of deficits is a common disorder affecting patients following a traumatic brain injury (TBI). Current literature suggests that awareness may not be a unitary concept and that distinct types of unawareness may exist. Awareness deficits are also seen across different domains of impairment (e.g. physical, cognitive and emotional). The present research study presents the Insight Interview (a new tool, designed to distinguish between different facets and domains of unawareness) and its comparison to existing measures.

Participants and Methods: Thirty-one participants who recently sustained a TBI of at least moderate severity were seen during their inpatient hospital admission. All participants were administered the Self-Awareness of Deficits Interview (SADI) (Flemming et al, 1996), the Patient Competency Rating Scale (PCRS) (Prigatano et al, 1986) and the Insight Interview over 2 sessions within 12 weeks of their emergence from post-traumatic amnesia (PTA). Nominated relatives and treating allied health staff completed the relative and clinician forms of the PCRS and the Insight Interview respectively within 2 weeks of the final session with the participant. Participants' awareness levels according to each instrument were then calculated. For the PCRS, two scores were obtained, one the discrepancy score between the relative and patient, and the other the discrepancy score between the clinician and patient.

Results: Preliminary results demonstrate that scores from the Insight Interview show modest but significant relationships with the SADI. Significant relationships between scores from the Insight Interview and both the discrepancy scores from the PCRS were also obtained.

Conclusions: These results suggest that the Insight Interview is a useful tool for identifying awareness deficits in patients in the acute stages following TBI.

Correspondence: *Tania Malouf, BSc - Psychology (Hons), Macquarie Centre for Cognitive Science, Macquarie University, Level 4, Building C5C, Macquarie University, NSW 2109, Australia. E-mail: tmalouf@maccs.mq.edu.au*

M. MCKERRAL & J. DESORMEAU. Relationship Between Neuropsychological Intervention and Vocational Outcome Following Traumatic Brain Injury Rehabilitation.

Objective: A continuum of province-wide public interdisciplinary rehabilitation services for mild (complicated) and moderate-severe TBI such as that in place in the province of Québec, Canada, is relatively unique. Specific hospitals and rehabilitation centers formally designated by the Québec Ministry of Health and Social Services include an end-point socio-professional reintegration phase. The approaches used in this setting rely on the application of available evidenced-based clinical practices for TBI. The main objective of this study was to determine how neuropsychological intervention, which is a major component of TBI interdisciplinary rehabilitation, was related to return to work.

Participants and Methods: Included in this study were data obtained from mild and moderate-severe TBI clientele having received outpatient socio-professional rehabilitation in Montréal for the years 2002-2008 (N= 453). Personal, injury-related, medico-legal, employment, and intervention (domain, frequency, intensity, length) variables were documented. Regression analyses were performed in order to determine relationships between neuropsychological intervention and vocational outcome, and other pertinent variables.

Results: Descriptive statistics and rehabilitation approaches used will be discussed. Data shows that at end of intervention, 48% of individuals with moderate-severe TBI and 57% with complicated mild TBI had returned to work-related activities. There was an overall positive relationship between intensity of neuropsychological intervention and return to pre-injury vocational status. However, referral delay played a moderating role in this relationship.

Conclusions: In terms of vocational re-integration following moderate-severe or complicated mild TBI, our findings demonstrate the importance of providing timely neuropsychological interventions in a broader rehabilitation context. Efforts must continue towards conducting research that measures the impacts of intervention in order to validate best practices for TBI rehabilitation.

Correspondence: *Michelle McKerral, Ph.D., Dept. of Psychology, Université de Montréal, C.P. 6128, Succursale Centre-Ville, Montréal, QC H3C 3J7, Canada. E-mail: michelle.mckerral@umontreal.ca*

A. MEYAPPAN, S. TAY, E. LAU, B.T. ANG & S.L. COLLINSON. Relationship of Trait Anxiety and Personality Factors with Post-Concussive Symptoms (PCS) Following Mild Traumatic Brain Injury (MTBI).

Objective: Anxiety is recognised as part of the sequelae of mild traumatic brain injury (MTBI). However, the role of dispositional or trait anxiety and other personality factors in the emergence and persistence of post-concussive symptoms (PCS) is relatively unknown.

Participants and Methods: 61 Mild TBI patients and 50 healthy controls were assessed at baseline following injury and at three months on standardized self-report measures of anxiety, depression, locus of control and the NEO-FFI personality inventory, as well as, a battery of neuropsychological tests.

Results: At baseline, 21 (34%) of MTBI patients demonstrated moderate to severe post concussive symptoms and significantly higher scores in trait and state anxiety, depression, locus of control and NEO-FFI neu-

roticism compared with patients who had no evidence of PCS or mild PCS. At three months, 9 (13%) of the moderate-severe group showed persistent PCS and retained high state anxiety and depression, but displayed no difference in the locus of control measure from the comparison group. Correlations at both the baseline and follow-up assessments revealed strong and significant associations between trait anxiety and PCS score (0.50 and 0.66), NEO-FFI neuroticism and PCS score (0.44 and 0.47), and trait anxiety and NEO-FFI neuroticism (0.70 and 0.67).

Conclusions: These preliminary findings suggest that premorbid disposition to anxiety and neuroticism may be important factors in the development and maintenance of moderate to severe post-concussive symptoms and may also play a role in the predisposition to debilitating post concussive syndrome. Further data relating to neuropsychological correlates of post concussive symptoms and a novel intervention for managing PCS will be discussed.

Correspondence: *Amutha Meyyappan, Bachelor of Social Sciences (Psychology), Psychology, National University of Singapore, 2 Mayflower Drive, Singapore 568792, Singapore 568792, Singapore. E-mail: amutha.meyyappan@gmail.com*

M. PASCUAL, N. PAÚL, D. DE NOREÑA, B. GONZÁLEZ & M. RIOS. Impact of acquired brain injury in primary caregivers. Preliminary findings.

Objective: To show acquired brain injury psychological and physical impact in primary caregivers

Participants and Methods: Participants: 31 relatives of patients from the Brain Damage Unit at Beata Mariana Hospital (Madrid). We had two groups of patients: Outpatients and in-patients.

Materials: The data was collected with the Spanish version of the Zarit Burden Scale, the Spanish version of Beck Depression Scale II (BDI-II) and personal semi-structured interviews.

Methods: All the statistical analyses were made with SPSS 14. We had global and specific scores for each tests. The information obtained with semi-structured interviews was qualitative.

Results: Primary caregivers expressed more burden in semi-structured interviews compared with total scores of Zarit and BDI scales. Complaints were about physical and psychological fatigue. Both tests deeply analyses shows consistent data with information obtained in semi-structured interviews.

Conclusions: Qualitative complaints, global scores and classical tests need to be replaced for new standard tests, specific analysis and sensitive measures for a characterization of burden in primary caregivers of patients with ABI. That information we can use it for providing coping resources in each stage processes.

Correspondence: *Margarita Pascual, Ph D, Brain Injury Unity, Hospital Beata Maria Ana, c/ Vaquerías 7 Bis, Madrid 28007, Spain. E-mail: margapasdarling@yahoo.es*

C.M. RAMSDEN & M. ODDY. The Impact of an Acquired Brain Injury on High-level Musical Skills: Two Case Studies.

Objective: Musical skills are recognized as being comprised of many components that are combined into a cohesive musical whole. Professional musicians spend many hundreds of hours practicing to attain a high level of musical expertise. Existing research indicates that musical training, particularly to the degree that leads to expert musical performance, results in changes to cortical structures. Given this, can injury to cortical structures, through single incident acquired brain injury, result in changes to musical skill?

Performing music makes demands across all areas of the cortex and the cerebellum, requiring input from a range of senses, spatial and visual processing, memory, attention and online-processing. As such, it was hypothesised that an acquired brain injury would result in impairments to some components of musical skill, but not complete loss of skills.

Participants and Methods: Two participants completed a range of musical tasks taken from standard examination tests from the UK Associated Board of the Royal Schools of Music. The participants both had professional musical training and had sustained severe traumatic brain injuries resulting in marked cognitive impairments. Both participants had completed similar musical tasks in the past.

Results: Their performances supported the hypothesis that while some musical skills remained intact, the participants had difficulty completing other tasks. For example, both participants demonstrated difficulties recalling musical sequences immediately after presentation but were able to generate new music (improvise) in a specified style.

Conclusions: The participant's performances may be interpreted in the light of cognitive impairments, such as difficulties with executive function and specifically with working memory.

Correspondence: *Clare M. Ramsden, Doctor of Psychology (Clinical Neuropsychology), Brain Injury Rehabilitation Trust, 5 Mill Lane, Old Marston, Oxford OX3 0PY, United Kingdom. E-mail: drclareramsden@yahoo.com.au*

J. RIIS, L. WORNING & F. BANG. Is Post Traumatic Amnesia (PTA) just Amnesia and does Prospective Recording of New Learning Ability during PTA Predict Long Term Outcome.

Objective: To evaluate the significance of early post traumatic confusion, sleep-wake cycle disturbance and attention disturbance for PTA resolution and to test the ability of daily prospective recording of attention and memory to predict outcome at three and 15 months.

Participants and Methods: A Prospective study included 50 patients with a Glasgow Coma score (GCS) between 3 and 13, who were tested on a daily basis using Galveston Orientation Amnesia Test (GOAT), a bi-hourly recording of sleep-wake pattern, and tests for attention and new learning ability. Initial CT-scans were independently rated using the Traumatic Brain Injury Model Systems criteria. Duration of PTA was defined as the interval from injury until 2 consecutive daily trials of recalling 3 words were error free. The time for GOAT⁷⁶ was also recorded. Patients were neuropsychologically tested at the end of PTA, at three months and at 15 months post injury. Overall functional ability was measured using the Disability Rating Scale (DRS) and the Glasgow Outcome Scale Revised (GOS-R). Possible effects of age and educational level was controlled for using demographic data, and the effect of premorbid intelligence using the Danish Adult Reading Test (DART) at 15 months. Univariable and multivariable logistic regression were used to predict neuropsychological test results and functional outcome at 15 months post injury.

Results: Post-acute data showed that severe attention deficits persist past PTA, using both a conventional (GOAT⁷⁶) and a learning ability criteria but not past 3 months. The frequency of sleep-wake cycle disturbance was $\geq 60\%$. Ability of a prospective testing of attention and memory to predict outcome at 15 months independently of other variables is shown (study ends feb. 2009).

Conclusions: A prospective study suggests that PTA might be a misleading term for the post-acute transient status of TBI patients. Our study highlights the value of systematic observation and management in the post-acute rehabilitation setting and its relation to late outcome.

Correspondence: *Jens . Riis, Cand. Psych., Neurosurgery, Aalborg university hospital, Hobrovej 18-22, Aalborg 9000, Denmark. E-mail: jeor@rn.dk*

H.J. RYLAND, W.H. WILLIAMS, J. MURRAY & M. TURNER. Practice Effects of Computerised Versus Pencil and Paper Neuropsychological Assessment in Sports-related Concussion.

Objective: Mild Traumatic Brain Injury (MTBI) – otherwise known as concussion – is typically understood as being a disturbance in consciousness caused by a blow to the head that has symptoms of cognitive disturbance, affective and somatic complaints which last for hours, days or possibly weeks. There is a major controversy over whether there are any long term consequences – weeks, months and years – to single concussive episodes. The identification of whether there are, or there are not, neuropsychological sequelae to MTBI is a major goal of neuropsychological research and practice. In this study we aimed to determine the reliability of measures for identifying concussive symptoms in athletes in terms of their robustness for being unaffected by practice effects.

Participants and Methods: To determine whether there are greater practice effects in conventional and/or computerised neuropsychological tests. Participants were 60 jockeys who had completed three consecutive annual baseline tests using both types of tests, excluding those with recent concussion and those who had consumed alcohol (from a population of 1977).

Results: Findings will be presented regarding practice effects of traditional neuropsychological and computerised tests (CogState™) based on an analysis of the selected sample.

Conclusions: Identification of practice effects in testing methods enables more reliable conclusions to be drawn when comparing baseline testing with post-concussional testing, especially when such practice effects are identified in a comparable control group.

Correspondence: *Helen J. Ryland, BSc (Lond), BSc, MSc (Exon), School of Psychology, University of Exeter, Washington Singer Laboratories, Perry Road, Exeter EX4 4QG, United Kingdom. E-mail: h.j.ryland@ex.ac.uk*

P. RZEZAK, S. BOLOGNANI, D. DRUMOND, A. RODRIGUES, D. LANDUCCI, F. MONTEIRO, T. RIVERO, M.C. MIRANDA & O.F. BUENO. Traumatic Brain Injured patients, regardless of disability level, show impairments in the same cognitive domains.

Objective: To describe the neuropsychological profile of patients with different levels of disability and recovery after Traumatic Brain Injury (TBI).

Participants and Methods: Forty-one adult TBI patients were grouped according to their levels of recovery and disability (mild, moderate and severe) using the Glasgow Outcome Scale, and went through a comprehensive neuropsychological evaluation. Z-scores were obtained comparing patient's performances and normative data. Also, performances of each group were compared.

Results: Mild disabled TBI patients had impairments in Stroop, Trail Making and Selective Reminding Test. Moderate disabled patients, besides all previously mentioned measures, showed deficits also in Rivermead Behavioral Memory Test (RBMT), Visual Reproduction and Verbal Fluency tests. Severe disabled patients, in addition to all same tests than the two other groups, also scored poorly on Digit Span, Logical Memory, Boston Naming, Rey Figure copy and Wisconsin Card Sorting Test (WCST). Through statistical analysis, mildly disabled patients had worse performance than severely disabled patients on Digit Span, Stroop, Trail Making, RBMT, Verbal Fluency and WCST.

Conclusions: The same pattern of impairment in processing speed, memory and executive functions was seen in all three groups of TBI patients. As the severity of disability worsened, patients' performance decreased: lower scores and more tests failed, but still involving the same cognitive domains. Grouping patients according to disability severity is coherent with cognitive deficits observed, and may be helpful as a criterion to place patients into rehabilitation programs, since injury severity is known to be related to treatment outcomes.

Correspondence: *Patricia Rzezak, Doctor, Centro Paulista de Neuropsicologia - AFIP, R. Embau, 54, São Paulo 04039-060, Brazil. E-mail: przezak@uol.com.br*

J.M. SARAJUURI, M. PASANEN, M. VARTIAINEN, M. RINNE, T. LEHTO & H. ALARANTA. Relationship between Cognitive and Motor Performance in Physically Well-recovered Men with Traumatic Brain Injury.

Objective: The primary and secondary effects of traumatic brain injury (TBI) often result in combined physical and neuropsychological sequelae that greatly challenge the affected person's autonomy. Motor performance and cognition have most often been studied in isolation.

The objective of the study was to investigate the relationship between cognitive and motor performance in physically well-recovered men with significant TBIs.

Participants and Methods: Thirty-four voluntary consecutively attended male patients with TBI were assessed. The inclusion criteria were:

(1) age 19–55 years; (2) body mass index less than 35; (3) passed Mini Mental State Examination (normal >24/30); and they were (4) able to maintain initial test positions; (5) to perform a 2 km Walk Test; and (6) to run a short distance. More than 1 year should have passed since the injury.

The motor performance tests were for static and dynamic balance, running for agility and a rhythm co-ordination. The neuropsychometric measures were: CERAD; Trail Making Tests; Digit Symbol sub-test from the WAIS-R; and the motor functions and acoustico-motor organization sub-tests from the Luria's Neuropsychological Investigation.

Results: The patients reported experiencing defects in balance, clumsiness in arm movements, difficulties in running and fatigue. 80% have had to change their physical activities after injury and 12% had quit their former sport activities. The results showed high, statistically significant correlations of the speed of the complex information processing and attention to the performance time in agility. The results also indicated that the patients with normal performance in the measures of executive functioning had statistically significantly faster mean performance time in dynamic balance and/or agility compared to the patients with pathological results.

Conclusions: The results showed that measures of information processing, attention and executive functioning may be associated to motor performance.

Correspondence: *Jaana M. Sarajuuri, LicPsych, Käpylä Rehabilitation Centre, Nordenskiöldinkatu 18 B, Helsinki 02500, Finland. E-mail: jsarajuuri@intressi.com*

M. SCHÖNBERGER & J. PONSFORD. The Relationship Between Age, Injury Severity and MRI Findings Following Traumatic Brain Injury.

Objective: Age and injury severity are amongst the most significant predictors of outcome after Traumatic Brain Injury (TBI). However, only a few studies have investigated the association between, age, injury severity and the extent of brain damage in TBI. The purpose of this study was to investigate the association between age, measures of injury severity, and brain lesion volumes as well as viable brain volumes following TBI.

Participants and Methods: 98 individuals with mild to very severe TBI (75.5% male, 24.5% female, mean age at injury 34.5 years) underwent a structural MRI scan, performed with a 1.5 Tesla machine, on average 2.3 years post-injury. Lesion volumes were highly skewed in their distribution and dichotomized for statistical purposes. Measures of injury severity were Glasgow Coma Scale (GCS) and duration of post-traumatic amnesia (PTA).

Results: Logistic regression analyses predicting lesion volumes, controlling for gender, cause of injury, time from injury to MRI scan and total brain volume, revealed that both older age and longer PTA were associated with larger lesion volumes in both grey and white matter in almost all brain regions. Older age was also associated with smaller viable grey matter volumes in most neo-cortical brain regions, while long PTA was associated with smaller viable white matter volumes in most brain regions.

Conclusions: The results suggest that older age worsens the impact of TBI on the brain. They also indicate the validity of duration of PTA as a measure of injury severity that is not just related to one particular injury location.

Correspondence: *Michael Schönberger, Ph.D, SPPPM, Monash University, Clayton Campus building 17, Wellington Road, Clayton, VIC 3800, Australia. E-mail: michael.schonberger@med.monash.edu.au*

L. SIERT & A. NORUP. Neuropsychological Support and Intervention to Adult Relatives of Patients with Severe Acquired Brain Injury in the Sub-acute Phase.

Objective: To describe neuropsychological intervention in relation to adult relatives of patients with severe acquired brain injury.

Participants and Methods: Relatives of patients with severe traumatic (TBI) or non-traumatic (NTBI) brain injury. The majority of the TBI patients (81%) had a period of post-traumatic amnesia above 28 days. The average length of stay for TBI patients was 107 days and for NTBI patients 109 days.

All relatives were offered individual neuropsychological support from day one of admission to rehabilitation. The relatives had at least one appointment with a neuropsychologist, and the relatives met the neuropsychologist about five to ten times during admission.

The relatives also had the opportunity to participate in a support group led by a neuropsychologist. In average, 10 relatives representing five to eight patients participated.

During the individual neuropsychological intervention the relatives received information about brain injury as well as psychological support, which helped them to work with their own emotional reactions and changed situation of life.

In the support group, the relatives had an opportunity to share experiences, grief and loss and to develop a social network.

Results: The relatives expressed a great need for sharing experiences and for psychological support, while the patients were admitted to hospital. The relatives stressed that information and neuropsychological support were important in the sub-acute phase.

Conclusions: Our clinical experiences demonstrate that working with the relatives is an important and parallel process in the treatment and rehabilitation of the patient.

Correspondence: *Anne Norup, Department of Neurorehabilitation, Hvidovre University Hospital, Kettegård Allé 30, Hvidovre 2650, Denmark. E-mail: anne.norup@hvh.regionh.dk*

M. WÄLJAS, A. VUORINEN, K. HARTIKAINEN, P. DASTIDAR, H. HUHTALA, S. LIMATAINEN, S. SOIMAKALLIO, J. ÖHMAN & M. JEHKONEN. Self-Reported Fatigue Following Uncomplicated Mild Traumatic Brain Injury.

Objective: To examine self-reported fatigue following an uncomplicated mild traumatic brain injury (mTBI) in comparison with healthy controls.

Participants and Methods: The Barrow Neurological Institute (BNI) Fatigue Scale and Fatigue Impact Scale (FIS) were completed by 29 uncomplicated mTBI and 27 healthy controls. MTBI patients completed the BNI Fatigue Scale and FIS twice: at 1 and 12 months post-injury. BNI Fatigue Scale is a relatively new measure of self-reported fatigue that was introduced in 2004. It was specifically developed to assess self-reported fatigue in connection with brain injury. FIS is a widely used fatigue scale that has proven to generate valid measures of the effect of fatigue in a variety of medical conditions including traumatic brain injury.

Results: Individual BNI Fatigue Scale items were examined for differences between the mTBI group's acute and chronic results. Statistically significant differences were found in 2 out of 11 items: item 2 and item 11 (overall fatigue index). In addition, item 11 significantly differentiated the mTBI group from healthy controls at one month post-injury. Patient group scored significantly higher in FIS total score, cognitive subscale score and physical subscale score at one month post-injury compared to controls. At one year post-injury, no significant differences were found between the two groups in either measure.

Conclusions: Levels of self-reported fatigue were significantly higher in uncomplicated mTBI patients than in healthy controls at one month post-injury. However, no significant differences were found between the two groups one year after the trauma.

Correspondence: *Minna Wäljas, Neurosurgery, Tampere University Hospital, P O Box 2000, Tampere 33521, Finland. E-mail: minna.waljas@pshp.fi*

C. WILLIAMS & R.L. WOOD. Impairment in the Recognition of Emotion across Different Media following Traumatic Brain Injury.

Objective: The current study examined emotion recognition following traumatic brain injury (TBI) and examined whether performance differed according to the affective valence and type of media presentation of the stimuli.

Participants and Methods: Sixty-four patients with TBI and matched controls completed the Emotion Evaluation Test (EET) and Ekman 60 Faces Test (E-60-FT). Patients with TBI also completed measures of information processing and verbal ability.

Results: Results revealed that the TBI group were significantly impaired compared to controls when recognising emotion on the EET and E-60-FT. A significant main effect of valence was found in both groups, with poor recognition of negative emotions. However, the difference between the recognition of positive and negative emotions was larger in the TBI group. The TBI group were also more accurate recognising emotion displayed in audiovisual media (EET) compared to still media (E-60-FT). No significant relationship was obtained between emotion recognition tasks and information processing speed. A significant positive relationship was found between the E-60-FT and one measure of verbal ability.

Conclusions: These findings support models of emotion that specify separate neurological pathways for certain emotions and different media, and confirm that patients with TBI are vulnerable to experiencing emotion recognition difficulties.

Correspondence: *Claire Williams, BSc MSc, Psychology Department, Swansea University, Singleton Park, Swansea, UK SA2 8PP, United Kingdom. E-mail: 200528@swansea.ac.uk*

R.L. WOOD, C. WILLIAMS & T. KALYANI. The Impact of Alexithymia on Somatisation after Traumatic Brain Injury.

Objective: High rates of alexithymia have been reported following traumatic brain injury (TBI). Difficulty modulating emotional states has been shown to increase the risk of affective distress and the tendency to express this distress in the form of physical symptoms. The current study therefore examined relationships between alexithymia, affective distress, and somatisation in a TBI sample.

Participants and Methods: Eighty three patients with TBI completed the Toronto Alexithymia Scale (TAS-20) and the Symptom Checklist (SCL-90-R).

Results: Alexithymic individuals reported higher ratings of anxiety, low mood and somatic symptoms. Alexithymia accounted for a significant amount of variance in anxiety, depression, and somatisation ratings. Scores on sub-scale 1 of the TAS-20 (difficulty identifying feelings) made a significant unique contribution to explaining somatisation ratings after controlling for the influence of anxiety and depression ratings.

Conclusions: Alexithymia after TBI increases the risk of affective disturbance and somatisation. It needs to be identified at an early stage to direct rehabilitation interventions and improve prospects for psychosocial outcome.

Correspondence: *Claire Williams, BSc MSc, Psychology Department, Swansea University, Singleton Park, Swansea, UK SA2 8PP, United Kingdom. E-mail: 200528@swansea.ac.uk*

C. WILLIAMS & R.L. WOOD. Alexithymia and Emotional Empathy following traumatic Brain Injury.

Objective: The frequency of alexithymia, and the proportion of cases reporting low emotional empathy after traumatic brain injury (TBI) was compared with a control group. The study also examined the relationship between alexithymia and emotional empathy, controlling for the influence of cognitive ability, and the relationship between alexithymia, emotional empathy and severity of head injury.

Participants and Methods: Sixty-four TBI patients and matched controls completed the 20-item Toronto Alexithymia Scale (TAS-20) and Balanced Emotional Empathy Scale (BEES).

Results: The TBI group exhibited a significantly higher frequency of alexithymia (60.9%) and low emotional empathy (64.4%) compared to the control group (10.9% and 34.4%). Significant moderate negative correlations were found between TAS-20 and BEES scores in TBI and control groups, with the TAS-20 accounting for a significant amount of variance in BEES scores. No significant relationship was found between sub-scale 1 of the TAS-20 (difficulty identifying feelings) and BEES in the TBI group, suggesting a dissociation between certain emotional processes after TBI. There was no relationship between alexithymia, emotional empathy and injury severity.

Conclusions: The results suggest an inverse relationship between alexithymia and emotional empathy.

Correspondence: *Claire Williams, BSc MSc, Psychology Department, Swansea University, Singleton Park, Swansea, UK SA2 8PP, United Kingdom. E-mail: 20052S@swansea.ac.uk*

S. YLIOJA & R.A. HANKS. Is Cognitive Outcome in Penetrating Brain Injury Distinguishable from that of Non-Penetrating Brain Injury?

Objective: The present study sought to determine whether cognitive outcome in civilian penetrating brain injury due to gunshot can be distinguished from that of non-penetrating brain injury due to motor vehicle accident.

Participants and Methods: Scores on a brief neuropsychological battery in a sample of 122 matched survivors of mild complicated, moderate, and severe penetrating and non-penetrating brain injury were examined initially during inpatient rehabilitation, 1 year post-injury, and 2 years post-injury. Logistic regression was used to determine if type of brain injury could be predicted from test scores at each time point. Receiver operating characteristic (ROC) analysis determined level of model discrimination.

Results: Results indicated that the neuropsychological test scores reliably distinguished between penetrating and non-penetrating brain injury at all time points. Of the brief neuropsychological test battery administered, penetrating brain injury was reliably predicted by higher scores on verbal learning compared to non-penetrating brain injury during inpatient rehabilitation, lower scores on verbal generativity at years one and two, and better fine motor dexterity performance at year two. Model discrimination was acceptable at all three time points.

Conclusions: Research in cognitive outcome following civilian penetrating brain injury is limited. In addition, no study to date compares cognitive profiles in penetrating and non-penetrating brain injuries. The current findings reveal that different cognitive predictors of these brain injury sub-types are present in early versus later recovery.

Correspondence: *Shelley Ylioja, M.A., Psychology, University of Windsor, 401 Sunset Ave, Windsor, ON N9B 3P4, Canada. E-mail: ylioja@uwindsor.ca*

L.A. ZHAVORONKOVA, A. ZHARIKOVA, I. FLEROV & M. OLG. Effect of stabilotraining with biofeedback at rehabilitation of patients with posttraumatic Korsakoff syndrome.

Objective: Severe traumatic brain injury accompanied by impairment of consciousness may result to defects in motor and mental functions, and sometimes leads to specific disorder named Korsakoff syndrome (KS). We proposed that motor training may serve as triggering mechanism for recovery of motor functions as well as other ones including different forms of memory, with more ancient motor memory as a basis. The aim of the present study is to evaluate rehabilitation effect of stabilotraining (ST) with biofeedback in patients with posttraumatic KS.

Participants and Methods: 10 KS patients were included in rehabilitation course with ST (7-12 seances). Clinical (MPAI scales), EEG and stabilografic data were evaluated and compared to that obtained in 18 healthy volunteers.

Results: Before ST course cognitive deficit estimated by differential MPAI scale was maximal in patients. The EEG coherence was lowest in frontal and parieto-occipital areas, especially between left frontal and right parieto-occipital areas. At the first step of rehabilitation the normalization of stabilografic and clinical data correlated to EEG coherence increase in parieto-occipital-central areas predominantly at the right hemisphere. At the next step of rehabilitation increase of EEG coherence was observed in the right central-frontal areas and at the last step - in frontal areas, predominantly in the left hemisphere. These changes correlated with regress of KS.

Conclusions: Thus, presented data allowed to propose that ST may be used as an effective approach at the early rehabilitation period for recovery of motor as well as mental functions in patients with posttraumatic KS. Supported by RHSF 07-06-00179a.

Correspondence: *Ludmila A. Zhavoronkova, Doctor of biological sciences, Clinical Neurophysiology, Institute of Higher Nervous Activity and Neurophysiology, Butlerova street, 5A, Moscow 117485, Russia. E-mail: lzavoronkova@hotmail.com*

S.R. ROSS, S.H. PUTNAM & K.M. ADAMS. The Personality Assessment Inventory (PAI) in the Detection of Insufficient Effort in Suspected Head Injury.

Objective: The Personality Assessment Inventory (PAI) is an increasingly popular measure of personality and psychopathology. In forensic settings, the PAI yields information that may bear on the overall validity of an examinee's presentation. Of particular interest to neuropsychologists has been the detection of probable malingering in mild head injury (MHI). In the current study, we examined the extent to which PAI validity indices were able to detect insufficient effort in a clinical sample of participants referred for neuropsychological evaluation.

Participants and Methods: Our sample of probable malingerers included 28 participants with questionable MHI who were seeking compensation for alleged dysfunction and performed at chance levels on the Recognition Memory Test. Twenty-two patients not involved in litigation and who suffered varying degrees of head injury formed the control group.

Results: Probable malingerers obtained significantly higher scores on clinical scales representing somatic complaints, anxiety, depression, and cognitive disturbance. Of particular interest, elevations were also found for the Negative Impression Management (NIM) scale, the Malingering Index (MAL), and the Mean Clinical Elevation (MCE) Index in malingerers. Using receiver operating characteristic (ROC) curve analysis, all validity indices significantly predicted probable malingering above chance levels. When logistic regression was used to examine the incremental validity of PAI indices, MAL remained the best predictor.

Conclusions: Findings provide support for the use of the PAI in forensic neuropsychological settings.

Correspondence: *Scott R. Ross, Ph.D., Psychology, DePauw University, 7 Larabee St, Greencastle, IN 46135. E-mail: srross@depauw.edu*

Psychopathology/Neuropsychiatry

S.R. ROSS, R. POY, M. PASTOR, P. SEGARRA, R. LOPEZ & J. MOLTO. Psychopathy and frontal lobe functioning: The role of executive dysfunction in secondary psychopathy.

Objective: Frontal lobe dysfunction underlies functional deficits in the personality disorder of psychopathy, though neuroimaging and neuropsychological studies have produced mixed findings. Studies that parse psychopathy into types (e.g., successful versus failed, Yang et al., 2005; reactive versus instrumental, Broomhall, 2005) suggest that frontal deficits may be most specific to the overtly antisocial tendencies of psychopathy. In a sample of American students and prison offenders, Ross et al. (2007) found that measures of secondary (reflecting impulsive-antisocial features), but not primary, (reflecting core affective features) psychopathy were positively associated with self-reported symptoms of executive dysfunction.

Participants and Methods: In the current study, we extend these findings to a mixed-gender group of 326 Spanish young adults by using a factor analytic strategy based on multiple measures to parse psychopathy into underlying primary and secondary dimensions.

Results: Overall, results were similar but stronger: after controlling for common variance in psychopathy dimensions, secondary, but not primary, psychopathy was robustly related to symptoms of executive dysfunction as measured by the Frontal Systems & Behavior Scale (FrSBe; Grace & Malloy, 2001). Specifically, FrSBe indices of functioning associated with the orbital frontal, followed by the anterior cingulate cortex, were most strongly related to a composite index of secondary psychopathy.

Conclusions: These findings further implicate the role of executive functioning—associated with orbital frontal and anterior cingulate cortex—in the impulsive-antisocial features of psychopathy.

Correspondence: *Scott R. Ross, Ph.D., Psychology, DePauw University, 7 Larabee St, Greencastle, IN 46135. E-mail: srross@depauw.edu*

J. EGGER, E. WINGBERMUHLE, P. VAN DER HEIJDEN, J. DERKSEN & H. DE MEY. MMPI – RF assessment augments Neuropsychological Treatment Utility.

Objective: The sequels of severe psychopathology are reflected in the decline of cognitive processes such as goal-setting and self-regulation, as well as social functioning, affective decision-making and personality (cold versus hot executive functioning). Main contributor to the differential diagnosis of psychopathology is the neuropsychologist, focusing on brain-context-cognition-behaviour relations. While, evolutionary, psychopathology can be considered as adaptive responding, neuropsychological assessment should be able to inform the clinician about the patients' adaptive qualities and to originate appropriate treatment. The inclusion of the Minnesota Multiphasic Personality Inventory (MMPI-RF), with an extensive tradition in this field, can be used to that end.

Participants and Methods: In 174 neuropsychiatric patients (aged 33.5±12.9), assessment was performed using WAIS-III, MMPI-RF and basic neuropsychological measures. Cluster analysis was performed with the MMPI-RF RC-scales. Clusters were interpreted according to MMPI-RF manual guidelines and analyzed by their neuropsychological correlates and MMPI-RF specific problem scales.

Results: Three clusters (C1-C3) were found with significant differences on emotional and adaptive functioning, Tower of London Test, WAIS-III-Similarities and Object-Assembly. C1 combined pronounced anhedonia and behavioural disengagement signaling a vegetative depressive state. Severe demoralization, behavioural disconstraint, bizarre thoughts/experiences and alienation from others characterized C2. C3 typically showed sensitive-delusion-of-reference, somatic concerns and low insight. Clusters showed meaningful differences on special problem scales such as suicidal ideation, behaviour-restricting fears, and aggression.

Conclusions: In addition to basic neuropsychological measures, MMPI-RF differential psychopathology further specifies the interplay of emotion, cognition and behaviour, leading to more complete understanding of the patient and to the identification of specific treatment needs.

Correspondence: *Jos Egger, PhD, Behavioural Science Institute, Radboud University Nijmegen, P.O. Box 9104, Nijmegen 6500 HE, Netherlands. E-mail: j.egger@psych.ru.nl*

A. KOLK & M. KALDOJA. Social-emotional development in children with mild traumatic brain injury.

Objective: Traumatic brain injury (TBI) is the most common cause of death and disability in childhood. The incidence of childhood TBI in Estonia is 369:100 000. Even mild TBI may cause persisting impairment in cognition, emotional, behavioural, and social functioning.

The aims of the present study were to investigate:

- 1) pre- and post-injury social-emotional behaviour in children with TBI;
- 2) gender differences in social and emotional behaviour pre- and post-injury.

Participants and Methods: Social-emotional behaviour were investigated in 32 children (13 girls, 19 boys) at the age of 3-65 months using The Ages and Stages Questionnaire: Social-emotional (ASQ: SE) and in 64 healthy controls.

During prospective study 9 months after the first evaluation 24 children with TBI and 48 controls were re-evaluated with ASQ: SE.

Results: Our findings suggest that children with mild TBI exhibit more problematic pre-injury difficulties in self-regulation ($p=0.02$) and autonomy ($p=0.049$). These difficulties were also present post-injury and new difficulties in interaction with other people ($p=0.01$) had emerged. Post-injury, boys with TBI showed significant declines in self-regulation ($p=0.036$), autonomy ($p=0.02$) and interaction with other people ($p=0.014$) whereas girls were more prone to have declines in adaptive functions ($p=0.074$).

Conclusions: After TBI the interplay of poorer self-regulation, autonomy and interaction with peers and other people in boys and lower adaptive skills in girls may have serious effect on these boys' and girls' social-emotional outcome. More post-injury difficulties were revealed. Early gender specific detection and intervention of emerging social-emotional difficulties is crucial.

Correspondence: *Anneli Kolk, PhD, Neurology, Children's Clinic Tartu University Hospital, Lunini 6, Tartu EE 51015, Estonia. E-mail: anneli.kolk@kliinikum.ee*

H. KASHYAP, K.J. KUMAR & J. REDDY. Neuropsychological Correlates of Insight in Obsessive-Compulsive Disorder.

Objective: Obsessive-Compulsive Disorder (OCD) is not a homogeneous entity. Insight into the illness has been implicated as a key factor associated with important clinical variables as well as neuropsychological functioning. However, the few neuropsychological studies on insight in OCD have generally treated it as a categorical variable, ignoring its nature as a dynamic, continuous variable. This study attempts to understand neuropsychological functioning in relation to insight in OCD.

Participants and Methods: 60 patients with Obsessive-Compulsive Disorder with a Y-BOCS score above 20 were sampled. They were assessed on the Brown Assessment of Beliefs Scale (BABS) to assess insight, as well as on tests of neuropsychological functioning.

Results: Statistical analysis using Pearson's correlations showed that scores indicating poorer insight on BABS correlated significantly with lower scores on the Controlled Oral Word Association test for verbal fluency and the Rey Complex Figure Test organization. In addition, the scores on BABS correlated significantly with the scores on the Clinician's Global Impression (CGI) indicating that poorer insight is associated with greater severity of illness.

Conclusions: The findings suggest that poor organization of material, particularly in the non-verbal domain, might be a hallmark of Obsessive-Compulsive Disorder, and that this may be more pronounced in patients with poorer insight into their illness. Moreover, the results might support the role of the medial and orbital prefrontal cortices in Obsessive-Compulsive Disorder with poor insight.

Correspondence: *Himani Kashyap, National Institute of Mental Health And Neuro Sciences (NIMHANS), Hosur Road, Bangalore 560029, India. E-mail: himanikashyapshreedhar@gmail.com*

M. NOONE, M. SEMKOVSKA, J.P. HORGAN & D.M. MCLOUGHLIN. A Study of Retrospective Memory Function in Depression.

Objective: Neurocognitive impairments in attention and working memory are well known to accompany major depressive episodes. However, the effect of depression on retrospective memory is unclear and of particular concern is the effect of electroconvulsive therapy on retrospective memory. The main objective of this work is to examine retrospective memory function during a major depressive episode. We hypothesise that depressed patients will perform worse than healthy controls on measures of retrospective memory.

Participants and Methods: In this case-control study a neurocognitive test battery was administered to patients with unipolar depression ($n=15$) during inpatient treatment for a major depressive episode (DSM-IV criteria) and to matched healthy controls ($n=27$). Both public events and autobiographical retrospective memories were assessed, using a specially constructed Events Questionnaire and the Autobiographical Memory Interview Short-Form respectively. The Events Questionnaire examines public events memory for the first year prior to assessment and the 15 years preceding that in three separate five year blocks. Severity of depression in patients, and absence of depression in controls, was assessed using the Hamilton 24-item depression rating scale (HDRS 24).

Results: The mean HDRS 24 score for depressed patients was 27.7 (SD 7.3). There was no difference between depressed patients and controls for public events memory across all time periods ($P=0.88$). In contrast, depressed patients were found to perform significantly worse than healthy controls on autobiographical memory recall ($P<0.01$).

Conclusions: Results indicate that compared to controls depressed patients are less able to recall personal events than public events. This finding suggests a dissociation between autobiographical and public events memory in patients suffering from depression.

Correspondence: *Martha Noone, Department of Psychiatry & Trinity College Institute of Neuroscience, Trinity College Dublin, St. Patrick's Hospital, Dublin 8, Ireland. E-mail: noonem@tcd.ie*

Y. OHIGASHI, M. YAMADA & K. KOBAYASHI. Tentative Explanation of Delusional Perception in PDFTBI patients with temporal pole lesions.

Objective: Neuropsychological mechanism of delusional perception is not yet clear. We tried to elucidate it in PDFTBI patients presenting persecutory delusions with temporal pole lesions. We examined in the patients if visual perceptions of human expressions would be maliciously deviated by biased emotional interpretations. Furthermore the role of temporal pole lesion for the appearance of delusional perception will be discussed.

Participants and Methods: We examined two PDFTBI (Psychotic Disorder Following Traumatic Brain Injury) female patients (case S and D) of 23 and 36 years old with temporal pole contusion. Both presented persecutory delusion and latency period from the onset of TBI to the appearance of psychotic state was 4-5 years. We investigated their emotion perception, using Emotional Intensity Scale (EIS) of 6 facial expressions (fear, sadness, surprise, anger, disgust and happiness).

Results: Both patients exhibited distorted perception in EIS of facial expressions compared with normal subjects. Case S overestimated surprise and fear in sadness, sadness in fear. Case D overestimated fear, anger and sadness in every emotion category except for happiness. Deviations of estimating expressions toward unpleasant emotions were found in both patients. To sum up their emotional evaluations of negative expressions were strongly confused.

Conclusions: If this negatively biased overestimations of facial expressions in other people persist considerably long period, they could take a turn for misunderstanding other's mind by maliciously biased interpretations. Temporal poles have been considered as important parts connecting visual and auditory perception to the amygdale and the orbitofrontal cortex. Lesions in the temporal poles could have caused the loss of this connection, resulted in the segregation between the amygdale function and the visual information processing (i.e., facial expression) in these patients. We propose this isolated or confused functioning of the amygdale as one probable cause of delusional perception.

Correspondence: *Yoshitaka Ohigashi, MD PhD, International Center, Kyoto University, Yoshida Honmachi, Sakyo-ku, Kyoto 606-8501, Japan. E-mail: ohigashi@mbox.kudpc.kyoto-u.ac.jp*

C. SEGALÀS, P. ALONSO, E. REAL, J. LABAD, B. BUENO, A. MIÑAMBRES, A. GARCÍA, S. JIMENEZ-MURCIA & J. MENCHÓN. Organizational Strategies: A New Cognitive Endophenotype of OCD?

Objective: Obsessive-Compulsive Disorder (OCD) is a highly heritable neuropsychiatric disorder. Recently, some studies have proposed different measures of executive functions and neuroimaging markers as having potential as neurocognitive endophenotypes for OCD. The aim of our study was to analyse neurocognitive performance in the execution of nonverbal memory tasks, measuring the use of organizational strategies during processing and recall of information in unaffected first-degree relatives of OCD compared to healthy volunteers and patients.

Participants and Methods: The Rey Osterrieth Figure Test (RCFT) for nonverbal memory was administered to 25 outpatients diagnosed with OCD, 25 unaffected first-degree relatives of patients with OCD, and 25 unrelated healthy volunteers.

Results: OCD patients and unaffected first-degree relatives demonstrated alterations in the use of organizational strategies during memory processing. Recall and recognition of RCFT were significantly better in healthy volunteers and unaffected first-degree relatives compared to patients.

Conclusions: Use of organizational strategies reflect executive dysfunction both in patients and unaffected relatives of OCD and could represent a new endophenotype candidate for OCD.

Correspondence: *Cinto Segalàs, Psychiatry, Hospital Universitari de Bellvitge, Feixa Llarga, s/n., L'Hospitalet de Llobregat, Barcelona 08907, Spain. E-mail: csegalas@bellvitgehospital.cat*

T. ILONEN & R. SALOKANGAS. The Rorschach Coping Deficit Index Reflects Neuropsychological Dysfunction.

Objective: The Rorschach Coping Deficit Index (CDI) provides a measure of adaptive resources that has specific implications for differential diagnosis and treatment planning as well as for personality description. Persons with elevated CDI are likely to show inept and ineffective ways of attempting to cope with ordinary aspects of daily living.

Participants and Methods: We examined the relationship between the Coping Deficit Index and neurocognitive abilities (language skills, perceptual organization, memory and executive function) in adolescent psychiatric inpatient data (n=267), adult first-episode schizophrenia and severe affective disorder data (n=117), and healthy control data (n=96). We also examined the relationship between CDI variables, neurocognitive variables and MRI volumes of brain in adult inpatient data (n=58).

Results: The CDI was associated with poor performance on verbal IQ and verbal memory and learning in all study groups. A significant relationship was found between the CDI and executive impairment in adult first-episode schizophrenia and severe affective disorder data, as well as in healthy control data. The CDI variables of EA and WSumC (how much resources people have available for planning and implementing deliberate strategies of coping with problem solving situations) with verbal learning and working memory were associated with left temporal grey matter volume.

Conclusions: In conclusion, the CDI seems to have neurocognitive aspects, and may reflect deterioration associated with the onset of serious psychological disorder or neuropsychological dysfunction.

Correspondence: *Emiliano Muzio, Ph.D., Department of Psychiatry, City of Helsinki Health Centre, Pekankatu 5 D, Helsinki P.O. Box 6564, Finland. E-mail: emiliano@muzio.net*

E. MUZIO & A. ANDRONIKOF. Psychotic Features on the Rorschach and Cognitive Neuropsychological Dysfunction.

Objective: The Rorschach Comprehensive System (RCS) offers the clinician and researcher a unique way to reliably identify and measure characteristics of perception and thinking which, although primarily associated with psychotic disorders, are also present in a wide range of other psychiatric and neurological conditions. These characteristics are represented by a number of Rorschach variables related to perceptual accuracy (the capacity to perceive events realistically and conventionally) and disordered thinking (the incapacity to think logically and coherently). Although the conceptual and empirical foundations of these variables are very robust, little is known about their relationships to cognitive neuropsychological dysfunction.

Participants and Methods: To further contribute to this growing body of research, we examined the relationship between Rorschach variables related to psychotic features and neurocognitive functions in a geriatric sample from France (N=102).

Results: Statistically significant Pearson correlations ($p < .05$) were found between the Mini Mental State Exam (MMSE) (Folstein et al., 1975), the Batterie d'Évaluation Cognitive 96 (BEC96) (Signoret, 1998) and our Rorschach variables. Exner's Perceptual-Thinking Index confirmed that, when combined, these Rorschach variables correlate with both the MMSE and BEC96, but also more specifically with measures of verbal fluency ($p < .001$), visual object naming ($p < .001$) and visual construction ($p < .01$).

Conclusions: The results confirm that psychotic features, as captured by the RCS, are related to neuropsychological dysfunction. They also

suggest that this relationship involves more specifically aspects of verbal memory functions, as well as visual-constructive and visual-semantic processing. The nature of these correlations and their implications for a better understanding of the neuropsychological underpinnings of psychotic phenomena are discussed.

Correspondence: *Emiliano Muzio, Ph.D., Department of Psychiatry, City of Helsinki Health Centre, Pekankatu 5 D, Helsinki P.O. Box 6564, Finland. E-mail: emiliano@muzio.net*

O. DELGADO, A. NIETO, J. BARROSO, D. FERREIRA PADILLA, J. RAMOS & M. DE LA VARGA. Executive Functions in Schizophrenia and Its Relationship with the Clinical Symptoms.

Objective: Frontal executive functions have been reported to be impaired in patients with schizophrenia. The Behavioural Assessment of the Dysexecutive Syndrome (BADS) is an ecological battery for identifying executive deficits. We aimed to study the executive functions in schizophrenic patients by means of the BADS, and its relationship with the positive and negative symptoms of the illness.

Participants and Methods: 23 schizophrenic patients underwent the BADS and the PANSS (Positive and Negative Syndrome Scale). The BADS includes six subtests and a twenty-item questionnaire which is administered to both the patient itself (DEX-self) and a relative/carer (DEX-others).

Results: BADS total profile score was impaired in 87% of patients. Percentage of patients impaired in each BADS subtest was similar ($F(5,137)=0.737$; $p=0.597$), being "Modified six elements" and "Zoo map" the most frequently impaired (65,2%), and "Rule shift cards" the less impaired (43,5%). Percentage of patients with more than the half of DEX items impaired differed according to the administration type: 8,7% of subjects when using DEX-self, in contrast to 34,7% when using DEX-others. Correlations were not significant for BADS subtests and the PANSS. However, results showed a correlation between PANSS-P and DEX-others ($r=0.441$, $p=.035$), and PANSS-N and DEX-others ($r=0.455$, $p=.029$).

Conclusions: Our results confirm the impairment of executive functions in schizophrenia, showing that the BADS is an useful tool so as to identifying executive deficits in this population, specially the "Zoo map" and "Six elements" subtests, and DEX-others questionnaire. Nevertheless, only DEX-other form is related to positive and negative symptoms of the illness.

Correspondence: *Daniel Ferreira Padilla, Student, La Laguna University, Campus de Guajara, SN, La Laguna 38205, Spain. E-mail: danifer@ull.es*

C. CHIU, M. HUA, H. HWU, C. LIU & W. CHEN. Neurocognitive Function in Individuals with Very High Risk Stage of Psychosis.

Objective: Literature shows a relatively consistent neuropsychological profile in patients with the first episode of psychosis (FEP). However, issues of whether individuals with very high risks stage of psychosis (VHRS) display neuropsychological deficit, and of conversion of these individuals to patients with the FEP have remained equivocal. The present study was to explore these questions.

Participants and Methods: Based on the Criteria of Prodromal State (COPS), 40 patients with the FEP, 45 individuals with the VHRS, and 107 healthy controls (HC) were included in this study. Each subject received a comprehensive neuropsychological test battery including memory, attention, executive function, processing speed, and intellectual measures. Before administrating a 1-year neuropsychological follow-up study, these subjects also received a follow-up evaluation of clinical symptom profile by experienced psychiatrists using the COPS.

Results: The VHRS group evidenced deficits of verbal memory, executive function, and processing speed compared with their normal counterparts. Twenty nine out of 45 individuals with VHRS receiving a follow-up evaluation of clinical symptom profile with the COPS revealed 11 of them meet the FEP profile while 19 remained static. Further data analysis exhibited that these 11 subjects' processing speed scores were remarkably lower than their normal counterparts while the rest of 19 participants' performance was compatible with their normal counterparts.

Conclusions: Based on our preliminary results, it appears that individuals with the VHRS did evidence neuropsychological deficits considerably compatible with those with the FEP, and the processing speed function might serve as a mark for the VHRS subtyping and facilitate the prediction of psychosis conversion.

Correspondence: *Mau-Sun Hua, Ph.D., Psychology, National Taiwan University, Dept. of Psychology, National Taiwan University, #1, Sec. 4, Roosevelt Rd., Taipei 106, Taiwan. E-mail: huams@ntu.edu.tw*

M. GARCIA-VALDECASAS COLELL & J. RUIZ-PEÑA. Schizophrenia and Dandy-Walker Complex: a Case Report.

Objective: Psychotic disorders are conceptualized as development disorders. Dandy-Walker complex represents a broad spectrum of cystic posterior fossa malformations. It is attributed to impairment in development that happens between gestation weeks 7th through 10th, and consists in cerebellar hypoplasia and cystic dilatation of fourth ventricle.

Participants and Methods: We report a case of a 34 years old Caucasian male with psychotic disorder, corpus callosum partial agenesis, colpocephaly and a Dandy walker complex.

Results: He displayed florid thought disorder, driveling speech, with incongruous affect and appeared cognitively impaired. He was very suspicious and expressed paranoid ideas. Rest of neurological examination was unremarkable. MRI scanning showed a Dandy walker complex and corpus callosum dysgenesis. EEG was normal. Initial Neuropsychological assessment, showed cognitive functioning in the lower part of the average range, but couldn't be considered as having mental retardation. We found low information processing speed, mild attention difficulties and severe impairment of executive functions. Verbal memory and delayed visual recall were showing lower impairment.

Conclusions: a. We report a case in which you can find, associated, a midline malformation and a psychotic disorder.

b. Evaluation of patients with psychotic disorders requires a careful search, with radiologic tests, for associated abnormalities which could help to explain the disease.

c. Patients showed a characteristic cognitive impairment that interferes in daily life activities. Cognitive outcome dependent upon associated anomalies and completeness of residual vermis.

d. Neuropsychological rehabilitation could be a good way to improve these cognitive abilities, primarily impaired.

Correspondence: *Macarena Garcia-Valdecasas Colell, Unidad de Esclerosis Múltiple, Virgen Macarena Hospital, Avda. Fedriani, n3, Policlínico 1a planta, Sevilla 41009, Spain. E-mail: macarena.valdecasas@gmail.com*

J. PEÑA, D.J. SCHRETLEN, N. OJEDA, P. SANCHEZ, E. ELIZAGARATE, A.B. YOLLER, J. EZCURRA & M. GUTIERREZ. CFA confirmation of a latent cognitive structure common to Spanish and North American patients with schizophrenia.

Objective: We sought to determine whether a latent cognitive structure confirmed in a United States sample of patients with schizophrenia (Schretlen et al., 2007) would be supported in an independent Spanish population of patients using similar measures.

Participants and Methods: We assessed 165 patients with schizophrenia from the Alava Psychiatric Hospital (Spain) using 13 measures derived from 9 cognitive tests. Confirmatory factor analysis was used to examine the fit of a previously reported 6-factor model. The hypothesized factors include attention, psychomotor speed, verbal memory, visual memory, fluency, and executive functioning.

Results: The six-factor model provided an excellent fit for the sample ($\chi^2/df = 1.64$, RMSEA = 0.06, NNFI = 0.96, CFI = 0.97). This model was compared to several competing nested alternatives, including five-, four-, and one-factor models.

Conclusions: The findings of this confirmatory factor analyses cross-validate the existence of a previously reported six-factor structure of cognitive functioning in a large Spanish sample of patients with schizophrenia. Underscoring the robustness of this model is the fact that it was first confirmed in a USA sample using slightly different measures,

administered in a different language to patients from different cultural backgrounds. The separable factors that comprise this common cognitive architecture functioning could provide useful targets for international clinical trials of drugs and behavioral interventions designed to enhance aspects of information processing in patients with neuropsychiatric disorders.

Correspondence: *Javier Peña, M.A., Psychology; University of Deusto, Av/ de las Universidades 24, Bilbao 48007, Spain. E-mail: nuberjaes@hotmail.com*

Cognitive Intervention/Rehabilitation

Y. BOGDANOVA, M. VERFAELLIE, E. ROSEN-WHITE & M.P. ALEXANDER. Neurocognitive Rehabilitation of Anoxic Brain Injury Following Cardiac Arrest.

Objective: We have demonstrated persistent cognitive impairments, particularly in executive function and memory, out of hospital cardiac arrest (CA). We investigated the efficacy of a structured program of rehabilitation on these deficits and associated disability.

Participants and Methods: Seven CA patients with moderate cognitive deficits at 12 months post-onset participated in the 10-week group program based on Goal Management Training (GMT). Composite measures for several cognitive domains were obtained before (T1) and after (T2), using alternative test versions when feasible. Dependent measures were T2-T1 cognitive change and patient and family responses to questionnaires probing daily activities, cognitive lapses and mood.

Results: There was modest, but significant improvement, on several executive and memory tasks, and in composite measures of executive function and immediate recall. Families reported improved recall, time estimation, organization and execution of daily activities, and less distractibility. This improvement was correlated with memory function - less benefit in patients with more severe memory impairment. There was a significant inverse correlation between apathy ratings and improvement in executive and memory domains.

Conclusions: GMT produced benefit in executive function, memory and daily activities in patients one year or more after anoxic brain injury. The greatest benefit was seen in patients with only mild to moderate memory impairment. Future investigations should focus on the durability of the improvement and the optimal timing of the intervention.

Correspondence: *Yelena Bogdanova, PhD, Memory Disorders Research Center, Boston University, Psychology Research (151-A), 150 South Huntington Street, Boston, MA 02130. E-mail: bogdanor@bu.edu*

M.C. FITZGERALD, P.M. DOCKREE, R.F. COEN & S. CARTON. Rehabilitation of Error Awareness Post Acquired Brain Injury (ABI): An Intervention.

Objective: Awareness of errors is an important prerequisite in rehabilitation. Few studies have investigated rehabilitation of error awareness following acquired brain injury. Pilot research has shown that receiving feedback about errors during a computerised task of sustained attention improves performance in patients who have sustained a traumatic brain injury. This study investigated the effectiveness of an intervention training programme designed to enhance error awareness.

Participants and Methods: Twenty ABI patients were randomly assigned to 'feedback' or 'no feedback' groups. The training was carried out in eight one-hour sessions over four weeks. Each participant received training in attention and error awareness using the computer-based Dual-task Attention to Response Task which was modified to include different categories of stimuli to prevent dropout caused by boredom. Members of the feedback group received audio-visual feedback on errors.

Results: Analysis of pre and post intervention measures indicated that error awareness improved for all participants, and that the improvement was greater in the feedback group.

Conclusions: This intervention provides an engaging task suitable for use across diverse ages and clinical backgrounds in the home, community or clinical setting. Its potential use for assessing as well as rehabilitating error awareness makes it an invaluable clinical tool.

Correspondence: *Mary FitzGerald, Clinical Neuropsychology, National Rehabilitation Hospital, Rochestown Avenue, Dun Laoghaire, Co. Dublin 12345, Ireland. E-mail: fitzgem7@tcd.ie*

M.M. JANBOZORGI & S.S. RAJEZI. Treatment of migraine: How effective is Biofeedback - Assisted Relaxation training?

Objective: behavioral interventions such as relaxation training and biofeedback are some of the most effective interventions for management of migraine headaches. In this study we evaluate the utility of biofeedback-assisted progressive muscle relaxation training (PRT) in the treatment of migraine.

Participants and Methods: In this prospective study, twenty patients (12-18 years old) with a confirmed diagnosis of migraine headache, admitted to the Talie counseling center between March 2005 to December 2005, were evaluated; they were randomly assigned in to an experimental group (n=10) receiving biofeedback-assisted PRT and a control group in a waiting list. All patients recorded the intensity of the headache and its frequency and duration before and 12 week after the treatment.

Results: the data was analyzed using independent sample t-test for mean differences. In the biofeedback assisted progressive muscle relaxation trained group, a statistically and clinically significant decrease was detected in intensity ($p < 0.001$; mean difference 31.7; SD= 1.86), frequency (mean difference 4.4; SD= 1.58), and duration (mean difference 3.55; SD= 1.32) headache activity in biofeedback-assisted progressive muscle relaxation training group.

Conclusions: It can be conclude that biofeedback-assisted progressive muscle relaxation training is a successful form of therapy in treatment of migraine.

Correspondence: *Sepideh S. Rajezi, M.A, psychology; shahid beheshti medical science university; iran- tehran- satarkhan street - agarahimi alley- n. 51, iran- tehran-, Tehran 98, Iran. E-mail: s_rajezi@yahoo.com*

A. JOHANSSON, E. DOMELLÖF & L. RÖNNQVIST. Does Timing Training Affect Goal-directed Upper Limb Movements in Youths with Cerebral Palsy?

Objective: Many children and youths with cerebral palsy (CP) have long-standing rehabilitation needs to maintain and improve functional abilities. However, most training methods lack scientific evaluation. Multi-modal integration training is based on synchronized rhythmic activation of upper- and lower-body extremities to a sensory signal where movements are fine-tuned via auditory and visual error feedback. Such a training regime is the Interactive Metronome® (IM) which is alleged to enhance motor function in persons with neurodevelopmental deviations by improving timing by integration of sensorymotor modalities through rhythmic activation. This study aimed to explore individual effects of IM in youths with different severity of CP disorder and functional impairments.

Participants and Methods: All participants (currently N=5) received an individually customised 4 week IM training program (12 sessions). The training involved bi- and unilateral rhythmic movements of upper- and lower-body extremities, with instant feedback of timing synchronization. Effects of IM training were examined by optoelectronic recordings. In focus were the kinematic characteristics of bi- and unimanual goal-directed movements of the upper limbs.

Results: Preliminary analyses of pre- and post-test differences indicate shorter durations on both bi- and unimanual preferred hand and increased durations on unimanual non-preferred hand conditions. Further analyses of kinematic properties and joint dynamics will reveal possible training effects on temporal and spatial characteristics of movements.

Conclusions: Multi-modal integration training appears promising for improving aspects of motor functioning in CP. Still, increasing the knowledge in relation to the severity of the CP disorder, age, magnitude of training and the preservation of effects is warranted.

Correspondence: *Anna-Maria Johansson, Psychology, Umeå University, Umeå SE-90187, Sweden. E-mail: anna-maria.johansson@psy.umu.se*

M. MATSUI, H. ARAI, T. NAKATSUBO, M. YONEZAWA, T. SUMIYOSHI, M. SUZUKI & M. KURACHI. **The effect of cognitive rehabilitation using car driving simulator in schizophrenia.**

Objective: Several previous studies suggest that cognitive processes putatively involved in driving are impaired in schizophrenia. This study examined the extent to which cognitive rehabilitation using car driving simulator alleviates cognitive deficits in schizophrenia. We predicted enhancement of response on car driving simulator would have been related to improvement of executive function.

Participants and Methods: Participants were 10 patients who met ICD-10 criteria for schizophrenia. Cognitive rehabilitation using car driving simulator consisted of simple reaction training, selective reaction training, training for handle manipulation and training for divided attention, and was conducted once a week for 3 months. Outcomes were assessed using the Japanese version of the Behavioral Assessment of Dysexecutive Syndrome (BADs) and evaluation of clinical symptoms.

Results: Accuracy in both selective reaction and handle manipulation became better, and response time to peripheral stimulus after the intervention was faster than it before the intervention in patients. Furthermore, the Rule Shift test scores for cognitive flexibility were significantly better after the intervention in patients with schizophrenia. There was no significant change of clinical symptoms.

Conclusions: The Rule Shift Cards test assesses the ability of participants to respond correctly to a rule and to shift from the use of one simple rule to another more complex rule. The results show that improvement of some factors of driving skill using car driving simulator could produce enhancement of ability of cognitive flexibility in patients with schizophrenia. This study suggests that cognitive rehabilitation using car driving simulator can clearly benefit schizophrenic patients.

Correspondence: *Mie Matsui, Ph.D., Dept of Psychology, University of Toyama, 2630 Sugitani, Toyama 930-0194, Japan. E-mail: mmatsui@las.u-toyama.ac.jp*

A. MATSUO, M. HIYAMIZU, S. MORIOKA, N. TOKUNAGA, M. NAKAMURA & K. SEKI. **The constancy of the ipsilesional upper limbs movement of the unilateral spatial neglect patient after the right hemisphere injury.**

Objective: When a movement in the ipsilesional upper limbs was repeated, those movement magnitudes have a gradual decrease in some patients with right hemisphere injury. This phenomenon was named incremental limb hypometria by Mizuno. The purpose of this research was to measure the constancy of the movement magnitude in the ipsilesional upper limbs of the right hemisphere injury, and to evaluate an influence of the USN.

Participants and Methods: The subjects were 18 right handed patients with right hemisphere strokes. Seven patients showed an USN in the past. To assess the movement magnitude in the ipsilesional upper limbs, we had blindfolded subjects draw lines with a pen on a sheet paper, 10 horizontal lines of a given length, using rightward and leftward continuous movements. Each line length was measured with a ruler, and the line length ratio was calculated from the 2nd through the 10th line based on the 1st line.

Results: The line length ratio was 1.07 ± 0.17 in all patients, the length of the 7th-10th lines showed significant extension in comparison with the 1st line. Also, when the line length ratio is compared by the existence of the USN, the line length ratio of USN patients were significantly less than that of non-USN patients, 1.02 ± 0.19 and 1.11 ± 0.15 , respectively.

Conclusions: We found an effect of the gradual line extension in the line drawing task. However, this effect corresponded only to non-USN patients, on the other hand, an USN patient rather showed the constancy of the movement.

Correspondence: *Atsushi Matsuo, Physical Therapy, Kio University, 4-2-2, Koryocho, Umaminaka, Kitakatsuragigun, Nara 635-0832, Japan. E-mail: a.matsuo@kio.ac.jp*

A. PACHECO, S. ARAUJO, L. FAISCA, S. CASTRO, K. PETERSSON & A. REIS. **Cognitive Profiles in Portuguese Children with Dyslexia.**

Objective: Individuals with reading disorders like dyslexia seem not be a homogeneous group, neither with respect to the underlying causes nor the resulting cognitive profile. Our purpose was to analyze the cognitive profile, using a hierarchical cluster analysis, in an attempt to isolate the main cognitive profiles present in a sample of dyslexic Portuguese children.

Participants and Methods: Eighteen dyslectic children from the 2nd to the 5th grade were assessed, on reading, spelling, phoneme deletion, rapid object naming, vocabulary, digit span and non-verbal IQ tasks. The results for the tasks were transformed into z-scores, and a hierarchical cluster analysis was made, using the Ward Method and squared Euclidian distances.

Results: The cluster analysis yielded three clusters, with distinct cognitive profiles of performance scores. The subjects in the first cluster were characterized by impaired performance on all tasks, despite having the best non-verbal IQ results. Children in the second cluster revealed greater impairment on reading, spelling and phoneme deletion, and better results on the other tasks, in particular on the vocabulary task. The cognitive profile of the third cluster was characterized by even worse reading skills compared to the others, and vocabulary, while the remaining tasks, including the phoneme deletion, were within the mean levels of the z-scores.

Conclusions: Our results are consistent with the view that dyslexia is a heterogeneous phenomenon, here characterized in terms of different cognitive profiles. It is unclear whether this is reflecting a corresponding causal heterogeneity. However, this suggests the possibility that adapted remediation programs might be more effective in terms of outcome.

Correspondence: *Andreia Pacheco, Clinical Psychology, Psychology (FCHS), University of the Algarve, Campus de Gambelas, Faro S005-139, Portugal. E-mail: aspacheco@ualg.pt*

P. SANDBERG, M. RÖNNLUND, L. NYBERG, L. BÄCKMAN & A. STIGSDOTTER NEELY. **Training of Three Executive Functions in Old Adults.**

Objective: Executive functions are usually described as being part of a system for controlling, monitoring and coordinating information in working memory. Impairment of executive functioning has been proposed to be an important factor underlying cognitive decline in old age. We previously showed that training one executive process (updating) resulted in improved performance for young and old in a criterion task (letter memory), but that transfer to untrained tasks was seen only for the young (Dahlin et al., 2008, Science). In the present study we extend that study by investigating whether training in three executive processes (inhibition, updating, shifting) would have greater effects on the transfer to untrained tasks.

Participants and Methods: Thirty older adults (age 61-78) participated in the study where 15 were randomized to a training condition and 15 to a control group receiving no training in between pretest and posttest. The training consisted of five weeks of training (three 45 min sessions/week) on six different tasks addressing the three executive processes inhibition, shifting and updating.

Results: Preliminary findings indicate that the training group improved on all the trained tasks. Also, the trained group gained more than the controls on the criterion task (letter memory). Contrary to expectations, no transfer to untrained tasks was seen (e.g. no near-transfer to inhibition, shifting and updating nor far-transfer to episodic memory, speed or working memory).

Conclusions: These results replicate Dahlin et al., 2008 by showing substantial task-specific improvements following training but slim transfer in a group of older adults. The implications of these data will be discussed. Correspondence: *Petra Sandberg, Department of Psychology, Umeå University, Umeå universitet, Umeå 90187, Sweden. E-mail: petra.sandberg@psy.umu.se*

S.L. DA SILVA, F. VELOSO, D.A. PEREIRA, C.E. SATLER, A. ARANTES & R.M. GUIMARÃES. **Neuropsychological rehabilitation of memory applied to Dementia reduces depression and promotes cognitive gains.**

Objective: Our aim is to demonstrate the cognitive and emotional benefits that came from Neuropsychological Rehabilitation (NR) of memory disorders.

Participants and Methods: Twenty one elderly people diagnosed with Alzheimer Disease or others types of Dementia in early or moderated stages participated to a NR that involved gardening and colored cues. These activities in NR were once a week and took eight weeks including previous and posterior neuropsychological assessment.

Results: The Wilcoxon statistical test revealed a significant increase after the NR in the following tests: Folstein MMSE screening evaluation test ($Z=-1.98$, $p<0.05$); Wechsler Verbal Similarities subtest ($Z=-2.09$, $p<0.05$); Wechsler Memory Scale (Associated Pairs with Late Recall) ($Z=-2.07$, $p<0.05$) and a statistical difference in scores of the Yesavage Geriatric Depression Scale ($Z=-3.02$, $p<0.00$). The results of a variance analysis ANOVA demonstrated that the contextual cues used in a group of elderly people increased the correct recall between their reminiscences associated with those colored cues used in the NR ($F=5.65$, $p<0.01$). Indeed, the Depression Scale scores were lower in those who correctly free-recalled the association ($F=2.12$, $p=0.14$). Pharmacological treatments with anticholinesterase administrated in 4 and 12 weeks were associated to the depression decline, but not the 30 weeks after the NR ($F=4.78$, $p<0.02$).

Conclusions: Patients who were benefited with this memory NR had a better cognition and humor, and they had a better association with their reminiscences and those colored cues that were presented.

Correspondence: *Sérgio L. Da Silva, Doctor, Psychology - PPP, University of Brasília, Campus Universitário Darcy Ribeiro ICC Sul IP, Asa Norte, Brasília 70910-900, Brazil. E-mail: leme@umb.br*

V.D. VIEIRA, S.D. BRUCKI, A.C. MARTINS, F. CANALI, L.G. VASCONCELOS, M.O. OLIVEIRA, B.G. BITTENCURT, L.T. LEITE, J. ABRISQUETA-GOMEZ J., P.H. BERTOLUCCI & O.A. BUENO. **The effects of family guidance combined with cognitive training on performance of AD patients.**

Objective: Numbers of families affected by dementia have jumped dramatically in recent decades. Family guidance provides information on the disease, helps others understand its impact on patients' daily lives and the importance of restructuring their routines, efficient use of residual skills, and training in and implementing functional strategies. Objective: Investigate the importance of family guidance for maintaining functionality in patients with early stages of AD

Participants and Methods: Twelve initial Alzheimer's disease patients (6 women), mean age 75.42 (6.22), schooling 9.58 (5.6) years, all meeting NINCDS/ADRDA criteria, on maximum anticholinesterase doses, were evaluated on the MMSE, the ADAS-Cog, the Neuropsychiatric Inventory, and the B-ADL Bayer Scale for daily living activities. We evaluated patients before and after 8 months of rehabilitation, holding two sessions every week (individual and group) and providing family guidance every two weeks. During individual sessions, we provided functional training (shopping at a supermarket), and each patient was instructed to write a list of items organized by categories, given some money, and taken to do their shopping.

Results: Comparative analysis showed no significant loss of cognitive profile on the MMSE (23.25 to 23.42), ADAS-Cog (17.11 to 21.2), B-ADL functionality improved (100.58 to 98.58), as did NPI behavior (23.42 to 19.83).

Conclusions: Family guidance may be an important means of improving performance and helping patient continue daily living activities for a longer period, since the family is the best way of inserting compensatory strategies in everyday living, thus enhancing autonomy and quality of life.

Correspondence: *Vera D. Vieira, Psicobiologia, UNIFESP, Rua Embaú, 54, Sao Paulo 04039030, Brazil. E-mail: vldu@psicobio.epm.br*

Emotional Processes

M. BALCONI & G. MAZZA. **Laterality, EEG Alpha Band Power and Behavioural Inhibition (BIS) and Activation (BAS) Systems in Emotional Face Comprehension.**

Objective: Brain asymmetry in response to emotional facial expressions is a main topic in emotion domain. Brain oscillations was used to analyze the contribution of cortical rhythms in this process. Secondly, behavioural activation system (BAS) and behavioural inhibition system (BIS) were considered such as an explicative factor for measuring the effect of motivational/emotional variable on alpha activity within the two hemispheres. Third, valence and arousal were considered as explicative factors in elucidating emotional face comprehension.

Participants and Methods: Asymmetry in comprehending facial expression of emotions was explored in the present research by analyzing EEG alpha frequency band variations within right- and left-cortical side. Nineteen subjects were submitted to an ample range of emotional facial expressions (anger, fear, surprise, disgust, happiness, sadness, and neutral).

Results: The results demonstrated that anterior frontal sites were more active (alpha decreasing) than central and parietal sites in response to facial stimuli. Moreover, right and left side responses varied as a function of emotional types, with an increased right frontal activity for negative emotions vs. an increased left response for positive emotion. Finally, whereas higher BIS subjects generated a more right hemisphere activation for negative, high arousing emotions (such as fear, anger, and disgust), BAS subjects were more responsive to positive emotion (happiness) within left hemisphere.

Conclusions: Valence and arousing power of facial expressions were considered to elucidate cortical differences in subjects' responses to emotional types, in addition to BIS/BAS system.

Correspondence: *Michela Balconi, Ph.D., Psychology, Catholic University of Milan, L.go Gemelli, 1, Milan 20123, Italy. E-mail: michela.balconi@unicatt.it*

C. ABEARE, K.A. CHAUVIN, K.A. KAPLON, O. CHU, C. DUMITRESCU & A. PASCUAL-LEONE. **Validation of the Emotion Word Fluency Test: Preliminary Evidence.**

Objective: The current study is an initial validation of the Emotion Word Fluency Test (EFT), a word generation task requiring examinees to produce as many emotion words as possible within one minute. The EFT was created as a supplement to the FAS and semantic fluency tasks, in order to measure verbal emotion word production.

Participants and Methods: Two hundred undergraduate participants, aged 17-43 (177 females, 33 males) completed the EFT as part of a larger battery that included the FAS, Animals, and the Levels of Emotional Awareness Scale (LEAS). The LEAS measures an individual's awareness of his own emotional responses, as well as predicting those of others.

Results: There were positive correlations between the EFT, the FAS and the LEAS. In order to examine the degree to which the relationship between the EFT and the LEAS reflected emotional functioning, a regression was conducted, controlling for the variance shared by the FAS. The model demonstrated that performance on the EFT predicted LEAS scores even after controlling for verbal fluency.

Conclusions: These results provide preliminary evidence that EFT may be a useful measure of emotional functioning that can be used in conjunction with other measures of verbal fluency as a part of a standard neuropsychological battery. In addition to its brevity, the EFT has the added benefit of being a performance-based measure of emotional functioning as opposed to self-report measures typically used in the assessment of emotional functioning. Future research should focus on further validation of this of the EFT in clinical populations.

Correspondence: *Christopher Abeare, Ph.D., University of Windsor, 401 Sunset Ave., Windsor, ON N9B 3P4, Canada. E-mail: cabear@uwindsor.ca*

R. KIEFFER. Coping and Psychological Distress in Children of Parents with ABI. A Preliminary report.

Objective: The effect of parental brain injury on children has been relatively little investigated. This study examines emotional and behavioural problems in children with a parent with an acquired brain injury, in relation to factors such as brain injury-related characteristics, family dysfunction and parental stress and depression.

Participants and Methods: The participants are 20 patients with acquired brain injury (> 4 year post injury), their spouses and children aged 7-13 years recruited from out-patients Brain Injury Rehabilitation Units across Denmark. Characteristics of the brain-injured parent were identified by self-report and report from the non-injured parent using the European Brain Injury Questionnaire. Emotional and behavioural problems among the children were identified by the non-injured parent and self-report using the Achenbach's Child Behaviour Checklist (CBCL) and Beck's Youth Inventory (BYI).

Negative factors such as family dysfunction, parental stress and depression were identified in both healthy parents as well as the children. A matched control group consists of children of parents suffering from another chronic illness, here diabetes and were recruited from the National Danish Diabetes Register.

Results: Initial findings suggests that children with a parent with an acquired brain injury indicate more symptoms of distress. The symptoms appear correlated to brain injury characteristics as well as parental stress, depression and family functioning.

Conclusions: These preliminary results show that the children living with a brain injured parent experience more emotional problems than the control group. Rehabilitation programs should include the whole family when offering psychological support and intervention and not over-estimate the well-being and coping capacity of school-aged children.

Correspondence: *Rikke Kieffer, MSc in Psychology, Psychology, University of Copenhagen, Øster Farimagsgade 5, Kbh K 1353, Denmark. E-mail: rikke.kieffer@psy.ku.dk*

**Invited Plenary:
Postnatal Development of Hippocampus:
Neuropsychological Implications**

Speaker: Lynn Nadel

11:00 a.m.–12:00 p.m.

**L. NADEL. Postnatal Development of Hippocampus:
Neuropsychological Implications.**

The postnatal development of the hippocampus has a number of important implications: (1) functions dependent upon the hippocampus may not be available until some time after birth; (2) developing circuits in the hippocampus may be particularly susceptible to alteration as a function of experience, both good and bad; and (3) hippocampal development may be at risk in the context of atypical genetic programs. I will discuss examples of each of these, and highlight their neuropsychological implications.

Correspondence: *Lynn Nadel, University of Arizona, 1503 E. University, Tucson, AZ 85721. E-mail: nadel@u.arizona.edu*

THURSDAY AFTERNOON, JULY 30, 2009

**Invited Symposium:
Highlights of Recent Results Associated with
Developmental Neuropsychology**

Chair: Margaret Semrud-Clikeman

1:30–3:00 p.m.

M. SEMRUD-CLIKEMAN, G.W. HYND & H. LYYTINEN. Highlights of Recent Results Associated with Developmental Neuropsychology.

Symposium Description: This invited symposium will focus on developments in our understanding of learning disorders and Attention Deficit Hyperactivity Disorder. The first presentation by Dr. Heikki Lyytinen will discuss the longitudinal study of dyslexia conducted at the University of Jyväskylä. This study has found that it may be possible to identify early in the child's life, which children are at risk for developing dyslexia. In addition, this paper will discuss the development of successful preventive practices. Dr. George Hynd will then present data from his NIMH study on dyslexia. In this paper he will discuss the relation between brain structure and function in learning disabilities using neuroimaging data. He will also present data of an extended family that is twice exceptional; that is, a family with a history of learning difficulties while also having significant strengths in perceptual abilities. Finally, Dr. Margaret Semrud-Clikeman will present functional and structural neuroimaging data concerning children with ADHD. In addition, she will discuss the possible relation between stimulant medication and changes in structure and brain function. Finally, she will present her current study of risk-taking in ADHD using functional neuroimaging.

Correspondence: *Margaret Semrud-Clikeman, Ph.D., Psychology, Michigan State University, 321 A West Fee Hall, E. Lansing, MI 48824. E-mail: semrudcl@msu.edu*

H. LYYTINEN, J. ERSKINE & U. RICHARDSON. Developmental Predictors and Prevention of Dyslexia.

Objective: The objective of this study was to evaluate children with familial risk for dyslexia longitudinally from birth using the Jyväskylä Longitudinal Study of Dyslexia. This study examined the developmental routes preceding dyslexia as well as possible remediation for children at risk for dyslexia.

Participants and Methods: There were 107 children at risk for dyslexia and 97 controls in this study. Each child was evaluated using a comprehensive neuropsychological battery evaluating basic aspects of reading and auditory processing. Due to the longitudinal nature of this study, the developmental routes preceding dyslexia were examined as well as response to an intensive intervention.

Results: Findings indicated that the earliest predictive signs comprised atypical speech processing and compromised categorical perception of speech sound. The association between speech perception and reading skill continued into school age and explained the variance of spelling skill after controlling for the other known predictors. Difficulties in the perception of the individual sounds a reader needs to connect oral and written symbols as well as problems with fast retrieval of the sounds were treated using computer games. These games provided differentiation of written and spoken words through emphasis on differences in sounds and repetition of tasks. Intensive practice occurred during a 1-2 months before school entry.

Conclusions: Overall, the intervention was found to increase the at risk children's performance close to their peers. The results of such preventive training among thousands of Finnish children are promising and may generalize to other populations.

Correspondence: *Margaret Semrud-Clikeman, Ph.D., Psychology, Michigan State University, 321 A West Fee Hall, E. Lansing, MI 48824. E-mail: semrudcl@msu.edu*

G.W. HYND & J. GILGER. Brain Morphology and Dyslexia; Relationship to an Extended Family who is Twice Exceptional.

Objective: Research into the neurobiological basis of severe reading disability, or dyslexia has a long and distinguished history. It was only some four decades ago that Critchley (1964) lamented that it might never be possible to identify the underlying neurological bases of dyslexia. Since that time of course postmortem studies (Casanova, et al., 2004) have revealed subtle neurodevelopmental anomalies in different brain regions, structural neuroimaging studies (MRI) have identified variations in gyral patterns (Eckert, et al., 2003), and genetic studies strongly support familial mechanisms of transmission (Fisher & DeFries, 2002) in developmental dyslexia. Research has clearly revealed a great deal about the neurological bases of dyslexia but nearly all of the studies published presume that dyslexia is a solitary diagnosis, or is comorbid with other more frequent developmental or disruptive behavioral disorders such as Attention Deficit Hyperactivity Disorder (ADHD). Ignored is a growing consensus that dyslexia can and not infrequently does manifest in association with unique abilities.

Participants and Methods: Participants included the index family and many members of the extended family where reading disability co-occurred in conjunction with superior non-verbal intelligence. Cognitive assessment and structural and functional imaging studies were conducted

Results: A follow-up examination of the extended family suggested a very strong familial link for superior visual spatial intelligence in the presence of reading disability. In addition to presenting data on this extended family, the results of more recent functional imaging (fMRI) studies of this unique, twice exceptional family will be presented.

Conclusions: There appear to be interesting associations and interactions between variation in gyral patterns, dyslexia, and superior visual-spatial intelligence.

Correspondence: *Margaret Semrud-Clikeman, Ph.D., Psychology, Michigan State University, 321 A West Fee Hall, E. Lansing, MI 48824. E-mail: semrudcl@msu.edu*

M. SEMRUD-CLIKEMAN & S. PLISZKA. Functional and Structural Neuroimaging in ADHD with and without Medication Treatment.

Objective: Children with ADHD children tend to have difficulty with attention, impulse control, and activity level. Children with ADHD: C have been found to show high levels of aggression, impulsivity, and poor compliance. Children with ADHD are often prescribed stimulant medication. Few studies have provided information about how children with ADHD with a history of medication would differ neurologically from those with no such history. The purpose of this study was to evaluate the relation of medication treatment in ADHD groups and brain activation using functional magnetic resonance imaging and structural imaging.

Participants and Methods: The participants in this study were 18 boys in three groups: ADHD:C with a history of stimulant medication of over one year, ADHD:C who have had no previous medication treatment, and controls. Each participants completed a MRI scan.

Results: Structural imaging found no differences between the ADHD groups on caudate volume; however differences were present in the anterior cingulate. fMRI found differences between the ADHD groups and controls in the 6 brain regions including the dorsal lateral prefrontal cortex, anterior cingulate, and frontal regions.

Conclusions: These findings indicated that there are hard-wired differences in ADHD that do not change with medical intervention, while other structures appear to be more plastic. On a go no go task using fMRI it was found that the children with ADHD responded differently to success and nonsuccess trials compared to controls. Those with ADHD showed less activation to nonsuccess trials compared to controls and compared to their response to success trials. Implications of these findings will be further discussed.

Correspondence: *Margaret Semrud-Clikeman, Ph.D., Psychology, Michigan State University, 321 A West Fee Hall, E. Lansing, MI 48824. E-mail: semrudcl@msu.edu*

**Paper Session 2:
Cognitive Deficits in Mild Cognitive Impairment and Dementia**

1:30–3:00 p.m.

J. CHEY, J.M. KIM, K. SHIN, J. LEE, M. SHIN & H. BYUN. The Neural Correlate of Cognitive Reserve.

Objective: The concept of cognitive reserve has been proposed to explain the discrepancy between the neuropathology and the clinical symptoms of people with the Alzheimer disease. It has been proposed that individuals with greater cognitive reserve can withstand the effects of neurodegenerative processes, and would delay the clinical manifestation of dementia, while individuals with smaller cognitive reserve would manifest the symptoms earlier in the disease process. The neural correlate of this cognitive reserve has been speculated to be the whole brain size or the general synaptic density of the brain, but no specific brain regions have been identified.

Participants and Methods: We examined the risk of having a small cognitive reserve, i.e., performing in the lowest 10% on cognitive tests in a non-demented community sample of 243 elderly people with various education levels, in the development of dementia in seven years. Utilizing the voxel-based morphometry, we also measured the regional brain volumes of these low cognitive performance (LCP) individuals and compared them to those of the normal cognitive performance (NCP) individuals who were matched in age and education.

Results: After a seven-year follow-up, the LCP group had over four times the risk of developing dementia caused by Alzheimer's disease and vascular diseases, compared to the elderly people with NCP. At baseline these LCP individuals had significantly smaller volumes of bilateral precuneus, the right middle frontal gyrus, and the left superior gyrus. Further, these volumes correlated significantly with general cognitive performance. The strongest association was observed between the right precuneus and the scores of the Dementia Rating Scale (.74) and the Clock Drawing (.69).

Conclusions: The precuneus appears to be one of the key sites in the brain that buffers the impact of neuropathology caused by Alzheimer's disease and vascular diseases along with the frontal cortices.

Correspondence: *Jeanyung Chey, Ph.D., Psychology, Seoul National University, San 56-1 Shillimdong, Kwanakgu, Seoul 151-742, Korea, South. E-mail: jychey@snu.ac.kr*

A. NORDLUND, M. GÖTHLIN & A. WALLIN. Cognitive Tests Predicting Different Dementia Disorders in MCI Subjects 4 Years Before Diagnosis.

Objective: To examine which neuropsychological tests most accurately predict different dementia disorders in Mild Cognitive Impairment (MCI). **Participants and Methods:** 176 consecutive MCI subjects in the Göteborg MCI study were followed up for 4 years. The neuropsychological assessment comprised tests of speed/attention, episodic memory, visuospatial function, language and executive function.

Results: After 4 years, 12 (7%) MCI subjects had improved to normal function, 111 (63%) were stationary (still MCI) and 53 (30%) had progressed to dementia. The specific dementia diagnoses were 24 Alzheimer's disease (AD), 14 mixed dementia (MD), 11 vascular dementia (VaD), 3 non specified and 1 primary progressive aphasia. The stationary MCI subjects were younger and performed significantly better in all cognitive domains. There were no significant differences between those converting to dementia in terms of age, education or MMSE score at baseline. The only significant difference between MD and VaD was on a naming test. According to a Partial Least Squares Discrimi-

nant Analysis, the tests that best differentiated MCI subjects who converted to AD from those who did not were memory – delayed recall – variables, a visuospatial and an executive test. The tests that most clearly differentiated MD and VaD converters from others were a language comprehension test, two executive and a speed/attention test.

Conclusions: The cognitive profiles of MCI subjects who within 4 years converted to AD and MD/VaD differed quite clearly, whereas differences between MD and VaD were modest. Thus, a comprehensive neuropsychological assessment is useful when distinguishing prodromal AD from dementia disorders with vascular components in MCI.

Correspondence: *Arto Nordlund, PhD, Institute of Neuroscience and Physiology, Sahlgrenska Academy at Göteborg University, SU/Molndal, Wallinsgatan 6, Molndal 431 41, Sweden. E-mail: arto.nordlund@neuro.gu.se*

H. JOKINEN, H. KALSKA, R. YLIKOSKI, S. MADUREIRA, A. VERDELHO, A. GOUW, W.M. VAN DER FLIER, P. SCHELTENS, F. BARKHOF, M.C. VISSER, F. FAZEKAS, R. SCHMIDT, J. O'BRIEN, M. HENNERICI, H. BAEZNER, G. WALDEMAR, A. WALLIN, H. CHABRIAT, L. PANTONI, D. INZITARI & T. ERKINJUNTTI. Cognitive Decline in Subcortical Ischemic Vascular Disease. Cross-sectional and Longitudinal Findings from the LADIS Study.

Objective: Subcortical ischemic vascular disease (SIVD) is a common, but often overlooked cause of vascular cognitive impairment. Diagnostic criteria for SIVD are based on MRI findings including substantial white matter lesions (WML) and multiple lacunar infarcts. Empirical studies validating these imaging criteria are still few. This study aimed at describing the cross-sectional and longitudinal cognitive characteristics of SIVD in a sample of older adults with WML.

Participants and Methods: In the Leukoaraiosis and Disability (LADIS) study, 639 participants (aged 65 to 84 years) underwent clinical and neuropsychological examinations in four annual assessments. The subjects meeting the MRI-criteria of SIVD at baseline were compared to the other subjects of the sample with analysis of covariance and linear mixed models.

Results: At baseline, the subjects with SIVD performed significantly inferior than the other subjects in several tests assessing psychomotor speed, executive functions, working memory, and global cognitive status. In three-year follow-up, a significantly steeper decline of performance was found among SIVD subjects in Verbal fluency test, Trail making test A, Stroop test parts I and II as well as in Mini-Mental State Examination. Moreover, the subjects with SIVD had a three-fold risk of developing dementia during follow-up independently of age, sex, education and medial temporal lobe atrophy (OR 3.0, 95% CI 1.6-5.6, $p < 0.001$).

Conclusions: SIVD, as a manifestation of cerebral small vessel disease, is related to progressive cognitive impairment and a considerable risk of dementia. SIVD seems to particularly contribute to the deterioration of psychomotor speed, executive control, and global cognitive function. Correspondence: *Hanna Jokinen, PhD, Department of Neurology, Helsinki University Hospital, PO box 302, HUS, Helsinki 00029, Finland. E-mail: hanna.jokinen@helsinki.fi*

A.I. TROSTER & J.A. FIELDS. Comparison of Visual Confrontation Naming in Alzheimer's Disease and Parkinson's Disease with and without Dementia.

Objective: The study compared naming in patients with Alzheimer's disease (AD), Parkinson's disease (PD), and Parkinson's disease with dementia (PDD). Visual confrontation naming is impaired early in AD but later, if at all, in PD. Impaired naming may be a harbinger of dementia (PDD), but naming errors have not been compared among the three conditions. Given presumed degradation of semantic networks in AD, but deficient word search strategy in PD, the quantity and quality of naming errors was hypothesized to differ in PD, PDD, and AD.

Participants and Methods: The BNT was administered to 13 control (NC), 13 PD, 13 PDD, and 15 AD participants and scored according to Hodges et al.'s system. Dementia groups had similar overall severity of dementia. Groups had similar education and depressive symptomatology, but PD was younger than other groups.

Results: AD made fewer correct responses than other groups, and PDD made fewer correct responses than PD and NC. As a function of all errors, semantic errors were the most common (approaching 70%) in all groups. AD and PDD made more semantic errors (especially within category) than NC, and PDD made more semantic errors than PD. Proportions of semantic error types (associative, within category, superordinate, circumlocutory) as a function of all semantic errors were comparable across groups. AD made more phonemic and "don't know" errors than PDD.

Conclusions: Results revealed that naming test impairment of PDD is intermediate to that of AD on one hand, and PD and NC on the other hand. PDD did not differ from AD in number and nature of semantic errors, but PDD made fewer phonemic and "don't know" errors than AD. Both dementia groups made more within category semantic errors than NC suggesting deficits in late stage semantic processing involving subordinate information activation/access. AD additionally may be characterized by loss of semantic knowledge ("don't know responses") and deficits in post-semantic processing (lexical and/or phonemic) given phonemic paraphasic errors.

Correspondence: *Alexander I. Troster, PhD, Dept. of Neurology (CB 7025), University of North Carolina School of Medicine, 312S Physicians' Office Building, 170 Manning Drive, Chapel Hill, NC 27599-7025. E-mail: trostera@neurology.unc.edu*

H. BERGMANN, P. ELING, K. BÖTZEL & A. DANERK. Impaired Visuomotor but not Visuo-perceptual or Cognitive Skill Learning in Parkinson's Disease.

Objective: The basal ganglia are often described as being essential for procedural learning in general. However, evidence so far suggested that the contribution of the basal ganglia might heavily depend upon the exact nature and underlying functions of the procedural task at hand. The aim of the study is to provide additional evidence for the heterogeneity of the concept of procedural learning by assessing a series of skill learning tasks in patients with Parkinson's disease (PD).

Participants and Methods: 15 PD patients in an off state, 12 PD patients in an on state and 15 matched controls participated. Three procedural learning tasks were employed: Mirror reading, Tower of London puzzle, and a mirror tracing task. Moreover, an explicit memory task (selective reminding word list test) was assessed.

Results: PD patients, irrespective of the medication state and disease severity performed at the same level as controls on the mirror reading and the Tower of London task. For the mirror tracing task, no medication effect was obtained, but patients in an advanced stage of their disease were impaired compared to early stage PD patients. For the selective reminding word list test a medication but no severity effect was obtained: PD off patients performed worse than controls and the PD on group.

Conclusions: Procedural learning does not appear to be a unitary concept. Rather, different brain mechanisms might subservise procedural learning depending upon the task demands involved. Explicit memory functioning in off patients might be impaired due to dopamine depletion in the frontal cortex.

Correspondence: *Heiko Bergmann, Donders Institute for Brain, Cognition, and Behavior; Radboud University Nijmegen, Postbus 9101, Nijmegen 6500 HB, Netherlands. E-mail: h.bergmann@donders.ru.nl*

Symposium 2: The Neuropsychology of Dual-Tasking

Chair: Jonathan Evans

1:30–3:00 p.m.

J.J. EVANS, J.J. EVANS, J.A. FOLEY, F. HAMILTON, L. PAUL, S.E. MACPHERSON & G. KINSELLA. The Neuropsychology of Dual-Tasking.

Symposium Description: Everyday life frequently requires people to dual-task, or do more than one thing at the same time, and may involve

two cognitive tasks (e.g. monitoring cooking pots whilst listening to the news), a cognitive task and a motor task (e.g. holding a conversation whilst walking), or two motor tasks (e.g. carrying a tray whilst walking). In recent years studies have shown that patients with a number of different neurological disorders, including Alzheimer's disease, stroke, head injury and Parkinson's disease, show disproportionate impairment when dual-tasking compared to single task performance. However the mechanisms that cause such deficits are not fully understood. Dual-task paradigms are therefore of theoretical and clinical value, helping us better understand the nature of attentional control that underlies the ability to do more than one thing simultaneously and the practical difficulties of patients. This symposium will address theoretical, clinical and methodological aspects of dual-task performance. Papers will: present evidence that dual-tasking reflects an independent and separable component of working memory (Foley et al); present evidence for the presence of dual-task deficits in clinical conditions in which such deficits have not previously been described (Hamilton et al. and Paul et al.); present evidence that measures of dual-tasking may provide a clinical marker for the early detection of Alzheimer's disease (McPherson et al.); and illustrate how dual-task conditions may offer a better insight in the everyday difficulties with activities of daily living in patients with Alzheimer's disease (Kinsella et al.).

Correspondence: *Jonathan J. Evans, PhD, University of Glasgow, Section of Psychological Medicine, Gartnavel Royal Hospital, Glasgow G12 0XH, United Kingdom. E-mail: jje2k@clinmed.gla.ac.uk*

F. HAMILTON, L. ROCHESTER, L. PAUL, D. RAFFERTY, C.P. O'LEARY & J.J. EVANS. Walking and Talking: Cognitive-Motor Dual-Tasking in Multiple Sclerosis.

Objective: Problems with walking and with attention are known to be prevalent in Multiple Sclerosis (MS), though no studies have reported how these two difficulties might interact. This study investigated the effects of performing a concurrent cognitive task when walking in MS to determine the effects of task demand on dual-task performance.

Participants and Methods: Eighteen participants with MS and 18 healthy controls took part. Participants completed walking and cognitive tasks under single and dual task conditions.

Results: MS participants, compared to healthy controls, had greater decrements in performance under dual-task conditions, including decrements in cognitive task performance, walking speed and swing time variability. In the MS group, the degree of decrement under dual-task conditions was related to levels of fatigue, a measure of general cognitive functioning and self-reported everyday cognitive errors, but not to measures of disease severity or duration.

Conclusions: We suggest that difficulty with cognitive-motor dual-tasking may lead to practical problems in everyday life including potentially increasing the risk of falls. Clinical tools to assess cognitive-motor dual-tasking ability are needed.

Correspondence: *Jonathan J. Evans, PhD, University of Glasgow, Section of Psychological Medicine, Gartnavel Royal Hospital, Glasgow G12 0XH, United Kingdom. E-mail: jje2k@clinmed.gla.ac.uk*

J.A. FOLEY, K. INASARIDZE, R.H. LOGIE & S. DELLA SALA. Dual Task Engages an Independent Executive Function.

Objective: Dual-tasking is the ability to perform two tasks simultaneously. There are ongoing debates as to the cognitive constructs underlying dual task performance, and the circumstances under which there are, or are not performance costs of dual compared with single task performance. In studies reporting no, or very small costs of dual task in healthy adults, performance is thought to be supported by an executive function within a multiple component model of working memory. This study investigated the nature of these cognitive processes by using a measure of dual tasking and several measures of working and episodic memory.

Participants and Methods: 120 healthy people participated. The dual task paradigm consisted of two tasks, a digit recall task, titrated to in-

dividual digit span, and a tracking task. As the dual task paradigm is titrated, it assesses the ability to coordinate performance on two demanding tasks independently of individual performance on single task. The measures of working and episodic memory were working memory span, digit span, immediate recall of Verbal Paired Associates and immediate recall of Word List Learning (both from the WMS-III).

Results: There were no significant correlations between dual task performance and any of these measures of working or episodic memory. There was a very small cost for dual task and dual task performance was internally highly reliable.

Conclusions: Results suggest that dual tasking reflects an independent and separable function of working memory.

Correspondence: *Jonathan J. Evans, PhD, University of Glasgow, Section of Psychological Medicine, Gartnavel Royal Hospital, Glasgow G12 0XH, United Kingdom. E-mail: jje2k@clinmed.gla.ac.uk*

L. PAUL, B.M. ELLIS, G.P. LEESE, A.K. MCFADYEN & B. MCMURRAY. The Effect of a Cognitive or Motor Task on the Gait Parameters of those with Diabetes, with and without Neuropathy.

Objective: To investigate the effect of a motor or cognitive task on the gait parameters of older people with diabetes (DM) and people with diabetes and diabetic peripheral neuropathy (DPN).

Participants and Methods: Thirty subjects were recruited; 15 with DPN (mean age 69 ± 3.0 years) and 15 with diabetes and no neuropathy (70 ± 2.9 years). The temporal and spatial parameters of gait were evaluated using the GAITRite walkway. Subjects undertook four walks under normal walking conditions (single task); four times while simultaneously undertaking an additional motor task, carrying a tray with cups of water (dual task); and four times whilst undertaking a cognitive dual task, counting backwards in sevens. This arithmetic task was also completed in sitting.

Results: In general the secondary task had a significant and adverse effect on the gait parameters and this effect was greater for those with DPN in both absolute and relative terms. Both groups had poorer arithmetic ability when walking compared to sitting and the DPN group spilled more water during the motor task compared to the DM group.

Conclusions: Patients with DPN have a more conservative gait pattern, which is partly maintained by cognitive attention. Problems with divided attention when walking were more present in both groups, DM and DPN, but were more evident in the DPN group and may increase their risk of falls.

Correspondence: *Jonathan J. Evans, PhD, University of Glasgow, Section of Psychological Medicine, Gartnavel Royal Hospital, Glasgow G12 0XH, United Kingdom. E-mail: jje2k@clinmed.gla.ac.uk*

S.E. MACPHERSON, M.A. PARRA RODRIGUEZ, S. MORENO, F. LOPERA & S. DELLA SALA. Dual Task Abilities in Alzheimer's Disease due to E280A Single Presenilin-1 Mutation.

Objective: Our previous work has demonstrated that patients with sporadic Alzheimer's disease (AD) are impaired in their ability to perform two tasks simultaneously compared to healthy controls, despite being able to successfully perform the tasks alone relatively well. Yet, it remains unclear what the earliest clinical manifestation of this dual task coordination deficit is. In this talk, our recent work examining dual task abilities in individuals who are at risk of early-onset familial AD due to an E280A presenilin-1 mutation will be discussed. The aim was to investigate whether the dual task paradigm can differentiate between those asymptomatic family members who test positive for the gene mutation and family members who test negative for the gene mutation.

Participants and Methods: Twelve patients with mild AD, 25 asymptomatic carriers and 33 non-carriers of the gene mutation were asked to perform digit recall accompanied by a secondary tracking task.

Results: Despite performing well on a variety of neuropsychological measures, including episodic memory tasks, the asymptomatic carriers show dual task decrements compared to those family members without the gene mutation.

Conclusions: The findings support the notion that a deficit in the coordination mechanism of the central executive may be a clinical marker for the early detection of AD due to the E280A presenilin-1 gene mutation. Correspondence: *Jonathan J. Evans, PhD, University of Glasgow, Section of Psychological Medicine, Gartnavel Royal Hospital, Glasgow G12 0XH, United Kingdom. E-mail: jje2k@clinmed.gla.ac.uk*

G. KINSELLA, C. RAMSDEN, B. ONG & E. STOREY. Impact of Task Complexity and Dual Task Conditions on Performance of Habitual Everyday Tasks in Mild Alzheimer's Disease.

Objective: In clinical settings, such as rehabilitation centres, it is frequently argued that people with Alzheimer's dementia (AD) may perform routine everyday tasks more effectively in their home environment than in the clinical environments. To address this issue and to evaluate the conditions that optimise or challenge effective performance of habitual everyday tasks, the performance of everyday actions in older adults with mild Alzheimer's disease as compared to healthy age-matched controls was investigated in their home environment.

Participants and Methods: 15 people with mild Alzheimer's disease and 16 healthy-age matched controls participated. Everyday actions were familiar activities, for example making a cup of tea, but varied in complexity (simple, complex) and performed under varied attention demand (single task, dual-task).

Results: Although both participant groups responded to increasing task complexity by making more errors, the AD group as compared to the control group made more errors under dual-task conditions regardless of the complexity of the task.

Conclusions: These results are discussed in relation to the role of executive attention of working memory in performance of everyday actions in mild Alzheimer's disease and the impact on management of early AD.

Correspondence: *Jonathan J. Evans, PhD, University of Glasgow, Section of Psychological Medicine, Gartnavel Royal Hospital, Glasgow G12 0XH, United Kingdom. E-mail: jje2k@clinmed.gla.ac.uk*

Invited Symposium:

Silent Cysts, Are There? The Case of Anja Kohonen: The Ingenious Zero with Large Arachnoid Cyst.

Chair: Ritva Laaksonen

1:30–3:00 p.m.

R. LAAKSONEN. Silent Cysts, Are There? The Case of Anja Kohonen: The Ingenious Zero with Large Arachnoid Cyst.

Symposium Description: The symposium is based on a case study with four presentations in a multidisciplinary fashion. The personal experiences of the case A.K. will be presented by herself. Test results as well as neurological and radiological (MRI) findings will be presented and discussed. The conclusions will be drawn from all the presentations.

Case description: A.K. is a female with well developed social skills and educational background, which made it possible for her to work in Strasbourg France at the Council of Europe. At the age of 31, while in France she went to an ophthalmologist to renew her driver's licence. After series of examinations a huge arachnoid cyst in the left hemisphere was discovered. There was no previous knowledge of this prenatal developmental disorder. A.K.'s personal experiences when reviewed later are indicative of early deficits unnoticed by the social network in family and at school.

Correspondence: *Ritva Laaksonen, KL-instituutti, Sotkatie 4, Vantaa 01450, Finland. E-mail: ritva.laaksonen@vandark.net*

A. KOHONEN. My Personal Experiences.

Objective: 16 years ago, as a 31-year-old cost analyst at the Council of Europe in Strasbourg I made an appointment at the ophthalmologist's

for a routine eye check-up. A picture of health, I didn't for one moment suspect that this visit to the doctor's would be fatal for my future. After the examination the doctor claimed it would turn him crazy to see like I do. So visual training was prescribed. As it only deteriorated the situation I was referred to a neurologist. The CT showed an arachnoid cyst followed by a battery of neuropsychological tests. The results didn't seem to fit to any of the examiners' theories but to me they explained many peculiarities: why I very well mistook a tractor for a horse, why the TV-set split into pieces before my eyes, why it seemed that jackets walked in the street without heads on them, why I had difficulties recognizing my own mirror-image. My accident proneness got a logical explanation, also why many took me for a drunk or a drug-addict. Many behavior patterns made sense too: they were compensation for the neuropsychological deficiencies. Instead of being a tragedy the neuropsychological findings were a relief to me. I still lead an active life, though not a professional. Most of all, now I have the official permission to be who I really am.

Participants and Methods: Personal narrative.

Results: Self knowledge.

Conclusions: Psycho-social well-being.

Correspondence: *Ritva Laaksonen, KL-instituutti, Sotkatie 4, Vantaa 01450, Finland. E-mail: ritva.laaksonen@vandark.net*

R. SULKAVA, H. KALSKA & R. LAAKSONEN. Clinical and Neuroradiological Findings of the Case A.K.

Objective: A.K. was referred to neurological examinations because of incidental ophthalmological findings in 1992. The findings were similar 16 years later.

Participants and Methods: Clinical neurological examination showed no pathological findings in addition to defects in the visual fields. A.K. had difficulties in fixing her eyes on objects. No hemiparetic findings. The tests for fine motor functions like tapping and diadochokinesis were normal. Cognitive abilities seemed to be normal.

Results: Magnetic resonance imaging (MRI) of brain shows a huge arachnoid cyst communicating to the posterior horn of the left lateral ventricle in the left hemisphere. There was no shift of the midline or focal changes. The width of sulci was normal and no signs of elevated intracranial pressure was seen. There was no change in MRI findings from the year 1992 to 2009.

Most of arachnoid cysts are developmental anomalies. They occur predominantly on the left side. They are usually asymptomatic and an incidental finding on imaging. This is true even of cysts that are quite large. The most commonly associated clinical features are headache and seizures. A.K. had only childhood headaches. Neurosurgical procedures were not carried out. This was wise because no progress in findings were seen in 16 years.

Conclusions: The history and clinical findings indicate that A.K.'s arachnoid cyst is an early developmental phenomenon. The trauma or infarct of this size in adulthood would have caused severe loss of cognitive functions and ruined the autonomy of living.

Correspondence: *Ritva Laaksonen, KL-instituutti, Sotkatie 4, Vantaa 01450, Finland. E-mail: ritva.laaksonen@vandark.net*

H. KALSKA, R. LAAKSONEN & R. SULKAVA. What Did the Neuropsychological Assessment Reveal about an Incidentally Emerged Large Arachnoid Cyst? The Case A.K.

Objective: Psychometric examinations were performed in order to find out whether testing would reveal deficits correlating to A.K.'s experiences in life.

Participants and Methods: Comprehensive neuropsychological examination was carried out at the period of initial diagnosis of the cyst in France and again when A.K. returned to Finland. The domains of intelligence, executive and psychomotor functions, attention, memory and visual and spatial functions were assessed using a broad battery of well-known clinical neuropsychological tests.

Results: The overall Verbal intellectual ability (WAIS-R) was about one standard deviation above the average whereas Performance IQ was

clearly below the average. On the three tests measuring executive functions (Stroop, Trail-Making Test, Fluency) A.K. showed normal or superior cognitive flexibility. There was great variability of performance on the measured aspects of memory (WMS-R, BVMT, RCF, WRMT). The most salient deficits were found in visual memory tests. According to Visual Object and Space Perception Battery (VOSP) there turned out to be clear deficits in object perception, earlier named apperceptive agnosia. In tasks measuring space perception A.K. was extremely slow in finding the right answers. She also had difficulties in identifying famous buildings and faces. Despite of fluency in verbal expression, she was extremely slow processing visual tasks. Verbalisation was used as a coping strategy.

Conclusions: A.K. had developed well-functioning top-down processing capabilities which allowed her to compensate severe visual processing deficits typical after RH-lesions.

Correspondence: *Ritva Laaksonen, KL-instituutti, Sotkatie 4, Vantaa 01450, Finland. E-mail: ritva.laaksonen@vandark.net*

R. LAAKSONEN, H. KALSKA & R. SULKAVA. The Subtle Sequelee of a Large Arachnoid Cyst: The Experiential World of Anja Kohonen and the Contraversies of Silent Cysts.

Objective: The case description aims to contribute to the controversial conceptions about the sequelee of arachnoid cysts, which have been considered silent as to neuropsychological disorders and pathological handedness in adult life, except for compression effects disappearing after surgery. (Wester & Hugdahl, 2003).

Participants and Methods: The case description is based on multidisciplinary examinations and interviews with A.K. who had lived as a healthy, educated woman till the age of 31.

Results: The case description reveals very severe deficits in visual and visuospatial functions, not due to observed visual field defects. Features of underlying agnosia in object as well as face recognition were observed affecting everyday functioning together with selective apraxia. Handedness was partly right (60 %) and partly left (40%). Reading, writing and calculation were not disturbed. Language, verbal reasoning and the ability to learn foreign languages were highly developed.

Conclusions: The case report reveals a very severe neuropsychological syndrome after left-sided arachnoid cyst with right hemisphere deficits. We propose a "crowding phenomenon" in explaining the RH type of deficits and language dominance. The changes appear similar to the findings of Lebowitz et al. (2006).

Correspondence: *Ritva Laaksonen, KL-instituutti, Sotkatie 4, Vantaa 01450, Finland. E-mail: ritva.laaksonen@vandark.net*

Poster Session 2:

Aging, Dementia, Cognitive Neuroscience, Electrophysiology, Imaging, Genetics

3:00–4:00 p.m.

Aging

C. CHESTER, I. PAVÃO MARTINS & M. GUERREIRO. Semantic Memory: Relations With Demographic Variables.

Objective: Semantic memory is believed to be the last and the least affected with aging. Verbal Fluency, Information and Vocabulary tests are used as a measure of semantic memory. We analyzed the influence of education, gender and age on scores in Verbal Fluency, Information and Vocabulary tests.

Participants and Methods: Method: In a population-based study, we analysed a group of 360 healthy subjects without brain lesions and independent on daily living activities. The sample had 228 female and 132 male, aged between 50 and 90 years old, and mean of age

65.11±8.40. The mean of education level was 6.97±4.24. Women were younger (64.36±8.56) than men (66.41±7.99), with significant differences between them ($t=2.24$; $p=.026$). The sample was divided in four groups for age and three groups for education level. There were no differences in educational level among genders.

Material: The Vocabulary, Information, Semantic Fluency tasks (food) were used to evaluate the performance of the subjects.

Results: We found significant differences between genders in Semantic Fluency and Information ($t=2.87$, $p=.004$; $t=7.21$, $p<.001$; respectively). The age groups and educational levels showed significant differences in all tasks ($p<.05$). However, the regression analyses highlight the strongest association of educational level with the performance in the tests.

Conclusions: Our analysis provided an evaluation of the effects of demographic variables for the results in the Vocabulary, Information and Verbal Fluency. Nevertheless, educational level was the variable with the highest association with the results.

Correspondence: *Catarina Chester, Laboratory of Language Research, Molecular Medicine Institute, Faculty of Medicine, Av. Professor Egas Moniz, Lisbon 1649-028, Portugal. E-mail: catarina.chester@gmail.com*

R. CORREIA-PASSINHAS, N. JIMENEZ, L. TABARES, A. NIETO & J. BARROSO. Enhancing Mini-Mental State Examination -MMSE-Memory Assessment.

Objective: MMSE (Folstein et al. 1975) is a cognitive screening tool world-spread used to map cognitive decline in the aging field. However, when distinguishing age-related from pathological memory decline MMSE seems not so informative. We propose adding extra delayed recall trials to MMSE with the aim of getting richer information in terms of memory impairment features and neural networks involved with the minimum time employed.

Participants and Methods: 77 non-demented (according to their GP's clinical judgement) elderly participants (65+) were assessed with the standard MMSE version. 15 minutes after the standard MMSE delayed recall item, participants were asked to spontaneously recall the three words formerly given. Subsequently a semantic guided recall and a recognition trial were respectively administered. Performance scoring 1.5 SD below mean was classified as impaired.

Results: Our results show that a 17% of our participants manifests memory impairment according to the standard MMSE version. Spontaneous 15 min. delayed recall (22% impaired) doesn't seem to change this result ($t=-1.76$, $p>.05$). However, when analysing the recognition trial, only 7% of the participants showed memory impairment which is significantly different to the standard delay recall impairment proportion ($t=2.04$, $p=.04$).

Conclusions: Although further analyses are required to firmly claim our conclusions it seems that adding a recognition 15 min. delay trial to standard MMSE turns a useful procedure to differentiate, at a very first stage, those patients presenting age-related memory decline from those with pathological memory impairment. It might help also to distinguish between fronto-basal networks and temporo-medial structures as neural basis beyond the impairment.

Correspondence: *Rut Correia-Passinhas, Universidad de La Laguna, Facultad de Psicología, Campus de Guajara s/n, La Laguna 38205, Spain. E-mail: rutcorreia@gmail.com*

T. HATTA, A. IWAHARA, E. ITO, N. NAGAHARA, M. NAKAO & H. HONJO. Relation between cognitive function and urinary incontinence in healthy community-dwelling middle and elderly people.

Objective: The aims of this study were first that to estimate the prevalence of urinary incontinence among healthy middle and elderly community-dwelling people and second that to examine the relationship between cognitive function and urinary incontinence.

Participants and Methods: A total of 201 participants (86 men and 115 women; age ranged from 50 to 89 years old) participated in this study. They were all healthy community-dwelling people diagnosed by the Nagoya university Y-town cohort study medical and neuropsychological examination.

Participants were given the structured questionnaire as for the condition of urinary incontinence and cognitive assessment battery (NU-CAB for memory, attention, verbal fluency, information processing speed, and visuo-spatial function).

Results: According to questionnaire results, 19 men and 32 women participants have experience of urinary incontinence with different levels (UI-Yes group), while 67 men and 83 women have no experience of urinary incontinence (UI-No group). An analysis of covariance (age and education were control variance) was conducted to examine group difference for each cognitive task performances.

The results showed first that a sex difference in the prevalence of urinary incontinence and second that significant relation between urinary incontinence and cognitive tasks for attention and information processing speed, while no relation was found in cognitive tasks for memory, verbal fluency and visuo-spatial function.

Conclusions: The findings were consistent with previous several studies that suggest relation between urinary incontinence and cognitive function. Further, present study revealed that prefrontal cortex related function such as attention and information processing speed relates strongly to urinary incontinence while the relation was not significant for temporal and parietal cortex related function such as visuo-spatial and memory.

Correspondence: Takeshi Hatta, Ph. D., Health Science, Kansai Univ. Welfare Sciences, 3-11-1, Kashiwara 582-0026, Japan. E-mail: thattajp@yahoo.co.jp

E. ITO, T. HATTA, N. NAGAHARA & A. IWAHARA. Awareness of memory impairment in middle and old aged community dwellers.

Objective: The objective of this study was to examine the state of awareness of memory impairment in middle and old aged community dwellers, using a Japanese Version of the Everyday Memory Checklist (EMC), which was originally developed by Wilson et al. (1989).

Participants and Methods: Subjects were recruited at a municipal physical examination in a rural area. They were informed of the objective, the method and ethical concerns, then 388 residents (mean age: 64.8 ± 10.1) participated in the study with consent. We asked the subjects to answer the Japanese version of EMC (Watamori et al., 2001) and measured Mini Mental State Examination (MMSE: Folstein et al., 1975), immediate recall of a short story (Japanese Version RBMT: Wilson et al., 1985; Watamori et al., 2001) and verbal fluency (VF: Ito et al., 2004). Subjects were divided into 5 age groups (under50, 50s, 60s, 70s, over80) for analyses.

Results: On the EMC, the mean score was 21.0 (under50), 21.1 (50s), 21.8 (60s), 22.7 (70s) 24.5 (80s) and there was a main effect of age group ($F(4, 383) = 3.072, p < .05$) according to ANOVA; over 80-year-old subjects were aware of more memory impairment than younger subjects. There were negative correlations between EMC and category verbal fluency ($r = -.35, p < .05$) in their 70s and between EMC and short story recall ($r = -.48, p < .05$) in their 80s.

Conclusions: These results indicated that healthy elderly subjects were aware of memory impairment, whereas, patients with Alzheimer-type dementia tend to be unaware of their memory impairment (Kazui, 2006). Moreover, awareness of memory impairment might be associated with verbal fluency and memory deficit.

Correspondence: Emi Ito, Nagoya University, 1-1-20, Daikominami, Higashi-Ku, Nagoya 461-8673, Japan. E-mail: emiito@met.nagoya-u.ac.jp

A. IWAHARA & T. HATTA. Cognitive Activity and Cognition at Old Age: The use of Technology as a Buffer of Cognitive Decline in Aging.

Objective: There is epidemiological evidence that lifestyle characterized by engagement in leisure activities of intellectual and social nature is associated with slower cognitive decline in healthy elderly. Especially, cognitively stimulating experience is thought to contribute to cognitive reserve. However, little is known about the benefits of the use of information technology (e.g., searching information by computer, reading online newspapers, and computer-mediated communication) that is recognized as a sort of cognitive activity.

Participants and Methods: In a cohort of 277 elderly persons without dementia, we assessed current frequency of cognitive activity including the use of information technology, and cognitive functions. The cognitive functions were measured by means of logical memory test (test for the assessment of episodic memory), Money road test (test for the assessment of visuospatial ability), Stroop test (test for the assessment of executive function), D-CAT (test for the assessment of attention) and verbal fluency test (test for the assessment of semantic memory).

Results: We constructed a series of linear regression models to examine the association of cognitive activity with each cognitive function. In analyses controlling for age, sex, and education, more frequent cognitive activity was related to better performance in logical memory test and Stroop test. In addition, more frequent use of information technology was related to better performance in Money road test and D-CAT.

Conclusions: The results suggest that current cognitive activity contributes to slower decline of episodic memory and executive function, and that current activity concerning the use of a computer contributes to slower decline of visuospatial ability and attention.

Correspondence: Akihiko Iwahara, Ph.D., Department of Domestic Sciences, Shoinhigashi Women's Junior College, 3-1-8, Sumiyoshi, Sumiyoshi-ku, Osaka 558-0045, Japan. E-mail: aiwahara@aol.com

L.J. MILLER, A. MYERS, L. PRINZI & W. MITTENBERG. Age Related Declines in Performance on the Wechsler Intelligence Scales from 1955 to 2008.

Objective: Declines in IQ scores with advancing age have been observed in each successive revision of the Wechsler Intelligence Scales. This study examined age related changes on the 2008 WAIS-4, and compared these to the effects seen on the 1955, 1981, and 1997 standardizations of the scales.

Participants and Methods: Analyses used WAIS-4 standardization data (N=2200, ages 16-90). The mean raw score corresponding to average performance for each subtest was determined for each age group and converted to subtest scores that were uncorrected for age using scaled score equivalents for the 20-34 year old reference group. These were summed to produce Index and Full Scale IQ scores that were not corrected for age. Similar procedures were used to derive subtest and IQ scores without age corrections from the WAIS (N=1967), WAIS-R (N=1880), and WAIS-3 (N=2450) standardization data.

Results: The most pronounced declines were in measures of processing speed and nonverbal reasoning, and were similar on timed and un-timed measures. Verbal abilities remained relatively stable across the life span. General intelligence as assessed by the Full Scale IQ was reduced 1 SD by age 75 when corrections for age were removed. Age related IQ declines have become less pronounced since 1955, particularly on measures of processing speed. This effect was linear and unrelated to concurrent IQ increases in the general population.

Conclusions: Age related intellectual losses parallel a 50% reduction in brain volume over the life span. A slowing of decline since 1955 may be related to the 9 year increase in life expectancy during this period.

Correspondence: Wiley Mittenberg, Ph.D., Center for Psychological Studies, Nova Southeastern University, 3301 College Ave, Ft Lauderdale, FL 33314. E-mail: wiley@nova.edu

N. NAGAHARA, T. HATTA, E. ITO & A. IWAHARA. Is the Stroop Color-Word Test sensitive to cognitive decline in elderly people?

Objective: The purpose of this study is to clarify the patterns of developmental decline of the Stroop Color-Word Test and other cognitive tests.

Participants and Methods: A thousand and eighty three middle and elderly people (432 men and 651 women) were given cognitive assessment battery which is including Stroop test, Logical Memory Test, Verbal Fluency Test, and Digit Cancellation Test (D-CAT). Those tests were conducted individually and it takes about 15 minutes per person. They participated this study as a part of the community health checkup.

Results: MANCOVA was carried out to examine the effect of aging on Stroop test, memory test, verbal fluency test, and digit cancellation test

including sex and years of education as covariates. Only the result of Stroop test shows the significant difference between performance of people in their 70's and 80's people whereas the results of almost tests indicate declines of performance with aging except letter fluency test. Also, the Stroop test shows not strong correlation with the Digit Cancellation Test, reflects attention.

Conclusions: The results suggested that the Stroop test has potential to assess early the cognitive decline in elderly people, although further longitudinal study will be necessary to put into practical use.

Correspondence: *Naoko Nagahara, Osaka College of Social Health and Welfare, 2-8, Tadei-cho, Sakai-ku, Sakai-shi, Osaka 590-0014, Japan. E-mail: n.nagahara@kenko-fukushi.ac.jp*

Y. NAKAGAWA, Y. MASAOKA, I. HOMMA & T. KOYAMA. Life-span change in Japanese grammar: From child to elder.

Objective: We investigated the grammatical ability of children and elderly people to examine the life-span change for Japanese receptive grammar.

Participants and Methods: The participants were 390 native children, aged three to twelve years and 75 native elderly person, aged 65 to 98 years with a mean age of 78.4 years. They were tested for cross sectional research by using a Japanese grammatical test (J.COSS: JWU, Japanese test for comprehension of syntax and semantics), which included 20 grammatical items with 80 questions. The elderly participants also administered with a Japanese version of the Mini-Mental State Exam (MMSE) to evaluate the cognitive impairment.

Results: The reproducibility of a scale analysis was 85.6 within an acceptable range, the development of 20 grammatical items was determined by a step-by-step order, in accordance with pass rate for child group, and a hierarchical order showed the almost opposite decline pattern for elderly group. The cognitive impairment group (a score of MMSE was 23 or less), was also able to understand a two-item combination sentence, however, participants showed age-related decline in the complex grammatical items (three items/ multi-item combination).

Conclusions: The results suggested the life-span symmetrical change from children to elder people for Japanese receptive grammar. Although the elderly people have not shown any influence of age-related decline in verbal IQ, especially lexical knowledge, the present study revealed the deterioration in grammatical knowledge influenced by aging and cognitive impairment in old age.

Correspondence: *Yoshiko Nakagawa, Ph.D, Clinical Psychology, International University of Health and Welfare, Aoyama Ichome Tower, 1-3-3, MinamiAoyama, Minato-ku 107-0062, Japan. E-mail: SNC59S10@nifty.com*

J. OOSTERMAN, R. VOGELS, B. VAN HARTEN, A. GOUW, A. POGGESI, P. SCHELTENS, R. KESSELS & E. SCHERDER. Assessing Mental Flexibility: Neuroanatomical and Neuropsychological Correlates of the Trail Making Test in Elderly People.

Objective: The Trail Making Test part B (TMT-B) is one of the most frequently applied tests and traditionally viewed as an indicator of flexibility performance. Previous studies indicate that performance on this test is highly sensitive to age-related changes in the brain and cognitive function. However, the precise contribution of periventricular hyperintensities (PVH), deep white matter hyperintensities (DWMH), and medial temporal lobe atrophy (MTA) to task performance remains unspecified. Similarly, diminished performance may be due to deficient flexibility functions, but also to other age-related cognitive decline (e.g. mental slowing). The aim of the present study was to determine neuroanatomical (PVH, DWMH, MTA) and neuropsychological (working memory, executive function, speed and attention, episodic memory) predictors of TMT-B performance in nondemented elderly people.

Participants and Methods: 156 participants underwent extensive neuropsychological testing and MRI scanning. TMT-B outcome measures included total completion time, TMT-B difference score (TMT-B minus TMT-A completion time), a TMT-B ratio score (TMT-B/TMT-A), and the presence of shifting and sequencing errors.

Results: MTA turned out to be the strongest independent predictor of most TMT-B outcome variables (all p-values < .01). PVH, next to MTA, independently predicted TMT-B difference score and shifting errors; PVH was furthermore the only predictor of sequencing errors (all p-values < .05). The predictive value of the neuropsychological scores differed among the various TMT-B outcome variables. For example, all neuropsychological scores predicted the TMT-B total completion time, whereas only executive function predicted the ratio score (p < .01).

Conclusions: We conclude that MTA is a very important predictor of TMT-B performance in elderly people. Furthermore, multiple cognitive functions are involved in TMT-B performance, with the ratio score as the best indicator of executive function.

Correspondence: *Joukje Oosterman, Donders Institute for Brain, Cognition and Behaviour, Radboud University Nijmegen, Montessorilaan 3, Nijmegen 6500 HE, Netherlands. E-mail: j.oosterman@donders.ru.nl*

S. WILKINS, J. GUZMAN, S. OSATO, S. DHANANI, D. HENRIQUES, C. ROYER, T. ABOUEZZEDINE, N. HARADA & S. CASTLE. Comparison of the GDS and the PHQ-9 Depression Screening Instruments in Ethnically Diverse Older Medical and Psychiatric Veteran Populations.

Objective: The Geriatric Depression Scale was developed with a Caucasian population, and some studies have suggested that it is not valid with certain ethnic minority groups. The Patient Health Questionnaire, PHQ-9, has become a widely used screening instrument for all ages. Our hypothesis was that the PHQ-9 would be a more useful instrument for depression screening in older, ethnically diverse medical and psychiatric veterans.

Participants and Methods: Part one of the study examined 40 intakes into the Geriatric Medicine clinic. All forty received a diagnostic clinical interview and the GDS and PHQ-9 in randomized order. Secondly, 28 additional geriatric medicine patients and 87 patients from the geriatric psychiatry clinic were administered the GDS and PHQ-9. Mean age of all subjects was 78.06 (sd=7.08). The study was initially conducted as part of a clinical improvement project. The project was approved by the VA research and human subjects committee for research purposes. Statistical analysis included Chi-Square with Fisher's Exact test as needed.

Results: In summary, the GDS and PHQ-9 did not show significant differences by ethnic group. As expected the geriatric psychiatry group had higher scores than the geriatric medicine on both the GDS and the PHQ-9. For the 40 medicine patients with psychiatric interview, sensitivity was best for the GDS (30 or 15 = .75) while PHQ-9 yielded a was .75 with a cut off of 6.5). Specificity for the GDS was .72 (.86 for 15 item GDS), and .84 for the PHQ-9. For the total sample of 157, the PHQ-9 and GDS forms were all significantly correlated

Conclusions: This study supports use of both the GDS and the PHQ-9. With regards to geriatric minorities both instruments were equal. The GDS 15 had the best sensitivity/specificity for the geriatric medical subjects. The GDS was significantly correlated with the PHQ-9. Significant limitations include a convenience sample, and diagnostic interviews on only 40 patients.

Correspondence: *Stacy Wilkins, Ph.D., VA Medical Center, 11301 Wilshire Blvd, Los Angeles, CA 90272. E-mail: swilkins@ucla.edu*

Dementia (Alzheimers)

L.G. GAGNON, S. BELLEVILLE, . LEPAGE & S. GAUTHIER. Working Memory Deficits in Alzheimer's Disease and Mild Cognitive Impairment: Contribution of Memory Trace Decay.

Objective: The aim of this experiment was to characterize as well as compare working memory deficits in normal aging (n=20), mild cognitive impairment (MCI) (n=20) and Alzheimer's Disease (AD) (n=13) by examining the contribution of memory trace decay in two self-paced working memory span tasks: reading and operation spans.

Participants and Methods: Complex span tasks involve the presentation of a series of propositions to be solved, followed by free recall of the solution items. They entail complex processing concurrent with short-term storage. Two matched conditions were compared for each type of stimuli: long-short and short-long. By manipulating the length of the first and last propositions of the series, we controlled the retention delay during which memory trace decays. Thus, retention (storage) requirements of memory items - but not their output characteristics - were varied, while overall task difficulty (processing) was kept equivalent. In this manner, we isolated the impact of temporal factors (*delay*) on retention in working memory.

Results: Results show a main effect of *retention delay* on absolute complex span for all groups, thus supporting a role for memory trace decay in working memory, as predicted by Towse & Hitch's Task-switching model. Moreover, a *delay by group* interaction highlights that persons with AD were more sensitive to delay in terms of *relative* span performance. This can be attributed to faster degradation of memory trace, a feature of episodic memory impairment in AD.

Conclusions: In summary, working memory span deficits in AD - but not MCI - are partly attributable to accelerated memory trace decay. Correspondence: *Lyssa G. Gagnon, Psychology, University of Montreal, 5662 Ave Gatineau, Montreal, QC H3T 1X7, Canada. E-mail: lyssa.gagnon@umontreal.ca*

S. KANG, H. AHN, M. SUH, S. SEO & D. NA. Activities of daily living in early onset and late onset Alzheimer's disease.

Objective: Alzheimer's disease (AD) is neurodegenerative disorder, it could be divided Early onset AD (EOAD) and late onset AD (LOAD) with an arbitrary cutoff onset age of 65 years. The aim of this study was to compare the Activities of daily living in EOAD and LOAD.

Participants and Methods: Subjects consisted of 224 patients (63 Men and 161 women with mean age of 68.4 years, range 49-87 years): 86 (35.2%) EOAD and 158 (64.8%) LOAD. Age of onset in the LOAD group ranged from 65 to 81 with average of 72.8; duration of dementia ranged from 1 to 12 years with average of 4.0 years. In the EOAD group, age of onset ranged from 40 to 64 years with average of 56.8 years; duration of dementia ranged from 1 to 10 years with average of 4.1 years. The duration of dementia in two groups were not significant difference (EOAD: 3.86 ± 2.04 , LOAD: 3.39 ± 1.95 , $t=1.759$ $p=0.080$). They met the criteria for probable Alzheimer's disease proposed by National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's disease and Related Disorders Association (NINCDS-ADRDA). Activities of daily living were assessed using a standardized rating scale, Seoul-instrument activities of daily living (S-IADL) at the first medical assessment. Caregivers providing behavioral information were family members living with the patient or relatives seeing the patient more than twice per week.

Results: The Total score of S-IADL with two groups were significant difference (EOAD: 20.17 ± 9.38 , LOAD: 17.68 ± 7.82 , $t=2.09$, $p=0.038$). And Keeping appointment, managing belongings, grooming, and walk outdoors of 15 subscale of S-IADL differed significantly with two groups.

Conclusions: Our study showed that in the same disease duration, Activities of daily living in patients with EOAD is decreased more than LOAD. Correspondence: *Sue J. Kang, Neurology, samsung medical center, Sungkyunkwan University School of Medicine, 50 Ilwon-dong Kangnam-ku, Seoul 135-710, Korea, South. E-mail: susue73@hotmail.com*

H. AHN, S. SEO, J. CHIN, K. IM, J. LEE & D.L. NA. The correlation of neuropsychological performances and cortical thickness in mild cognitive impairment and Alzheimer's disease.

Objective: Neuropsychological tests are useful tool for assessing cognitive deficits and monitoring their changes as the disease progresses from mild cognitive impairment (MCI) to AD. Advances in neuroimaging provided insight about brain-behavior correlation. However, the association between neuropsychological functioning and cortical thickness has rarely been investigated. This study attempted to find neural correlates for neuropsychological performances in patients with amnesic type of MCI (aMCI) and AD.

Participants and Methods: Participants were 170 patients with AD and 99 patients with aMCI. All the subjects received Seoul Neuropsychological Screening Battery (SNSB). The cortical thinning was quantified by measuring the thickness of the cortical mantle across the entire brain using automated 3-D MRI imaging processing. The correlation of cortical thickness and neuropsychological performance was analyzed by the stepwise multiple linear regression analyses.

Results: Of the SNSB subtests, only scorable tests were used for the correlations. The regression analyses (corrected 0.001) showed specific brain regions with significant cortical thinning in all the SNSB subtests except for place orientation, digit span forward, SVLT and RCFT recognitions, and Stroop test word reading.

Conclusions: Our study involving a large sample of aMCI and AD suggest that the correlation of cortical thickness with neuropsychological measurement can be a powerful model for finding the neuronal correlates of a variety of cognitive deficits. Anatomical correlates for neuropsychological deficits included not only the neural networks that we expected from previous studies but also other brain regions, which may help interpret neuropsychological results in brain injured patients.

Correspondence: *Hyun Jung Ahn, Neurology, Samsung Medical Center, 50 Ilwon-dong Kangnam-ku, Seoul 135-710, Korea, South. E-mail: anesther@hanmail.net*

A. KIRK, M. CROSSLEY, D. MORGAN, N. STEWART, C. D'ARCY, D. FORBES & J. BIEM. Design and Operation of a Multidisciplinary Memory Clinic Using Telehealth Technology To Serve a Rural and Remote Population.

Objective: Saskatchewan's population is one million but it is significantly larger than Finland. We developed a Memory Clinic for rural patients with early dementia.

Participants and Methods: Upon referral, a telehealth visit using videoconferencing allows patients and families in their own communities to meet the clinic nurse and neuropsychologist for orientation and preliminary data collection. Blood tests are taken during that visit. Patient and family then travel to Saskatoon for an in-person appointment. They see a neurologist, neuropsychologist, and geriatrician for history-taking and examination. Neuropsychological testing, CT, and physiotherapy assessment are administered. At day's end, clinic staff meets to discuss results, diagnosis, and management of the two new patients seen that day. The neurologist and neuropsychologist meet with patient and family to provide feedback and discuss plans. The neurologist sees patients in follow-up at 6 and 12 weeks, 6 and 12 months, and then annually or as needed. Patients are randomly allocated to 6 week appointment either in-person in Saskatoon or via telehealth with subsequent appointments alternating between in-person and telehealth. Patients and family complete questionnaires to rate satisfaction and convenience of visits.

Results: Over 200 patients have been assessed. 100% of patients and family would use telehealth again and 97% would recommend it to others. Satisfaction scores were not significantly different for telehealth versus in-person visits. Telehealth visits were rated significantly higher for convenience. MMSE scores did not significantly differ between in-person vs. Telehealth visits.

Conclusions: A multi-disciplinary telehealth-based memory clinic is an effective way to assess and care for dementia patients in remote areas. Correspondence: *Andrew Kirk, MD, FRCP(C), Medicine, University of Saskatchewan, Neurology, Royal University Hospital, 103 Hospital Drive, Saskatoon, SK S7N 0L5, Canada. E-mail: andrew.kirk@usask.ca*

A. LLORENTE, C. BINDSCHAEDLER & A. JARNE. Confabulation in Mild Alzheimer's Dementia.

Objective: The aim of this study was to explore the frequency of spontaneous and provoked confabulations, examine its relationship with memory, executive functions and global cognition also relate the spontaneous, provoked confabulations and intrusions.

Participants and Methods: 33 elderly with mild Alzheimer's dementia and 37 elderly without dementia between 65 to 85 years of age entered the study. We used an interview of spontaneous confabulations, two test of semantic memory and the Spanish versions of different tests: Dalla Barba provoked confabulation's interview, Grober and Buschke memory test and the Mattis dementia rating scale.

Results: Thirty three percent of the patients did not submit spontaneous confabulation. A higher score of spontaneous confabulation largest number of false alarms in memory and less ability of conceptualization. Patients with Alzheimer's dementia made about 14% provoked confabulations. Sixty-four percent of the Alzheimer's dementia patients were considered mild provoked confabulators. The provoked confabulators group obtained better performance in the conceptual semantic memory task and in the Mattis dementia rating scale total score. Provoked confabulators and non confabulators did not statistically differ regarding spontaneous confabulations. Provoked confabulators and non confabulators did not statistically differ regarding intrusions in the cued recall. Provoked confabulators also had a trend towards better executive abilities on the initiation/perseveration subscale of the Mattis dementia rating scale than non confabulators.

Conclusions: In mild Alzheimer's dementia, spontaneous and provoked confabulations are frequent. These results support the hypothesis of executive dysfunction in spontaneous confabulation but do not support the hypothesis of executive dysfunction or global cognitive impairment in provoked confabulations. In addition, spontaneous confabulations, provoked confabulations and intrusions evidence that only share some common neurocognitive mechanisms.

Correspondence: *Ana Llorente, Doctor, Adult Psychiatry, Complex Asistencial en Salut Mental Benito Menni, Dr. Antoni Pujadas, 3S, Sant Boi de Llobregat 08830, Spain. E-mail: anallv@copc.es*

I. CONTADOR, A. LOPEZ-ROLON, B. FERNÁNDEZ-CALVO & F. RAMOS. Apathy and memory performance in Alzheimer's disease.

Objective: We examined whether the presence of apathy influences the performance of early-stage Alzheimer's disease (e-s-AD) patients, and that of non-demented patients suffering from unipolar depression (n-d-UD) on standardized verbal and non-verbal memory test batteries.

Participants and Methods: We used the Hopkins Verbal Learning Test and Malec's Visual-Spatial Learning Test to compare a group of e-s-AD patients with apathy (n=18), a group of e-s-AD patients without apathy (n = 11), a group of n-d-UD patients (n =17), and a control group (CG; n=27). All groups were matched for age and education, and e-s-AD groups were matched on MMSE scores.

Results: Contrary to what we expected, apathy in e-s-AD patients was not associated with significantly lower scores on neither verbal nor non-verbal memory tests. However, compared to the CG, apathetic n-d-UD patients did perform significantly worse on a non-verbal position recall task and on tasks of recall and recognition of words, recognition of words.

Conclusions: The neurodegenerative process in e-s-AD seems to affect the impact that apathy is known to have usually on verbal and non-verbal memory.

Correspondence: *Israel Contador, University of Évora, Col. Pedro da Fonseca (PIT). Rua da Barba Rala, Évora 7000, Portugal. E-mail: icontador@usal.es*

M. SOTANIEMI, V. PULLIAINEN, T. PIRTTILÄ, T. HÄNNINEN & L. HOKKANEN. The validation of the Finnish version of CERAD neuropsychological battery.

Objective: CERAD (Consortium to Establish a Registry for Alzheimer's Disease) neuropsychological battery (nb) is used widely across the world as an evaluation tool for dementia. In Finland it has been in use since 1999. Until 2007 the norms of the Finnish CERAD-nb have been adopted from the American norm study. The objective of this study is to validate optimal cut off points for the Finnish version of CERAD-nb

in distinguishing mild Alzheimer's disease from cognitively normal elderly. New cut points for normative gradation have been suggested for Finnish population, but these levels need to be validated in clinical population. This is important for the use as a screening tool in primary health care.

Participants and Methods: The data came from two sources: a population based study of Finnish healthy elderly and a part of a study on recently diagnosed patients with very mild to mild (CDR 0.5-1.0) Alzheimer's disease (AD). Healthy elderly (n=315) and AD patients (n=171) underwent CERAD-nb investigation as a part of a wider examination procedure.

Results: The AD group performed more poorly in all subtests except Clock drawing. The most efficient subtests to discriminate very mild and mild AD patients from the healthy elderly were Wordlist delayed recall/savings, Wordlist learning and Wordlist recognition. Verbal fluency, Boston naming and Delayed constructional praxis were better discriminators than Constructional praxis or Clock drawing.

Conclusions: The present provisional cut points seem too low especially for Wordlist recognition and too high for delayed Wordlist savings/learning. Cut points for all other subtests will be scrutinized as well.

Correspondence: *Mona Sotaniemi, University of Helsinki, Jäkälätie 13 B 4, Helsinki 00730, Finland. E-mail: mona.sotaniemi@helsinki.fi*

M. TOEPPER, T. BEBLO, H. GEBHARDT, C. THOMAS, F.G. WOERMANN, M. DRIESSEN, H.J. MARKOWITSCH & G. SAMMER. Behavioural and neural correlates of inhibitory functioning in patients with Alzheimer's disease and healthy control subjects.

Objective: Early detection of Alzheimer's disease (AD) offers the chance to decelerate the patients' cognitive decline and to prolong a self-determined, independent life. Neuropsychological testing is one key approach to establish an early diagnosis. In a pilot study, we compared a new neuropsychological instrument - the Block-Suppression-Test (BST, Beblo et al., 2004) - and classical screening instruments (MMSE, clock drawing test) with regard to their diagnostic value. Only the BST classified patients and controls correctly (sensitivity and specificity = 100 % versus MMSE: sensitivity = 85 %). Moreover, statistically significant interaction effects during the comparison of digit, block and suppression spans suggested a specific inhibitory deficit in early stages of AD. In a follow-up study, we used functional magnetic resonance imaging (fMRI) to investigate the neural mechanisms underlying such suppression or inhibition processes.

Participants and Methods: In cooperation with the Bender Institute of Neuroimaging (BION) in Giessen, Germany, we administered an fMRI-compatible version of the BST. 20 healthy control subjects had to perform the Corsi-Block-Tapping-Test (CBT) and the BST during fMRI. While the CBT requires the storage and subsequent reproduction of visually presented stimuli sequences, visuospatial distracters had to be additionally suppressed in the BST.

Results: In comparison to the CBT performance, the dorsolateral prefrontal cortex (BA 9) showed more activity when distracters had to be simultaneously suppressed during the storage of spatial stimuli sequences.

Conclusions: Our results show that especially the dorsolateral prefrontal cortex plays a crucial role for active inhibition during visuospatial processing. A second fMRI study with AD patients has already been started.

Correspondence: *Max Toepfer, Department of Psychiatry, Er. Hospital Bielefeld, Remterweg 69-71, Bielefeld D-33617, Germany. E-mail: max.toepfer@erkb.de*

Dementia (Subcortical, Specific Disorders, MCI, etc.)

B. BALDIVIA, S. BATISTELA, M.G. ROCHA, S.D. BRUCKI & O.F. BUENO. Clustering and Switching on Verbal Fluency: Comparison Between Parkinson's Disease Patients and Healthy Subjects.

Objective: To verify differences on semantic verbal fluency task performance between Parkinson's Diseases patients with (PD-D) and without dementia (PD), and healthy subjects groups.

Participants and Methods: Fifteen patients PD-D, twenty-one patients DP and nineteen healthy subjects, had their performance on semantic verbal fluency task (animal category) compared. Troyer's (2008) criteria were used to classify animal's categories and number of words. Cluster and switches generated and mean cluster size was used as scores. Groups performance were compared by ANOVA

Results: Groups had no difference on age, but PD-D group had less years of schooling and lower score on MMSE ($p < 0.000$), so years of schooling were used as covariate on ANCOVA analyses. On fluency verbal task PD-D group had lower scores on total of words generated ($p < 0.000$), number of cluster ($p < 0.000, 4$) and switchings ($p < 0.000, 1$). There were not differences on cluster size between the groups. No difference was observed between healthy subjects and PD group.

Conclusions: Results showed no differences between PD and healthy subjects. However, differences on total of words generated, clusters and switchings were observed when compared with PD-D, suggesting that semantic verbal fluency task is impaired on PD-D. Moreover, it could demonstrate that PD-D have lower semantic organization, and consequently an impairment on executive function.

Correspondence: *Beatriz Baldívia, UNIFESP, tres rios, 95 p 43, Sao Paulo 01123001, Brazil. E-mail: biabaldivia@yahoo.com.br*

I. GALTIER, Y. MOLINA, A. MACHADO, N. JIMÉNEZ, A. NIETO, J. BARROSO & J. LORENZO. Phonetic and Semantic Fluency in Different Stages of Parkinson Disease.

Objective: Parkinson Disease (PD) has been related to executive impairment as a consequence of fronto-striatal affection. Verbal fluency is known to be sensitive to impaired prefrontal activity and therefore broadly studied on PD patients. However, no concluding results have been found. Disease stage may be a relevant variable to explain conflicting results.

Participants and Methods: We studied 61 individuals paired by age, sex and education. Eighteen of them were healthy controls (CG) and 43 non-demented patients with PD classified according to their stage of illness (Hoehn and Yahr, 1967): 18 at early stage (PDe or I-II, H. & Y.) and 25 at advanced stage (PDA or III-IV, Y. & H.). Phonetic (letter F) and semantic (animals) fluency task were administered. We analyzed word production and strategies such as number of clusters, cluster mean size and number of switches (Robert 1998; Troyer 2000).

Results: We found significant differences between groups in phonetic fluency in terms of total number of words and number of switches. The PDA group presented a lower performance compared to CG. No differences were observed in semantic task performance.

Conclusions: PD patients in advanced stage show a decreased performance in phonetic fluency specially associated to a lesser use of "switching" strategies. Considering "switching" strategies as a component of cognitive flexibility, our results suggest that even in default of dementia, PDA could show deficits of executive functioning related to the affection of the fronto-striatal system. Our results make evidence of the importance of considering stage of illness when studying cognitive dysfunction in PD.

Correspondence: *Iván Galtier Hernández, Psicobiología y Metodología de las Ciencias del Comportamiento, Universidad de La Laguna, Campus de Guajara, La Laguna 38205, Spain. E-mail: igaltier@ull.es*

D. FERREIRA PADILLA, A. MACHADO, R. CORREIA-PASINHASS, J. BARROSO & A. NIETO. Amnesic MCI-MD with Prefrontal Impairment Shows Greater Preservation of Premotor Functions than Non-Amnesic MCI-MD with Prefrontal Impairment.

Objective: Some recent studies have suggested that amnesic MCI patients might have frontal impairment. However, published results have principally referred to prefrontal functions. We aimed to compare premotor functions in aMCI multiple domains patients with prefrontal impairment (aMCI-MD+F) versus naMCI multiple domains patients with prefrontal impairment (naMCI-MD+F).

Participants and Methods: 13 aMCI-MD+F and 12 naMCI-MD+F clinically diagnosed patients underwent three premotor tasks: alternat-

ing series, two-hand coordination and motor inhibition. Both groups were comparable in age, sex, education level and general cognitive state. Criteria for prefrontal impairment consisted in a performance of 1.5 SD below the mean of the respective age and education matched population in one or more of the following prefrontal tasks: STROOP, FAS and Backward Digits.

Results: All naMCI-MD+F patients (100%) had one or more premotor tasks impaired. On the other hand, seven MCI-MD+F patients (53.8%) performed impaired in one or more premotor tasks. These percentages differed significantly ($t(1,12) = -3.207; p = .008$). With respect to naMCI-MD+F group, right-hand and left-hand alternating series were the most frequently impaired tasks (58.3%), followed by coordination (50%) and inhibition (41.7%). Regarding to aMCI-MD+F group, inhibition was the most frequently impaired task (46.2%), followed by coordination and left-hand alternating series (30.8%) and right-hand alternating series (23.1%).

Conclusions: Both MCI multiple domains subtypes show premotor functions impairment when prefrontal functions are also impaired. However, aMCI-MD patients with frontal affection evidence greater preservation of premotor functions.

Correspondence: *Daniel Ferreira Padilla, Student, La Laguna University, Campus de Guajara, SN, La Laguna 38205, Spain. E-mail: danifer@ull.es*

J. CHUNG. Self-appraised versus informant-reported and objective cognitive function in mild cognitive impairment (MCI).

Objective: The current knowledge of how self-appraised memory and cognitive function related with informant reports and objective neuropsychological performances in MCI is limited. This study aimed to expand the understanding of cognitive and memory functions of older adults with MCI by investigating the degree to which self-appraised cognitive functions related to informant reports and objective neuropsychological performance.

Participants and Methods: 69 older community-dwelling subjects with MCI and 86 normal controls (NC) participated in the study. The Multifactorial Memory Questionnaire and the Informant Questionnaire on Cognitive Decline in the Elderly evaluated self-appraised and informant-reported memory and cognitive function respectively. Fuld Object Memory Evaluation (FOME), digit span tests, the Chinese version of MMSE, and the Chinese version of Rivermead Behavioural Memory Test (RBMT) evaluated objective performance.

Results: The MCI group was significantly differed in self-appraised strategy use and neuropsychological assessment compared to the NC group. Informants of MCI reported more functional deficits in their relatives with MCI compared to those with NC. Self-appraised satisfaction and ability of cognitive functions did not correlate with informant reports and neuropsychological performances, but self-reported strategy use correlated with FOME and RBMT in MCI.

Conclusions: The incongruence between self-appraised cognitive functions and informant reports and objective neuropsychological performances in MCI suggested that this group might present signs of unawareness of impairment. Although strategy use is positively correlated with neuropsychological performances in MCI, the design of cognitive interventions involving memory strategies should consider the learning potential and nature of strategies appropriate for older Chinese people. Correspondence: *Jenny Chung, PhD, The Hong Kong Polytechnic University, Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Kowloon NA, China. E-mail: jenny.chung@polyu.edu.hk*

F. CLEMENT, S. BELLEVILLE & S. MELLAH. Memory Related Brain Activation in MCI: An Interaction between Disease Severity and Cognitive Process.

Objective: Persons with Mild cognitive impairment (MCI) suffer from cognitive deficits that are under the clinical threshold to fulfill criteria for dementia; yet they have an increased risk of developing Alzheimer's

disease (AD). Functional brain imaging can provide critical information regarding the pattern of cognitive or neural compensation that occurs as the disease progresses. The current neuroimaging literature is however inconsistent regarding whether increased or decreased brain activation characterizes MCI persons. The goal of this study was to assess the impact of cognitive impairment and task demands during a familiarity-based and recollection-based fMRI task.

Participants and Methods: Twenty-six persons with MCI and thirteen healthy matched controls participated in the study. Persons with MCI were divided into those with higher and lower cognitive capacities based on their performance on a dementia scale. Participants first learned a series of word pairs. At retrieval, they were asked to recognize pairs of words as old or new (familiarity based recognition) or as intact or rearranged (recollection based recognition).

Results: MCI persons with higher cognitive capacities showed more prefrontal activation than healthy controls in the intact/rearranged task that indexed recollection, a cognitive process that is impaired early in AD. In contrast, MCI persons with lower cognitive capacities showed more prefrontal activation than healthy controls during the old/new task that indexed familiarity, a cognitive process that is impaired at a later stage of AD.

Conclusions: These results indicate that the pattern of cerebral activation varies as a function of the overall disease severity in MCI.

Correspondence: *Francis Clement, Centre de Recherche de l'Institut Universitaire de Gériatrie de Montréal, 4545, Chemin Queen-Mary, Montréal, QC H3W 1W4, Canada. E-mail: francis.clement@umontreal.ca*

D. FERREIRA PADILLA, A. MACHADO, R. CORREIA-PASINHASS, J. BARROSO & N. ANTONIETA. Prefrontal Functions are Impaired in Amnesic MCI Multidomain.

Objective: Amnesic Mild Cognitive Impairment (aMCI) is considered the previous stage of Alzheimer's Disease (AD), and therefore, normally related to medial temporal and posterior affectation. However, some recent studies have suggested frontal impairment within these patients. We aimed to characterizing the state of prefrontal functions in a group of aMCI multiple domains patients.

Participants and Methods: We included 17 aMCI-MD patients diagnosed through clinically criteria. The mean age was 65,18 (7,56) years. Three prefrontal tasks were administered: STROOP, FAS and Backward Digits. Interference index, total words generation and backward span were respectively used in order to establish normality or alteration for each task (-1,5 Sd) when comparing with a sex and education level healthy subjects matched group (n=69).

Results: 12 of our 17 aMCI-MD patients (70'6%) showed impairment in some prefrontal task (35'3% one task impaired and 35'3% two tasks impaired). Percentages of impairment differed significantly between tasks ($F(2,50)=5,700; p=0,006.$), being STROOP test more frequently impaired (64'7%) than Backward Digits (23'5%) and FAS (17'6%). STROOP and Backward Digits detect prefrontal impairment together in 70'6% of subjects. FAS do not increase the sensibility of STROOP at all.

Conclusions: Our results confirm frontal impairment presence in aMCI-MD patients, showing that the STROOP test is the most sensible tool so as to identifying executive deficits in this population. Moreover, used together, STROOP and Backward Digits increase the sensibility for detecting prefrontal impairment.

Correspondence: *Daniel Ferreira Padilla, Student, La Laguna University, Campus de Guajara, SN, La Laguna 38205, Spain. E-mail: danifer@ull.es*

M. GÖTHLIN, A. WALLIN & A. NORLUND. If Combined, Are Life Style Risk Factors and Neuropsychological Profiles Markers of Disease Progression in MCI?

Objective: To examine whether the cognitive profiles of Mild Cognitive Impairment (MCI) subjects with higher scores on life style risk factors such as BMI, sagittal diameter, bloodpressure and cholesterol levels differ from those of MCI subjects with lower scores.

Participants and Methods: Consecutive MCI subjects (N=290) were included in the study. A principal component analysis (PCA) of life style factors produced an underlying theoretical composite value. Subjects with scores above (MCI-high) and below (MCI-low) the normal distribution on this composite value were compared on cognitive performance. The neuropsychological assessment comprised tests of speed/attention, episodic memory, visuospatial function, language and executive function.

Results: The two groups did not differ in terms of age, education or MMSE-scores. MCI-low performed worse on two memory tests, a naming test, and a test of visuospatial function, but better on an executive test. Thus, subjects with lower PCA life style composite values performed worse on tests typically associated with Alzheimers disease.

Conclusions: As weight loss and declining blood pressure are associated with dementia but not MCI, these findings may be interpreted as that the developing AD pathology is more advanced in the MCI-low group. The combination of anthropometrical and neuropsychological data could be a potential marker of disease progression in MCI. Further longitudinal studies are needed in order to corroborate this hypothesis, based on cross-sectional data.

Correspondence: *Mattias Göthlin, Psychiatry and Neurochemistry, Institute of Neuroscience and Physiology, Wallingsgatan 6, Mölndal 43141, Sweden. E-mail: mattias.gothlin@neuro.gu.se*

M. GUSTAVSSON, S. ROLSTAD, J. SKOOGH, G. STEINECK, B. JOHANSSON & A. WALLIN. Subjective vs. Objective Cognitive Impairment in Subjects Seeking Care at a Memory Clinic.

Objective: Studies have shown associations between subjective cognitive impairment and subsequent dementia. However, correlations between self-reported cognitive impairment and neuropsychological test results are weak in most studies. Few have explored subjective cognitive impairment with comprehensive questionnaires, and memory is often the only cognitive domain investigated in studies of subjective cognitive impairment.

Participants and Methods: In this study, 138 non-demented patients and 50 healthy controls completed a 190-items questionnaire with questions about everyday life and difficulties related to the cognitive domains of memory, attention, language, visuospatial- and executive functions. The patient group underwent examination at an outpatient memory clinic and scored above 24 on the MMSE. A majority of the patients were also examined with a comprehensive neuropsychological test battery.

Results: Results showed that patients reported significantly more difficulties than controls in all cognitive domains ($p < .0005$ for all subscales), not just memory. Preliminary analyses of the patients' self-reported difficulties on one hand and their results on neuropsychological tests on the other hand, indicate that correlations were significant only within the domain of visuospatial functions.

Conclusions: Patients at an outpatient memory clinic report significantly more difficulties than controls in all cognitive domains, not just memory. Discrepant results were found when the self-report was compared with the results on neuropsychological tests.

Correspondence: *Marie Gustavsson, Institute of neuroscience and physiology, Wallingsgatan 6., Mölndal 43141, Sweden. E-mail: marie.gustavsson@neuro.gu.se*

S. KIM, J. PARK, J. LEE, H. AHN, J. CHIN, S. SEO, D. NA & S. HAN. Voxel-Based Analysis of Diffusion Tensor Imaging in patients with dementia or mild cognitive impairment with small vessel disease :Correlates with cognitive and motor deficits.

Objective: Patients with subcortical vascular cognitive impairment show high signal intensity on T2-weighted MR images that represents ischemic cell damages. However, despite similar degree of ischemic changes, the amount and the severity of clinical presentations including cognitive impairment and motor deficits may vary. We investigated the clinical correlates of ischemic changes using voxel based morphometric analyses of diffusion tensor imaging (DTI).

Participants and Methods: Participants were 27 MCI and 34 dementia patients who all had significant small vessel disease on MRI. In all patients, detailed neuropsychological tests, a scale for motor deficits called Pyramidal and Extrapyramidal scale (PEPS), and 3-Tesla MRI and DTI scans were performed. Voxel based analysis of the FA and MD maps were computed.

Results: Voxel-based analyses showed a correlation ($P < 0.001$ uncorrected for multiple comparison) between attention tasks and DTI abnormalities in cingulate gyrus, ventral striatum, posterior PVWM, and left parietal lobe. Visuospatial test correlated with decreased FA and increased MD in the splenium of corpus callosum and the inferior longitudinal fasciculus. Frontal/executive task correlated with decreased FA in basal forebrain, cingulate gyrus, ILF, splenium of corpus callosum, and increased MD in basal ganglia, thalamus, cingulate gyrus. In motor deficits, the total PEPS score correlated with decreased FA and increased MD in the corpus callosum and corona radiata.

Conclusions: Our results suggest that clinical deficits in dementia or MCI patients with small vessel disease correlate with specific fiber tracts. Even in areas where there was similar degree of ischemic changes on visual rating, there were various white matter damage in DTI analysis. These findings suggest that patients with small vessel disease who show cognitive and motor impairments relate to a specific distribution of fiber tract damage, rather than the severity of the total ischemia.

Correspondence: *Sook Hui Kim, Konkuk university hospital, Hwa yang dong 4-12, Kwang Jin-ku, Seoul 143-729, Korea, South. E-mail: suuki76@korea.com*

J. YOON, M. SUH, S. OH, H. AHN, S. KIM, S. SEO & D. NA. Hypophonia in Subcortical Vascular Mild Cognitive Impairment and Subcortical Vascular Dementia.

Objective: A reduced vocal loudness, hypophonia, is one of the common motor symptoms observed in patients with subcortical vascular dementia (SVaD) or subcortical vascular mild cognitive impairment (svMCI). However, few studies systematically investigated the hypophonia in this patient population. The main purposes of this study were 1) to investigate the prevalence of hypophonia in patients with SVaD or svMCI, 2) to define hypophonic characteristic, and 3) to find variables related to hypophonia.

Participants and Methods: Participants were 88 patients with SVaD(27/88) or svMCI(61/88) and 21 normal controls who underwent voice tasks. The voice tasks consisted of sustained phonation, reading a passage, and singing a song. Two speech pathologists rated the vocal loudness of patients utilizing a five Likert-type scale, with a score of 0 indicating a normal vocal loudness and 4 a profoundly reduced vocal loudness. A computerized program analyzed recording files of all voice tasks. In addition, to find out which variables might be related to the reduction of vocal loudness, motor, frontal-behavioral, and cognitive function scales were also carried out.

Results: The perceptual ratings demonstrated that 24(39.3%) out of 61 svMCI patients and 13(48.1%) out of 27 SVaD patients presented reduced loudness. In the objective acoustic analysis, the patient groups showed more reduced vocal intensity (dB) than normal controls ($p < 0.05$). The scores of frontal-behavioral scale were not correlated with vocal loudness. However, the scores of motor and cognitive function scales were highly correlated with vocal loudness.

Conclusions: These findings would provide preliminary information about the specific characteristics of hypophonia in SVaD and svMCI patients.

Correspondence: *Ji Hye Yoon, M.S., Department of Neurology, Samsung Medical Center, 50 Ilwon-Dong, Kangnam-ku, Seoul 135-710, Korea, South. E-mail: tracie86@hanmail.net*

M. LOISELLE, S. JOUBERT & M. KERGOAT. A multimodal Category-Specific Semantic Deficit for Animals: A Case Study.

Objective: The main goal of the present study was to investigate the pattern of semantic impairment in a patient, FG, a 71 year-old woman, who presented with selective difficulty in recognizing animals.

Participants and Methods: We first carried out a detailed neuropsychological assessment with the aim of evaluating the integrity of FG's cognitive abilities, and to circumscribe the nature of her deficit. She also underwent a high-resolution 3D MRI and a SPEC scan. We then tested her ability to identify and answer different questions about animals and famous people in different modalities (visual, auditory, verbal). Multiple choices were presented when the participant could not respond to the stimulus in free recall. FG's results were compared to those of six healthy age- and education-matched participants.

Results: FG's performances reveal an important deficit for animals throughout all modalities, suggesting a genuine semantic impairment. All of her performances for animals were well below the performance of controls and even near chance level. Her deficit also extended to some fruits and vegetables she could not recognize, but did not affect any other category of objects (ex.: clothes, tools, etc.). Interestingly, FG's ability to recognize faces of famous persons was normal, although she presented difficulties recognizing famous persons via their voices and in the free recall of famous people's names or other kind of specific information.

Conclusions: Results are discussed in the context of FG's global profile and several hypotheses relative to the organization of semantic memory are proposed and explored.

Correspondence: *Magalie Loiseau, Université de Montréal, 8325, rue St-Gérard, Montréal, QC H2P 2E1, Canada. E-mail: magalie.loiseau@umontreal.ca*

A. MIDORIKAWA & M. KAWAMURA. Cognitive Functions of a Patient with Fronto-temporal Dementia (FTD) having Superior Painting Skills is similar to that of Autistic Savant Syndrome.

Objective: Some patients with fronto-temporal dementia (FTD) show superior abilities such as painting or composing even after the onset of the disease and these abilities have been considered as "acquired" savant syndrome. In this report, we presented a case of FTD who developed a painting skill after the onset of the disease and have discussed cognitive similarities between acquired and autistic savant.

Participants and Methods: The subject was a 53-year-old, right-handed woman. At the age of 49, she noticed having difficulty recalling the names of certain objects. Neuropsychological examination showed a marked deficit in verbal function, namely Gogi (word meaning) aphasia. MR images showed marked atrophy in the left temporal lobe.

She developed drawing behavior after the onset of FTD, despite not having been artists or having any interest in drawing before the illness. In this study, we examined following three respects which were reported as characteristics of autistic savant syndrome. 1)Painting style. 2)Subscales of the Wechsler intelligence scales. 3)Process of assembling a jigsaw puzzle.

Results: 1) The pictures drawn by her were realistic as opposed to abstract in character. In other words, her paintings were of a "slavish" style, depending on vivid imagery of objects. She painted details of the objects, such as veins on a leaf. 2) In the WAIS-R, she showed good scores on the Block Design subscales (12 point) whereas; bad scores on the Comprehension subscale (1 point). 3) She assembled a jigsaw puzzle quickly and showed low error rate even when comparing with young healthy subjects. She could also make the puzzle without any reference.

Conclusions: Above mentioned three items were known as characteristics of autistic savant, especially gifted in painting. In the literature, it has been documented that patients with semantic dementia or Gogi (word meaning) aphasia even within FTD patients, show three tendencies. Therefore semantic (or word meaning) deficit might be crucial to having a tendency to use local processing.

Correspondence: *Akira Midorikawa, Ph.D., Chuo University, 742-1, Higashi-Nakano, Hachioji 192-0393, Japan. E-mail: green@tamacc.chuo-u.ac.jp*

P.S. QUINLAN, A. NORDLUND & D.R. GUSTAFSON. Inverse Relationship between Triiodothyronine and Cognition in MCI.

Objective: Given the important role of thyroid hormones (TH) in cognitive function, neurogenesis, human metabolism and potentially dementia pathology, it is important to evaluate this association against the background of a variety of metabolic factors and traditional CSF markers of dementia in Mild Cognitive Impairment (MCI).

Participants and Methods: In 43 euthyroid MCI patients, serum levels of TSH, total T4, free T4, total T3, and insulin and CSF levels of beta-amyloid 42, total-tau, and phospho-tau were measured. Body mass index and waist-to-hip ratio were calculated. Each participant underwent a comprehensive neuropsychological test battery, consisting of 20 tests covering the cognitive domains speed/attention, memory, visuospatial functions, language and executive functions. A composite cognitive score was calculated.

A linear regression model adjusted for age, sex, education, and APOE ϵ 4 was used to evaluate the relationship between thyroid hormones and cognitive function.

Results: T3 was independently inversely related to cognitive function in fully adjusted models. The addition of CSF biomarkers and other metabolic parameters did not alter the association between T3 and cognitive function, nor did they contribute to the model. Test performance across all cognitive domains was inversely associated with T3. In particular, episodic memory, executive and visuospatial function decreased with increasing T3 levels.

Conclusions: These findings suggest a unique relation between T3 and cognition in MCI, associated with a neuropsychological profile typical of prodromal Alzheimer's disease. While mechanisms remain unclear, the association between TH levels and cognition in a condition often preceding dementia, requires further exploration.

Correspondence: *Patrick S. Quinlan, Institute of Neuroscience and Physiology, University of Gothenburg, Wallingsatan 6, Gothenburg 43141, Sweden. E-mail: patrick.quinlan@neuro.gu.se*

J. SUBIRANA MIRETE, O. BRUNA, M. PUYUELO, C. VIRGILI & E.H. WIIG. Assessment of Processing Speed and Executive Functions performance when discriminating between Mild Cognitive Impairment and Dementia States.

Objective: In everyday clinical practice, cognitive impairment is usually assessed with neuropsychological batteries to demonstrate decline in cognitive functions in order to distinguish between mild cognitive impairment and dementia states. However, sometimes these assessments take too much time and are not enough sensitive. In the present study, processing speed and executive functions were evaluated to determine the effectiveness to discriminate between patients with Mild Cognitive Impairment (MCI) from those with diagnosis of dementia.

Participants and Methods: Executive functions and perceptual and cognitive speed were evaluated in 86 cognitive impaired outpatients with MCI or Dementia. A control group composed by 25 normal subjects was also assessed. All patients were classified into groups according to Petersen's MCI criteria (MCI Group) or DSM-IV-TR and NINDS-ADRDA criteria for dementia (Alzheimer's Disease/Vascular Disease). Executive functions assessment included tests to evaluate verbal fluency (FAS), Similarities and Digit Backwards (WAIS) and Rhythms (Luria's Neuropsychological Assessment). Perceptual and cognitive speed was assessed with A Quick Test of Cognitive Speed (AQT) and Mini-Mental Status Examination (MMSE) was also administered as a criterion to evaluate general impairment.

Results: The findings support that, although executive functions measures could discriminate quite sensitively between MCI and Dementia groups ($F=3,175$; $p<.05$), perceptual and cognitive speed measures were remarkably more sensitive to these changes ($F=-52,676$; $p<.001$). In general, these neuropsychological tests tended to be more sensitive to discriminate AD patients from MCI subjects than in vascular disease group.

Conclusions: The results of the present study should that tests measuring perceptual and cognitive speed and executive function should be used for first-line or complementary screening for progressive cognitive impairment.

Correspondence: *Judit Subirana Mirete, Master in Clinical Psychology, Ramon Llull University - Faculty of Psychology, C/Valencia, 536, 1st 3rd, Barcelona 08013, Spain. E-mail: juditsm@blanquerna.url.edu*

R. YU, T. CHENG, Y. CHU, C. YANG, F. CHU, M. CHIU & M. HUA. Neuropsychological Features of Two Patient Cases with Posterior Cortical Atrophy.

Objective: Posterior cortical atrophy (PCA) is a relatively rare neurobehavioral syndrome characterized by an early onset of prominent complex visual disturbances with relatively preserved memory and language. The principal neuropathology involves posterior cerebral regions including occipitoparietal and occipitotemporal lobes. However, the issue of whether ingredients of Balint's and/or Gerstmann's syndromes are the key neuropsychological features of the PCA has remained indeterminate. This case study was thus to re-examine this subject.

Participants and Methods: Based on Benson's (1988) general diagnostic guideline including an early complaint of visual disturbances with relatively preserved memory and language function, the onset at the age of 50s to early 60s with an insidious course, and more prominent posterior than anterior cerebral atrophy evident in structure CT or MRI, two patients were diagnosed as probable posterior cortical atrophy by experienced neurologists and included in the study. Each patient received a comprehensive neuropsychological test battery including orientation, intelligence, learning and memory, attention, core linguistic function, visual perception, visuospatial reasoning, praxis, psychomotor speed, and emotional status.

Results: These patients exhibited a significant deterioration of performance intellectual functioning, spatial perceptual dysfunction, constructional apraxia, and environmental disorientation. In addition, one patient displayed ocular apraxia, optic ataxia, simultanagnosia, right-left disorientation, agraphia, acalculia, finger agnosia, and dressing apraxia while another evidenced simultanagnosia and prosopagnosia.

Conclusions: Based on the present results, it appears that an inclusion of elements of Balint's instead of Gerstmann's syndrome in the core diagnostic criteria for PCA, claimed by Mendez and colleagues (2002) would be cogent. However, further investigation on a large scale is needed. Correspondence: *Mau-Sun Hua, Ph.D., Psychology, National Taiwan University, Dept. of Psychology, National Taiwan University, #1, Sec. 4, Roosevelt Rd., Taipei 106, Taiwan. E-mail: huams@ntu.edu.tw*

S. BATISTELA, B. BALDIVIA, M.G. ROCHA, S.D. BRUCKI & O.F. BUENO. Relationship between Switching On Semantic Verbal Fluency and Working Memory on Parkinson Disease Patients and Healthy Elderly.

Objective: To verify if switching on semantic verbal fluency task is related to working memory in Parkinson Disease patients with (PD-D) and without dementia (PD) groups in comparison to healthy elderly control group

Participants and Methods: Fifteen patients PD-D, twenty one patients DP matched by age and schooling to nineteen healthy subjects, had their performance on semantic verbal fluency task (animal category), Corsi and Digit backward span compared. Troyer's (1998) criteria were used to classify animal's categories. Switches generated were used as scores of executive function. Groups performance were compared by ANOVA.

Results: Groups had no difference on age, but PD-D group had less years of schooling and lower score on MMSE ($p<0.000$), so years of schooling were used as covariate on ANCOVA analyses. On fluency verbal task PD-D group did less switching ($p<0.001$) and also had lower performance on Corsi ($p<0.007$) and Digit ($p<0.02$) backward span in comparison to others. No difference between healthy subjects and PD group was observed for any task.

Conclusions: PD-D had significantly lower scores of switching, Corsi and Digit backward span in comparison to others groups, suggesting that semantic verbal fluency and working memory are impaired on PD-D. Moreover, it may indicate that semantic integration is related to working memory tasks and could be considerate a measure of executive functions impairment on PD-D.

Correspondence: *Beatriz Baldivia, UNIFESP, tres rios, 95 p 43, Sao Paulo 01123001, Brazil. E-mail: biabaldivia@yahoo.com.br*

Cognitive Neuroscience

G.E. GINANI, O.A. BUENO, S. TUFIK & S. POMPÉIA. Relationship between Mood and Cognitive Effects of Acute Doses of Donepezil in Young Healthy Volunteers.

Objective: Improvements in mood and cognitive performance after chronic administration of donepezil have been reported, but their interaction has been largely ignored. We hypothesized that the acute effects of donepezil would improve attention and mood in healthy volunteers, indicating a strong relation between them.

Participants and Methods: We conducted a double-blind, placebo controlled independent groups design study including 36 young, healthy, male volunteers. Subjects were randomly assigned to one of three oral treatments: placebo, donepezil (5 mg) and donepezil (7.5 mg). Testing included the Psychomotor Vigilance test (PVT) and a visual-analogue mood scale (VAMS). Data was analysed using analysis of variance (ANOVAs) followed by Tukey HSD tests and the level of significance adopted was $p < 0.05$.

Results: Differences were found among treatments in the following VAMS scales: energetic, quick-witted, proficient, relaxed and gregarious. In all scales the 5 mg dose improved whereas the 7.5 mg worsened mood. A different pattern of results was found for the PVT. The 7.5 mg dose improved attention [minimum reaction times and measures of sustained attention (percentage of change and Slope RRT)] in relation to placebo, the 5 mg having had intermediate effects (all p values < 0.05).

Conclusions: Cognitive and mood effects of acute doses of donepezil do not show the same pattern of results, so improvement in cognition after ingestion of this drug cannot be attributed to changes in mood.

Correspondence: *Giuliano E. Ginani, MSc, Psicobiologia, UNIFESP, Rua Napoleão de Barros, 925, São Paulo 04024-002, Brazil. E-mail: giuliano.ginani@gmail.com*

S.S. ARAÚJO, L. FAISCA, K.M. PETERSSON & A. REIS. Visual Processing Factors Contribute to Object Naming Difficulties in Dyslectic Readers.

Objective: Despite robust evidences for an object naming deficit in dyslectic readers, the precise nature of this deficit remains unclear. The dominant theoretical position claims that naming problems result from phonological processing difficulties. However, recent findings suggest that a visual impairment, possibly engaging early stages of visual processing, might contribute to a poorer naming performance. The present study investigated this possibility by assessing to which extent dyslexics were affected by experimental manipulation of color and dimensionality of visually presented objects in a naming task.

Participants and Methods: Eighteen dyslexic children and two control groups with twenty participants each were tested (age-matched controls; reading-matched controls) in a visual object naming task. The object attributes were manipulated in three experimental conditions: 2D representations of objects were presented in color; in black and white (B&W); and as 3D real objects.

Results: The results showed that the dyslectic group responded slower compared to the control groups. A significant interaction was also observed between group and condition - controls showed longer response latencies for B&W and real objects, while dyslectic readers were not affected by the experimental manipulations. Between-group comparisons further revealed that the naming difficulties observed in the dyslexics were more pronounced in the 2D color condition.

Conclusions: The dyslectic readers were not sensitive to the experimental manipulations, while controls were affected by this manipulation of the stimulus features, benefiting from surface colour information. This pattern of results suggest that factors related to visual processing might, in addition to phonological factors, contribute to the object naming deficits observed in dyslexia.

Correspondence: *Susana S. Araújo, degree, Department of Psychology, University of Algarve, Departamento de Psicologia, Faculdade de Ciências Humanas e Sociais, Campus de Gambelas, Faro S000, Portugal. E-mail: smaraujo@ualg.pt*

I. BRAMÃO, L. FAÍSCA, C. FORKSTAM, F. INÁCIO, K. PETERSSON & A. REIS. Interaction between perceptual color and color knowledge information in object recognition: Behavioral and electrophysiological evidence.

Objective: In this study we combined event-related EEG techniques with standardized low-resolution brain electromagnetic tomography to investigate the relative influence of perceptual and knowledge information in object recognition.

Participants and Methods: We constructed two color object verification tasks – a perceptual and a knowledge verification task – using high diagnostic color objects where both typical and atypical color versions of the same object were presented. Continuous EEG was recorded in 25 participants. We explored the differences between the ERPs elicited by typical and atypical color objects (between 100ms and 600ms after stimulus onset) in each color verification task using a cluster randomization procedure.

Results: In the color knowledge task we found significant differences around 200ms, 400ms and 600ms after stimulus onset. The first observed difference indicates the moment where the brain uses the perceptual color information to perform the color knowledge task. By source analysis, posterior and frontal brain regions were identified as being possible generators of this difference. At 400ms after stimulus onset we observed a N400-like effect, indicating the involvement of semantics in color processing information. The differences observed around 600ms after stimuli onset could reflect reprocessing to check for possible processing errors. In the perceptual color verification task we found no differences concerning color information.

Conclusions: Our results suggest that perceptual color information is engaged and interferes with task performance during color knowledge verification; in contrast, we found no use of color knowledge in the perceptual color verification task. Thus, it seems that perceptual color information plays a more significant role in object recognition compared to prior color knowledge.

Correspondence: *Inês Bramão, Universidade do Algarve, Faculdade de Ciências Humanas e Sociais, Campus de Gambelas, Universidade do Algarve, Faro S005-139, Portugal. E-mail: mibramao@ualg.pt*

S. CASTRO & S. SILVA. The perception of musical phrases by musicians.

Objective: What are the mechanisms involved in the perception of musical phrases? We examined Event-Related Potentials (ERPs) and event-related power changes in the electroencephalogram of musicians who listened to melodies comprising two musical phrases, that were either separated by a silent pause or by filling tones.

Participants and Methods: Twelve professional musicians listened to 100 melodies. Half had a pause at the end of the first phrase; in the other half, the pause was replaced by tones. Participants were asked to detect an out-of-key note while electroencephalographic activity was recorded (32-channels).

Results: In melodies containing a pause, the onset of the second phrase evoked a positive ERP peak ranging from 400 to 700 ms post-onset and an alpha band (8-12 Hz) increase in power. In melodies without a pause, there was no peak, and an alpha band decrease was observed; at the offset of the first phrase the filling tones elicited a theta band (4-7 Hz) increase.

Conclusions: ERPs after the pause match the Closure Positive Shift (CPS) component that has been reported in other studies. Time-frequency responses suggest that the absence of pauses at the end of phrases violates the listener's expectation and increases cognitive activation, whereas power changes in phrases followed by pauses might reveal cognitive idling. This is consistent with the hypothesis that the CPS reflects a redirection of the focus of attention from one phrase to the next.

Correspondence: *Sao Luis Castro, University of Porto, rua Doutor Manuel Pereira Silva, Porto 4200-392, Portugal. E-mail: slcastro@kqnet.pt*

L. NAHUM, D. GABRIEL & A. SCHNIDER. The Value of Nothing: Behavioral Relevance Determines the Processing of Negative Prediction Errors.

Objective: Integration of the absence of anticipated outcomes is crucial for adaptive behavior. Patients failing in this capacity risk confusing reality; they are disoriented and act according to currently irrelevant memories (behaviorally spontaneous confabulation). The psychological determinants of this capacity are poorly understood. Animal and human studies demonstrated that absence of anticipated outcomes activates the orbitofrontal cortex (OFC) and induces specific modulation of early electrocortical activity. In the present study, we used high-resolution evoked potentials to explore whether this modulation of brain activity depended on the sole absence of the anticipated reward or on the need to adapt behavior.

Participants and Methods: Healthy subjects had to predict behind which one of two colored rectangles a "game" was hidden. If they chose the "correct" side, there was a high chance that they would get some money. On some trials, however, the outcome indicated that they received nothing. There were two such conditions: either there was simply no reward, or there was no reward because the "game" had switched to the alternative rectangle, necessitating behavioural adaptation on the next trial.

Results: We found that behaviourally relevant absence of the expected reward induced specific electrical field topographies between 200-285 ms and 485-630 ms compared to the other conditions. Source localization indicated that this condition activated a larger fronto-limbic network involving the OFC in these time windows.

Conclusions: The study demonstrates that negative prediction errors are processed differently depending on whether they have behavioral relevance or not.

Correspondence: *Louis Nahum, Msc, Clinical Neurosciences, Geneva University Hospitals, 26 Avenue de Beau-Séjour, Geneva 1211, Switzerland. E-mail: louis.nahum@hcuge.ch*

A. PACHECO, S. ARAÚJO, L. FAÍSCA, K.M. PETERSSON & A. REIS. Profiling Dyslexic Children: Phonology and Visual Naming Skills.

Objective: In the latest years, a number of studies have suggested that reading failure and visual naming difficulties shown by dyslexic population are explained by a common deficit in the phonological processing system. However, more recently, Wolf and Bowers (1999) proposed a competing approach, the Double-Deficit hypothesis, which suggests that phonological impairments and the processes underlying naming deficits contribute independently to reading dysfunction, leading to different dyslexic subtypes. Having this hypothesis as a background, we explored different profiles in Portuguese dyslexic children and examined whether the predictive roles of phonological awareness and rapid naming skills to reading and orthographic abilities vary as a function of reading group (dyslexics vs. normal readers).

Participants and Methods: We compared twenty dyslexic children with an age-matched control group in reading, orthographic, rapid naming and phonological processing tasks.

Results: Our results shown that 20% of dyslexics were characterized by a double-deficit, 35% had a single naming-deficit and 35% had a single phonological-deficit. For dyslexics, only rapid naming predicts reading skills; while orthographic performance is not explained by any predictor. For normal readers only the phonological measure reached significance both for reading and orthographic skills.

Conclusions: Overall, our results support the independent contribution of phonological and naming measures to reading and orthographic variance and make unlikely that naming deficits in dyslexia are explained exclusively by a phonological impairment.

Correspondence: *Andreia Pacheco, Clinical Psychology, Psychology (FCHS), University of the Algarve, Campus de Gambelas, Faro 8005-139, Portugal. E-mail: aspacheco@ualg.pt*

K. SUZUKI, Y. NISHIO, K. KOKUBO, M. TAKAGI & E. MORI. Contribution of the Left Retrosplenial Region to Human Navigation.

Objective: The clinical studies indicated retrosplenial involvement in human navigation. Most cases with topographical disorientation were

related to damage to the right retrosplenial cortex. Only two patients with the left retrosplenial lesions were reported to have deficits in navigation. In contrast, the majority of functional neuroimaging studies involving navigation in large-scale space activate the bilateral retrosplenial cortex. We report five patients with topographical disorientation following damage to the left retrosplenial cortex.

Participants and Methods: Five right-handed men with way-finding difficulty following stroke (3 patients with infarction and 2 patients with haemorrhage) were examined systematically.

Results: They could recognize the landmarks in their neighbourhoods and retained a sense of familiarity. But they could not use the preserved recognition of landmarks in order to proceed and did not know which direction to take. Drawing maps of familiar places and showing direction of a particular place were also difficult. These features were not different from those in patients of topographical disorientation following the right retrosplenial lesions. Neuropsychological examinations also demonstrated mild anomia or amnesia predominantly for verbal materials, which indicated language dominant side on the left. Lesions were restricted to the left retrosplenial region and forceps major in two patients and were extended to the medial occipital lobe in three. Although the deficit improved gradually and main topographical deficit had resolved in daily living, detailed testing revealed residual deficits even after several months of onset.

Conclusions: Our findings indicated that not only the right but also the left retrosplenial region contributes greatly to human navigation.

Correspondence: *Kyoko Suzuki, MD, PhD, Yamagata University School of Medicine, 2-2-2 Iidanishi, Yamagata 990-9585, Japan. E-mail: kyon@med.id.yamagata-u.ac.jp*

J. VAN DIJCK, W. GEVERS, C. LAFOSSE & W. FIAS. The Internal Structure of Number Space.

Objective: Several psychophysical investigations have suggested that the mental representation of numbers takes the shape of a number line on which magnitude is positioned in ascending order. Expanding these evidences, pathological rightward deviations in the bisection of number intervals due to right brain damage, are generally interpreted as originating from a purely spatial-attentional deficit in the processing of the left side of number intervals. Recently however, the universality of this interpretation has been questioned by the observation of several double dissociations between tasks that were considered to tap on the same underlying mental representation. The aim of the present study was to unravel the exact relation between the different task and effects that were used as evidence for the spatial representation of numerical magnitude.

Participants and Methods: A group of right brain damaged patients (nine with and five without neglect) and twelve healthy controls were subjected to physical line bisection, bell cancellation, number interval bisection, parity judgment and magnitude comparison.

Results: After replicating all previously reported effect in patients and healthy controls, all data was entered into a principal component analysis which extracted three orthogonal components.

Conclusions: We discuss that this three component structure captures the dissociations reported in literature and argue that the interactions between numbers and space are richer than originally thought.

Correspondence: *Jean-Philippe van Dijck, Experimental Psychology, Ghent University, H. Dunantlaan 2, Ghent 9000, Belgium. E-mail: jeanphilippe.vandijck@ugent.be*

M. BALCONI & E. SANTUCCI. The Role of Dorsal Stream for Motor Imagery Process. An ERP Analysis.

Objective: It has been argued that cortical motor system is shaped of many anatomical and functional distinctive sites (Rizzolatti, Luppino, 2001). Posterior parietal region is fundamental for sensory-motor transformations oriented to action's execution: this assumption has to envisage the role of dorsal stream which is involved in the analysis of visual movement and monitoring of action.

This work has analyzed the relation between motor imagery process (MI) and motor representation which is essential for our action and analysable by the former (Jeannerod, 1994). We used a MI task which entailed the production of mental motor images of everyday acts shared according to the part of the body involved in the execution.

Participants and Methods: 25 subjects were tested by using an ERP procedure. We thought of an epoch of 400 ms (-100/300) in order to probe late movement-related cortical potentials and cognitive components of MI.

Results: ERP variations were submitted to repeated measures analysis of variance. ANOVA showed a pre-motion positivity (PMP) localized within the fronto-central sites and a negative motor potential (MP) prior to the onset, with its maximum over the occipital areas. Besides, we found a negative peak at about 100 msec after the onset, more localized within parieto-occipital sites and a positive deflection at about 285 ms after the onset, with its maximum over the fronto-central areas.

Conclusions: The results were read in the light of spatial representation systems of the action and taking into account the role of frontal and parietal lobes for the generation, maintenance and modification of mental motor images.

Correspondence: *Michela Balconi, Ph.D., Psychology, Catholic University of Milan, L.go Gemelli, 1, Milan 20123, Italy. E-mail: michela.balconi@unicatt.it*

Electrophysiology/EEG/ERP

M. BALCONI & D. CRIVELLI. Observing, Imitating and Executing: An Electrophysiological Investigation of Acting and Inter-acting Processes.

Objective: Action and inter-action imply the relation with non-biological entities, like objects and tools, or biological ones, as human beings. Both of them detain a primal position in our life, they foster the creation of social relations and the development of mental representations. The aim of this study is to explore, by using ERP analysis, the processes involved in action and inter-action pianification and intentional attribution during observation, imitation and execution of acts towards objects (BIO-nonBIO condition) or with other human agents (BIO-BIO condition).

Participants and Methods: EEG signal has been recorded to 13 subjects, filtered and then reduced by ERP procedure. The data have been analysed by repeated measures analysis of variance (ANOVA) with a 3x2x5x2 model (TASKxCONDITIONxSITExSIDE).

Results: Firstly, morphological analysis showed a negative deflection, Readiness Potential, foregoing the movement onset. Secondly, the phenomenon arises about 500 ms before the action and it is mainly localized on parieto-temporal areas. Moreover it is ampler in the execution task and for BIO-BIO condition.

Conclusions: These results have been read at the light of recent theories related to action planning and intention regulation. ERPs responses were related to motor task even if crosswise active and, interestingly, in case of inter-actions between human agents. The spatio-temporal distribution has been evaluated considering the neuroanatomical network involved.

Correspondence: *Michela Balconi, Ph.D., Psychology, Catholic University of Milan, L.go Gemelli, 1, Milan 20123, Italy. E-mail: michela.balconi@unicatt.it*

M. BALCONI & E. BRAMBILLA. Neuropsychological and Cognitive Correlates in Tourette Syndrome. The Inhibitory Process Hypothesis.

Objective: Tourette Syndrome involves involuntary movements known as tics, which can enable the subject to make good performances in cognitive tasks. Spatial memory and selective attention appear to be impaired in subjects with TS, as revealed by behavioural and ERP correlates. The present study intends to explore the cognitive and neuropsychological performance of a patient with TS.

Participants and Methods: Two cognitive tasks (Spatial Memory and Stroop Test) have been presented to a female subject with Tourette Syndrome. Plus category, during the registration of psychophysiological parameters (autonomic measures) and EEG profile (ERP procedure). Behavioral (correct responses), psychophysiological (EDA, Blood Pressure, Heart Rate), and EEG indexes (ERP effects) were monitored during the two task execution.

Results: The subject has shown an adequate level of behavioural performances, as well as a functional arousal response related to the cognitive tasks. Nevertheless, the first phase of Spatial Memory task (coding) elicited an increased frontal P300a and a parietal P300b effect, while the second phase (response behaviour) activated N200 peak deflection higher on the parietal sites. Secondly, Stroop elicited a higher N200 peak in response to congruous targets within the parietal and occipital sites.

Conclusions: These results are compatible with the inhibitory hypothesis, which states the presence of a iper-functional control adopted by the subjects in order to check for the tic behaviour. Moreover, according to previous works (Smith, 2004; Johannes, 2003) attentive task could have activated an inhibitory process triggered by that TS patients, finalized to have a good performance.

Correspondence: *Michela Balconi, Ph.D., Psychology, Catholic University of Milan, L.go Gemelli, 1, Milan 20123, Italy. E-mail: michela.balconi@unicatt.it*

L. ANDERSSON, P. SANDBERG, J. OLOFSSON & S. NORDIN. Attending sight, sound and smell.

Objective: A common notion is that attention is highly similar across sensory modalities. Thalamic areas have previously been reported to play a large role in attentive modulation of sensory information. Olfactory sensory information is however not gated by thalamus, and attention to smells may therefore differ from other senses.

Participants and Methods: Event-related potentials were recorded from 28 participants (14 f) using intensity-matched olfactory, visual and auditory stimuli under different attention conditions (sensory information relevant to the current task, irrelevant, or distracting to a parallel working memory task).

Results: No attention effects were found on the sensory N1 component. The P2 component, suggested to reflect stimulus classification, was diminished in all modalities as an effect of reduced attention. The P3 component, reflecting context-updating, was reduced in vision and olfaction when stimuli were irrelevant or distracting, whereas no attentional P3 attenuation was found for auditory stimuli.

Conclusions: These results suggest that olfactory information can be modulated in a way that is similar to visual attention. Moreover, it seems that olfactory and visual stimuli, at least at a later stage of processing, can be suppressed to a greater extent than auditory stimuli.

Correspondence: *Linus Andersson, MSc, Department of Psychology, Umeå Universitet, Institutionen för psykologi, 901 87 Umeå, Umeå 901 87, Sweden. E-mail: linus.andersson@psy.umu.se*

J. SIMOLA, K. HOLMQUIST & M. LINDGREN. Right Visual Field Advantage in Parafoveal Processing: Evidence from Eye-Fixation Related Potentials.

Objective: In reading, both foveal (currently fixated) and parafoveal words (outside the current eye fixation) are important. Having only the fixated word available slows reading, but when the next word is available, reading is almost as fast as when the whole line is seen. Prior studies have also shown that words presented to the right visual field (RVF) are processed faster and more accurately than words in the left visual field (LVF). This asymmetry results either from an attentional bias, reading direction or the asymmetry of the hemispheres for language processing. The current experiment investigated visual field differences in parafoveal information extraction.

Participants and Methods: We measured eye-fixation-related potentials (EFRP), a technique that combines eye-tracking and electroencephalography (EEG), from 22 right-handed participants. After a central fixation, a prime word appeared in the middle of the screen together

with a parafoveal target that was presented either to the LVF or to the RVF. Both hemifield presentations included three semantic conditions: the words were either semantically associated, non-associated, or the target was a non-word. The participants began reading from the prime and proceeded by making a saccade towards the target, subsequently they made a semantic association judgement.

Results: Between 200 – 280 ms from the fixation onset, an occipital P2 EFRP-component differentiated between parafoveal word and non-word stimuli. The effect was obtained only when the parafoveal word was presented in the RVF.

Conclusions: This result suggested that a low-level perceptual learning at reading from left to right likely affects the extraction of parafoveal information.

Correspondence: *Jaana Simola, MSc, Department of Psychology, University of Helsinki, Siltavuorenpenger 20 D, Helsinki 00014, Finland. E-mail: jaana.simola@helsinki.fi*

V. VAITSES, F. KLIEMANN & R. RODRIGUES. Relationship between Performance of Visual Memory and Global Field Synchronization of EEG in children with Learning Disabilities.

Objective: The global field synchronization of EEG (GFS) is a neurophysiological index that expresses the degree of connectivity of neural networks involved in a given cognitive processing. This synchronization refers to the electrical fields generated by brain activity. The duration and electrical field configuration in space is called a "microstate" (Koenig, 1999), and it is proposed that it coincides with the minimum unit of cognitive processing. Rey Complex Figure (RCF) expresses visual organization and visual memory. It can be used by copying or through the reproduction by memory (Lezak, 1995). In reproduction by memory, visual attention and memory are observed in addition to visuo-spatial organization. This study aimed to verify the main hypothesis that a better score in the realization of a cognitive task, corresponds to a greater functional connectivity, as is expressed by GFS.

Participants and Methods: 65 patients aged 7, 8 and 9 underwent electroencephalographic recording during drawing Rey picture by memory. We confronted the results obtained in the RCF and rate in GFS in alpha and theta band. This index was obtained from analysis software developed and provided by Koenig (<http://www.puk.unibe.ch>).

Results: The statistic method was Pearson correlation index. None of the results achieved 0.5.

Conclusions: No correlation was found between the performance in the cognitive neuropsychological test complex figure recall and global field synchronization in the EEG.

Correspondence: *Vivian Vaitses, neuro sapiens, Pça Dom Feliciano 78/607, Porto Alegre 90020-160, Brazil. E-mail: vivian.vaitses@ufgrs.br*

Genetics/Genetic Disorders

J. EGGER, W. VERHOEVEN, E. WINGBERMUHLE & H. DE MEY. Neuropsychology and Genetics: Probabilistic Models and the Endophenotype Strategy.

Objective: Clustering of symptoms and behaviours (such as intellectual disability, somatic anomalies, neurodevelopmental characteristics, and psychiatric signs) that are associated with genetic syndromes, is sometimes referred to as the "endophenotype strategy" and is assumed to facilitate better understanding of the syndrome. Endophenotyping is highly similar to notions in trait psychology. In this tradition, psychiatric syndromes have been hypothesized as extreme positions on an underlying structure of dimensional traits applying both to the normal and the disordered.

Participants and Methods: Although trait models generated many fruitful research lines, they show limited predictive capacities, especially when used for classification purposes. This may be due to the fact that the basis of trait-research, the factor-analytic method, is not the method of choice when non-linear relations between traits and syndrome-classifications are to be expected.

Results: To re-orient the phenotype methodology toward a probabilistic approach, the use of multiple classification latent class analysis (MCLCA) is advocated (Maris, 1999). In MCLCA, a phenotype is considered as a set of hypothetical abstractions or components (e.g., OCD-like symptoms, motor abnormalities, social dysfunctions) that are constituted by various features (e.g., overeating, skin-picking, ruminating). The linkage between the features and the components can be quantified in terms of cue validity (the level to which the features contribute to the different components, i.e., the conditional probability that, given a component, the feature is present).

Conclusions: Consequently, the likelihood of the presence of a behavioural phenotype can be estimated and a possible connection with genetic abnormalities or a genetic subtype can be investigated.

Correspondence: *Jos Egger, PhD, Behavioural Science Institute, Radboud University Nijmegen, P.O. Box 9104, Nijmegen 6500 HE, Netherlands. E-mail: j.egger@psych.ru.nl*

C.B. MELLO, S. BOER, C.E. MELO, T.S. RIVERO, S.A. BOLOGNANI, V.F. MELONI, D. BRUNONI, M. MUSZKAT & O.A. BUENO. Variability in Clinical, Neuropsychological and Behavioral Phenotype In Ring Chromosome 14 Syndrome - Report of Two Brazilian Cases.

Objective: Neuropsychological assessment is an important tool for a better understanding of neurocognitive variability among individuals with chromosome abnormalities. In this study we report clinical, neuropsychological and behavioral findings in two Brazilian patients with Ring chromosome 14 syndrome.

Participants and Methods: Patient 1 is a 12 year-old boy and a patient 2 is a 23 year-old male. Genetic analysis included clinical evaluation and molecular/cytogenetic studies with GTG-banded chromosomes and FISH using Alpha satellite probe specific for chromosome 14 according to standard protocols. Neuropsychological assessment included intellectual scales (WISC-III; WAIS-III) and measures of executive functions (WCST), working memory (digit span; Corsi Block Test), visuospatial (copy of the Complex Figure of Rey), attention (Continuous Performance Test) and language skills (verbal fluency, naming tests). A z-score allowed comparing patients' performance to age-matched controls. Behavioral assessment was based on inventories such as the CBCL.

Results: Clinical phenotypical similarities between patients included early incidence of epileptic seizures, short stature and mild mental retardation. In neuropsychological assessment, visuospatial, memory, and executive impairments were detected in both patients, as well as a behavioral feature characterized by high sociability. Conversely, Case 2 presented better language and attentional skills than Case 1.

Conclusions: The differences in neuropsychological performance identified in these two patients suggest that, in Ring chromosome 14 syndrome, independent of the presence of mental retardation, some neurocognitive functions remain stable throughout development while other may change with age. Results indicate that behavioral and neuropsychological assessment may contribute to a better understanding about within-individual expressions of the neurocognitive phenotype in chromosome abnormalities. Correspondence: *Claudia B. Mello, PhD, Psychobiology, Universidade Federal de Sao Paulo, Rua Embau, 54, Sao Paulo 04039-060, Brazil. E-mail: cberlim@ib.usp.br*

K. WINGEIER, S. STROZZI, R. KREIS, E. GIGER, S. GALLATI, B. CONRAD & M. STEINLIN. Heterogeneous Cognitive Abilities in Boys Suffering from Duchenne Muscular Dystrophy.

Objective: Duchenne muscular dystrophy (DMD) has long been recognized as a cause of mental retardation. However, there is tremendous individual variation in intellectual functioning across affected boys. Therefore, a comprehensive neuropsychological assessment has been conducted to emphasize possible cognitive impairments among these patients. Moreover, a genetic evaluation has been accomplished to detect individual gene deletions.

Participants and Methods: Besides general intellectual abilities a broad range of neuropsychological functions were tested in sixteen boys with

diagnosed DMD. The battery included tests to assess skills in the following domains: Information processing speed, various aspects of attention/distractibility, perception, verbal/auditory and visuo-spatial performances, arithmetic/mathematics, executive functions, verbal fluency and memory skills. The performance of the DMD group was then contrasted with normative data of healthy boys and related to individual gene deletions.

Results: In the present cross-section study cognitive impairments of boys suffering from DMD neither correlated with age nor with the stage of the muscle disease. General cognitive abilities showed a mean IQ of 86 with broad individual variation (IQ between 52 and 120). Most patients performed poorly on specific attention tasks, arithmetic and in particular digit span tests.

Conclusions: In regard to these findings, we conclude that verbal short-term memory is most likely impaired in patients suffering from DMD. Nevertheless, it has to be stressed that an extensive range of intellectual abilities with individual cognitive strengths and weaknesses seems to characterize DMD, making it probable that specific dystrophin isoforms have different impacts on brain functions.

Correspondence: *Kevin Wingeier, MSc, Department of Pediatric Neurology and Neuropsychology, University Children's Hospital, Postfach, Bern 3010, Switzerland. E-mail: kevin.wingeier@insel.ch*

Hemispheric Asymmetry/Laterality

J.M. LUST, R.H. GEUZE, T. GROOTHUIS, C. VAN DE BEEK, P.T. COHEN-KETTENIS & A. BOUMA. **Sex Specific Effect of Prenatal Testosterone on Language Lateralization in Children.**

Objective: Brain lateralization refers to the division of labor between the two hemispheres in controlling a wide array of functions and is remarkably well developed in humans. Human lateralization of handedness and language is most likely under genetic control, but discordant lateralization patterns in monozygotic twins suggests scope for environmentally induced plasticity. The potential role of prenatal testosterone in human lateralization development is the topic of a long ongoing debate. The aim of the present study is to investigate the relation between prenatal testosterone exposure and language lateralization at a later age.

Participants and Methods: Prenatal levels of testosterone were measured in amniotic fluid during the pregnancy (week 15-18) of 54 healthy pregnant mothers. Language lateralization was assessed in their offspring (29 boys, 25 girls) at the age of 6.5 years with a dichotic listening test. Using focused attention conditions, in which the child is instructed to report information from the left ear or the right ear, we were able to differentiate between effects of prenatal testosterone on the left hemisphere itself and effects on interhemispheric connectivity.

Results: Here we demonstrate a clear relationship between prenatal levels of testosterone and language lateralization at the age of 6.5 years. The results revealed that this modulating effect of testosterone on lateralization of language is sex specific, indicating that in girls, higher prenatal testosterone exposure facilitates the left hemisphere language processing, whereas in boys, the data suggest that higher prenatal testosterone exposure reduces the size or the functionality of the corpus callosum.

Conclusions: These findings provide new insight into the mechanisms underlying the epigenetic effect of testosterone on language lateralization. Instead of a single mechanism driven by prenatal testosterone differences between males and females, it appears that testosterone operates through different mechanisms in boys and girls.

Correspondence: *Jessica M. Lust, MSc, Clinical and Developmental Neuropsychology, University of Groningen, Grote Kruisstraat 2/1, Groningen 9712 TS, Netherlands. E-mail: j.m.lust@rug.nl*

V. VILLBERG, E. NISKANEN, M. NISSI, M. KÖNÖNEN, R. VANNINEN, R. KÄLVIÄINEN, E. MERVAALA & M. ÄIKIÄ. **Identification of Language-specific Activated Regions During a Sentence Comprehension fMRI task.**

Objective: The purpose of this study was to determine the pattern of receptive language lateralization with fMRI (functional magnetic reso-

nance imaging). In some previous fMRI studies temporal and parietal areas have responded more strongly to sentences than to single words or word lists. By using an auditory sentence comprehension paradigm, we aimed to engage neural circuits necessary for whole-sentence processing, and to determine whether this activation lateralizes language to the dominant hemisphere.

Participants and Methods: Whole-brain fMRI (1.5 T, echoplanar) was obtained so far from 14 healthy adult subjects (7 males, 7 females, ages 18-59 years) as they performed an auditory sentence comprehension task. The study is still going on. Subjects listened to simple spoken sentences, half of which contained semantic errors (such as nonsense verb associations) and indicated the semantic correctness of the sentences with a button press. As a comparison condition, we used an active tone decision task. The contrast was designed to eliminate activation in pre-linguistic auditory processing systems, general executive systems and motor areas. Tasks were implemented in a simple block design (32 s each, 11 blocks total). Lateralization was quantified by counting activated voxels in each hemisphere for each participant.

Results: This paradigm activated widespread cortical areas on the left hemisphere but predominantly in dorsal prefrontal areas, temporal and temporo-parietal areas. For most of the subjects activation was lateralized strongly to the left. However, according to preliminary lateralization index analysis, there was at least one subject with an abnormal bilateral/ right lateralized activation pattern (which remained approximately the same in a re-test). Detailed analysis of the results will be presented.

Conclusions: This auditory sentence comprehension paradigm was able to localize essential receptive language areas. They were relatively widespread, but distinct from early sensory and motor systems.

Correspondence: *Ville Villberg, Kuopio University Hospital, Taivaanpöntie S B 56, Kuopio 70200, Finland. E-mail: ville.villberg@kuh.fi*

R.K. POWLING. **The Relationship Between Cumulative Formal Music Practice and Cerebral Language Lateralisation.**

Objective: Given the degree of plasticity within the human brain, it is likely that musical experiences influence cerebral organisation. Previous research on this topic has focused on the relationship between language lateralisation and factors such as age at commencement and extent of musical training. Alternative research has investigated the effects of practice on musical achievement, distinguishing between formal (a highly structured, cognitively demanding approach) and informal practice. The current study amalgamated these research domains, investigating the relationship between language lateralisation and type of musical practice. It was hypothesised that participants reporting more lifetime cumulative formal practice would exhibit greater atypical language lateralisation, compared to those reporting less cumulative formal practice.

Participants and Methods: Self-reported musical background and instrumental experiences were retrospectively assessed in a sample of 56 right-handed undergraduates. A dichotic listening task assessed language lateralisation.

Results: Results indicated greater atypical lateralisation in a median-split high cumulative formal practice group, compared to the low cumulative formal practice group; however a factorial ANOVA indicated that this difference was non-significant. Results were similar when formal practice hours were incorporated into a regression model of factors believed to affect musical achievement.

Conclusions: Despite the null result, the importance of practice type should not be ignored in future lateralisation and musicality research. Critical periods during development may have a significant, interactive role in determining when cerebral organisation is most influenced. Future research is outlined to enable more precise investigations into the musical factors, particularly type of instrumental practice, that may influence language lateralisation.

Correspondence: *Rosie K. Powling, Applied Psychology BSc Hons, Neuropsychology, Frenchay Hospital, Frenchay Park Road, Frenchay, Bristol BS16 1LE, United Kingdom. E-mail: rpowling@hotmail.com*

Imaging

R.K. POWLING, C. DOODY, S. SIMBLETT, M. NEWSON, M. LIKEMAN & I. WRIGHT. The Relationship between Language Functions and Cortical Activation during a Covert Verb Generation Paradigm.

Objective: Assessment of language lateralisation and risk of post-surgery language decline are essential aspects of epilepsy surgery decision-making. Recent research has indicated that functional Magnetic Resonance Imaging (fMRI) employing a covert verb generation paradigm is an appropriate procedure for assessing language lateralisation. The covert verb generation paradigm assumes intact language comprehension and expressive language functioning. The aim of this study was to investigate the relationship between these language functions and the ability to engage successfully with the covert verb generation paradigm language task, as indicated by frontal cortical activation during fMRI. It was hypothesised that verbal comprehension and verbal fluency would positively correlate with levels of frontal cortical activation during task engagement.

Participants and Methods: Twenty paediatric and adult participants undergoing investigation for epilepsy surgery participated in the study. The variables of interest were verbal fluency (phonemic and semantic), verbal comprehension (WAIS-III/WISC-IV verbal comprehension index) and task engagement in a covert verb generation paradigm (as indicated by frontal cortical activation).

Results: The results document the relationship between level of verbal comprehension and verbal fluency and corresponding levels of frontal cortical activation during engagement with the covert verb generation paradigm.

Conclusions: The findings are discussed with regard to the limitations of current fMRI protocols in determining language lateralisation. The implications for modification of fMRI procedures for persons with impaired verbal comprehension and verbal fluency are considered.

Correspondence: *Rosie K. Powling, Applied Psychology BSc Hons, Neuropsychology, Frenchay Hospital, Frenchay Park Road, Frenchay, Bristol BS16 1LE, United Kingdom. E-mail: rpowling@hotmail.com*

K. CHOI & J. CHEY. The Role of a Default-Mode Network in Stress Experience in Elderly People with Harm Avoidance Trait.

Objective: Neuroticism has been associated with susceptibility to stress. Harm Avoidance (HA), a trait closely related to neuroticism, could also augment stress experience. In addition, since temperament could be reflected in resting brain metabolism, we explored the relationships between HA and resting brain metabolism especially in a default-mode network (DMN). The DMN includes precuneus, posterior cingulate cortex and medial prefrontal cortex and its resting state activity is known to denote one's alertness and wakefulness. Therefore, we also investigated the mediating effect of the DMN in the relationship between HA and stress experience.

Participants and Methods: We recruited 65 elderly female individuals and assessed their personality with the Temperament and Character Inventory (TCI). We measured the stress individuals were experiencing with the Elders Life Stress Inventory (ELSI). Resting brain metabolism data of forty-five right-handed subjects were acquired through the FDG-PET. Correlation analyses were conducted to examine the associations between HA, resting brain metabolism and stress. Also, using bootstrap method, we examined whether the DMN mediates the relationship between HA and stress.

Results: People with high HA scores exhibited higher brain metabolism in the DMN, especially the precuneus. And they showed higher total stress ratings in ELSI by reporting more stressors. Also, further analysis revealed that the precuneus mediated the association between HA and stress experience.

Conclusions: The results of this study suggest that individuals with high HA scores are more vigilant and this is reflected on the resting state activity in the DMN. Their elevated sensitivities to situations or people seem to cause them to experience more stress in everyday life.

Correspondence: *Kyungin Choi, Master, Neuroscience, Seoul National University, Room M42S, Building No. 16, Seoul 151-742, Korea, South. E-mail: cki1202@snu.ac.kr*

T. HASHIMOTO, S. UMEDA & S. KOJIMA. The Effects of Subliminal Cuing on Prospective Memory.

Objective: We examined the promoting effects of subliminal cuing in prospective memory using functional MRI.

Participants and Methods: Sixteen healthy Japanese (aged 19–29 years) participated. Written informed consent was obtained from each participant. This experiment was conducted in accordance with the Declaration of Helsinki and was approved by the Ethical Committee of the Keio University.

In the MRI scanner, participants were instructed to press the first button if the presented word is identical two trial back, press the second button other than pressing the first button (2-back task) and press the third button if they see the food-representing word (e.g. beef, radish) in priority to the 2-back task.

Subliminal stimuli were presented according to the three conditions. In the prospective cue condition (P), "food" was presented. In the action cue condition (A), "pressing 3" was presented. In the control cue condition (C), "shopping" was presented.

All images were acquired using a 3 T Siemens Symphony MRI scanner. Preprocessing and data analysis were performed using SPM5 software.

Results: Behavioral performance

P showed most accurate performance and A showed fastest RT, however no significant differences were found during ongoing task.

fMRI results

Prospective memory task: P showed greater activities in the left hippocampus, middle cingulate cortex (MCC) and SMA than C. A also showed enhanced activities in MCC and SMA than C. On the contrary, A showed reduced responses in the right amygdala and insula than C. Faster reaction, greater activity in the MCC was observed.

Subliminal cuing effects: During the ongoing task, P showed greater activities in the right caudate than C. Reduced activities were observed in the brain stem in both P and A compared with C. Besides, A showed reduced activities in the anterior medial PFC than C.

Conclusions: Subliminal cuing facilitated prospective memory performance and those neural correlates were observed.

Correspondence: *Teruo Hashimoto, Riken BSI Symbolic Cognitive Development, 2-1 Hirosawa Wako, Saitama 351-0198, Japan. E-mail: t-hashimoto@brain.riken.jp*

J. HASSENSTAB, L.H. SWEET, C.E. FINNERTY, R.C. MULLIGAN, U.S. CLARK, B.A. JERSKEY, S.P. DAVID, R.A. COHEN & R.S. NIAURA. The Effect of Withdrawal on Brain Response to Smoking Cues.

Objective: Cue reactivity (CR) paradigms have been used to elicit craving, assess dependence severity, and predict treatment outcome. Brain response to nicotine-specific CR during withdrawal may yield markers of nicotine dependence and a better understanding of the neural mechanisms involved.

Participants and Methods: We sampled FMRI brain response to a visual cue reactivity challenge among 17 dependent cigarette smokers (ages 28–53 years, 64% female, mean cigarettes per day 17) during a 12-hour overnight abstinence, and again after administration of a transdermal nicotine patch adjusted to smoking level. A block design was presented with four 42s periods of smoking cues alternated with four 42s periods of neutral cues. Region of interest analyses were conducted in two bilateral a priori regions associated with nicotine withdrawal, the nucleus accumbens and the amygdala. Brain response to each cue condition was averaged individually within each ROI for contrasts of nicotine condition.

Results: During withdrawal, nicotine dependent smokers showed a large effect size for cue-related response in the right amygdala [$F(1,16) = 4.25, p = 0.056, \eta^2 = .21$]. In the nucleus accumbens, a large deactivation effect was seen [$F(1,16) = 3.67, p = 0.073, \eta^2 = .19$] when exposed to nicotine cues. This is particularly noteworthy because in the satiation condition, nucleus accumbens demonstrated positive activity.

Conclusions: The nucleus accumbens and amygdala are important in nicotine withdrawal. Our results support previous research that has shown greater amygdala response during negative affective processing. The deactivation of the nucleus accumbens during withdrawal relative to satiation may constitute a mechanism for craving.

Correspondence: *Jason Hassenstab, Ph.D., Butler Hospital TRG, Brown University Medical School, 345 Blackstone Blvd, Providence, RI 02906. E-mail: jasonhassenstab@yahoo.com*

H. KOBAYASHI, K. SEKI, M. FUKUZAKI, M. URANO, Y. HAYAKAWA & M. MIMURA. Effects of subject-performed tasks in memory of action events: a case-control fMRI study.

Objective: The subject-performed task (SPT), in which an individual actually performs presented actions while learning, is known to be associated with better recall as compared to verbal learning. Recent neuroimaging studies have demonstrated that the supramarginal gyrus (SMG) plays a crucial role in SPT effect. In the present study, an individual with a focal SMG lesion underwent fMRI in order to further elucidate the role of the SMG for SPT effect.

[Participants and Methods]

Case A with the focal left SMG lesion and eight healthy individuals participated in the study. The participants learned action sentences under three learning conditions; i.e., verbal tasks (VT), experimenter-performed tasks (EPT), and SPT. The 1.5 T GE SIGNA MRI was used and EPI BOLD images were obtained during recognition phase.

Participants and Methods: Case A with the focal left SMG lesion and eight healthy individuals participated in the study. The participants learned action sentences under three learning conditions; i.e., verbal tasks (VT), experimenter-performed tasks (EPT), and SPT. The 1.5 T GE SIGNA MRI was used and EPI BOLD images were obtained during recognition phase.

Results: Recognition performances of Case A were identical to those of the healthy individuals. Both Case A and the healthy individuals showed better recognition under SPT and EPT than VT. The fMRI demonstrated that for SPT the healthy individuals showed activation in the left SMG, right angular, bilateral premotor and supplementary motor cortices. Case A instead showed activation in the left visual cortex, right prefrontal cortex and bilateral somatosensory association cortices.

Conclusions: For SPT, the healthy individuals showed reliable activation in SMG. Case A, who had a focal damage in SMG, was unable to utilize action representation in the external space. Instead, Case A appeared to activate compensatory information of somatosensory attributes to obtain SPT effect.

Correspondence: *Hitomi Kobayashi, Kobe University, Towa city coop zushi #307, Zushi 2490006, Japan. E-mail: hkby55@aol.com*

J.J. VAN STEENBURGH. Prefrontal Asymmetry: Correlates of Restraint, Disinhibition and Eating Behaviors.

Objective: Prefrontal asymmetry is related to affective disposition and state. Restrained eaters (RE), who chronically diet, have right prefrontal asymmetry (negative affect) at rest. After ice cream preload, REs typically counter-regulate; they eat more ice cream in ad lib taste tests than they do without a preload and more than do unrestrained eaters (UREs). REs' electrophysiology is relevant due to high risk of overweight and obesity. Prefrontal asymmetry may predict tendency to disinhibit or consumption.

Participants and Methods: EEG was used to measure prefrontal asymmetry (F4-F3) in 15 REs and 24 UREs before, during and after a counter-regulation eating trial.

Results: There were no group differences in resting prefrontal asymmetry ($n=39$). After preload ($n=20$), increasing right prefrontal asymmetry (negative affect) was correlated with disinhibition, as measured by the TFEQ ($r=.520, p=.019$). Also, for preloaded REs ($n=9$), there was a marginally significant relationship between left prefrontal asymmetry (positive affect) immediately after a preload and ice cream consumed ($r=.608, p=.082$). For UREs without a preload ($n=13$), there was a marginally significant relationship between right prefrontal asymmetry (negative affect) before the ice cream taste test and ice cream consumed ($r=.794, p=.059$).

Conclusions: REs' left prefrontal asymmetry (positive affect) predicted subsequent consumption, while UREs' consumption in the absence of a preload was predicted by right prefrontal asymmetry (negative affect). Both REs' and UREs' tendency to disinhibit might predict shift in prefrontal asymmetry from left (positive affect) to right (negative affect) after a preload, a thought supported by the emotional eating literature.

Correspondence: *Joseph J. van Steenburgh, M.S., Drexel University, 3429 Midvale Avenue, Philadelphia, PA 19129. E-mail: proxy@cyberbs.com*

L. MORENO-LÓPEZ, A. VERDEJO-GARCÍA, E.A. STAMATAKIS, M. FERNÁNDEZ-SERRANO & M. PÉREZ-GARCÍA. Strategic Self-regulation and Its Relation with the Posterior Cingulate Cortex in Abstinent Polysubstance Abusers.

Objective: Drug abuse is associated with neurocognitive changes linked to altered functionality of several areas of the brain (Verdejo-García, Pérez-García, Sánchez-Barrera, Rodríguez-Fernández, & Gómez-Río, 2007). Exploring these changes may contribute towards a better understanding of the chronic nature of addiction. In this study, we sought to examine the association between brain regional metabolism and neuropsychological performance in a sample of abstinent polysubstance abusers.

Participants and Methods: We measured brain regional metabolism at rest with Positron Emission Tomography (PET) and neuropsychological performance with Strategy Application Test (R-SAT) in forty abstinent polysubstance abusers following residential treatment. We performed two sets of bivariate correlations and regressions using two types of dependent measures: one based on regions of interest (examining mean uptake on selected regions), and a second one based on voxel uptake measures (using Statistical Parametric Mapping voxel-based whole-brain analyses).

Results: Results showed significant association between performance in this task and regional metabolism especially in the posterior cingulate cortex (PCC) bilaterally.

Conclusions: Studies in control and drug-using populations show that the posterior PCC may exert a crucial role in judgment and decision-making as they relate to the processing of self-relevant stimuli and the ability to control self-generated action outcomes (Aron & Paulus, 2007). These results are discussed in terms of their relevance for the understanding of cognitive dysfunction and neuroadaptations linked to addiction.

Correspondence: *Laura Moreno, Personality, evaluation and psychological treatment, Faculty of psychology, University of Granada, Campus de Cartuja s/n, Granada 18011, Spain. E-mail: lmoreno@ugr.es*

J. HASSENSTAB, W. GONGVATANA & A. CONVIT. Brain Morphology in Middle-Aged Obesity and Insulin Resistance.

Objective: Concurrent with significant worldwide increases in obesity, the prevalence of associated metabolic dysfunction is increasing rapidly. Insulin resistance is etiologically linked to obesity, and in previous studies we have found evidence of subtle reductions in declarative memory and executive functioning among this population as early as middle-age. The goal of this exploratory structural MRI study was to expand upon these results by investigating whether obese and insulin resistant middle-aged adults exhibit morphological differences in frontal and temporal lobe regions with established associations to declarative memory and executive functioning.

Participants and Methods: 1.5 T structural images were acquired on 32 obese and insulin resistant participants (ages 61 ± 9 years) and contrasted with imaging from 28 healthy and lean participants of similar age, gender, and educational levels. Regional volume, surface area, and cortical thickness were used as dependent variables in select regions of the frontal and temporal lobes including lateral prefrontal cortices and medial temporal structures.

Results: Results indicated that obesity and insulin resistance were associated with reduced overall grey matter volumes ($p=.016$), and significantly reduced cortical thickness in the frontal poles (BA 10; $p=.002$), lateral orbital frontal regions ($p=.01$), medial temporal regions ($p=.05$), and trends for reduced cortical surface area in the entorhinal cortex ($p=.07$).

Conclusions: The current study, unlike any published study to date, has shown that as early as middle-age, individuals with obesity and insulin resistance exhibit subtle reductions in overall cortical volumes and specific reductions in cortical thickness in areas with known associations with declarative memory and executive functioning.

Correspondence: *Jason Hassenstab, Ph.D., Butler Hospital TRG, Brown University Medical School, 345 Blackstone Blvd, Providence, RI 02906. E-mail: jasonhassenstab@yahoo.com*

M. RIOS-LAGO, J. PERIANEZ, J. ALVAREZ-LINERA, A. RAMOS, G. LUBRINI & A. LAGARES. Diffusion Tensor Imaging After Traumatic Brain Injury: Speed of Information Processing and Attentional Control.

Objective: Attentional control is one of the main cognitive mechanism impaired after traumatic brain injury (TBI). Besides, speed of processing (SIP) seems to modulate attentional performance. While neural correlates of attentional control have been widely studied, there are few evidences about the neurophysiological bases of SIP. Different authors suggested that it could be a property of cerebral white matter. Diffusion tensor imaging (DTI) provides a unique insight into the cellular integrity of the brain, offering an in vivo view into the microarchitecture of cerebral white matter. The aim of this study was to clarify whether there are anatomical dissociations between the neural basis of attentional control and speed of processing during performance of attentional control tasks.

Participants and Methods: Twelve severe TBI patients and fourteen age matched healthy controls were recruited for the study. All subjects underwent DTI-MRI scans performed on a 3.0T Signa HDx MR scanner. Fractional anisotropy (FA) values were calculated and correlated with behavioural measures of attentional control and SIP, as measured by the Stroop Test and Trail Making Test.

Results: Analyses confirmed impairments in neuropsychological scores influenced by speed of processing. The analyses revealed a correlation between FA and SIP where the greater integrity of the cerebral white matter, the better cognitive performance in the speed tests. Conversely, there were no significant correlations between axonal integrity and scores free of SIP.

Conclusions: Part of the difficulties showed by TBI patients in attentional control tasks rely on a slowed SIP. DTI results reveal that these deficits are related to injuries caused in cerebral white matter.

Correspondence: *Marcos Rios-Lago, Basic Psychology II, UNED, Fac. Psychology UNED, c/Juan del Rosal, 10, Madrid 28040, Spain. E-mail: mrios@psi.uned.es*

S. SORIA-PASTOR, L. ZUBIAURRE-ELORZA, D. FERNÁNDEZ-ESPEJO, N. IBARRETXE-BILBAO, C. FALCÓN, N. BARGALLÓ, F. BOTET, N. PADILLA-GOMES & C. JUNQUÉ. White Matter Impairment and its Cognitive Correlates in Prematurely Born Children with Low-risk of Brain Dysfunctions: A DTI Study.

Objective: Preterm birth increases the risks of white matter (WM) injury and long-term neurological, cognitive and behavioral outcomes. Perinatal complications contribute to brain damage and neuropsychological sequelae. We used diffusion tensor imaging (DTI) to investigate if prematurely born children with low-risk of neurological deficits have WM microstructural damage.

Participants and Methods: Twenty-two preterm children, born before 34 weeks of gestational age and with a mean age of 9 years, and 22 matched control subjects were submitted to a DTI examination. Children underwent a cognitive assessment using the Wechsler Intelligence Scale for Children - 4th Edition. FMRIB's Diffusion Toolbox from FSL v.4.0 was used to obtain the fractional anisotropy (FA) maps. The voxelwise statistical analysis of the FA was carried out using tract-based spatial statistics method. Group comparisons and correlations with the full-scale intelligence quotient (FSIQ) were performed.

Results: We found that the corpus callosum, the anterior and the posterior corona radiata, the insula, the anterior cingulate and the superior longitudinal fasciculus showed significantly lower FA in the preterm group ($t > 3$, $p < 0.001$ uncorrected for multiple comparisons) relative to controls. Moreover, FA values in regions involving the left frontal lobe and bilaterally the parietal lobe correlated with FSIQ scores in the preterm group.

Conclusions: Preterm children show WM microstructural abnormalities in fibers involved in complex cognitive functions that might be related with global intellectual functioning. DTI is able to detect subtle WM changes associated with premature birth even in subjects with low-risk of neurological deficits.

Correspondence: *Sara Soria-Pastor, MsC, Department of Psychiatry and Clinical Psychobiology, University of Barcelona, Casanova, 143, Barcelona 08036, Spain. E-mail: sarasoria@ub.edu*

P. VOSS, M. FORTIN, V. CORBO, C. LORD, J. PRUESSNER, M. LASSONDE & F. LEPORE. Visual Loss Differentially Affects Grey Matter Density of Brain Structures Involved in Spatial Navigation.

Objective: We have recently shown that blind individuals can outperform sighted subjects in spatial tasks involving route learning (Fortin et al, 2008). Knowing that spatial navigation is sub-served by a network of several different brain structures, we aimed to investigate if the above-mentioned behavioural enhancements were driven by any structural changes resulting from blindness. We therefore obtained volumetric assessments of the hippocampus and caudate nucleus in both blind and sighted individuals using a manual segmentation protocol.

Participants and Methods: Nineteen blind and nineteen matched sighted controls participated in the study. All subjects underwent high resolution MRI scans to obtain anatomical images of their brains. The manual segmentation and volumetric analyses were then performed using DISPLAY, a software developed at the McConnell Brain Imaging Centre of the Montreal Neurological Institute.

Results: While no volume differences were found between groups for the caudate nucleus, blind individuals showed a significantly larger hippocampal volume than the sighted ones. Moreover, while the volume of both the hippocampus and the caudate nucleus positively correlated with one another in the sighted, no such correlation was found in the blind.

Conclusions: Our results suggest that vision differentially influences the development of structures involved in spatial navigation: the absence of vision appears to solely affect the hippocampal volume. This may be due to the hippocampus' ability to regenerate cells even in adulthood. Furthermore, the absence of vision might also affect the interactions between both structures, as revealed by the absence of a volumetric correlation between them in the blind individuals.

Correspondence: *Patrice Voss, University of Montreal, Case Postale 6128, Succursale Centre-ville, Montreal, QC H3C 3J7, Canada. E-mail: patrice.voss@umontreal.ca*

L. ZUBIAURRE-ELORZA, S. SORIA-PASTOR, C. JUNQUÉ, P. VENDRELL, G. RAMETTI, N. BARGALLÓ & F. BOTET. Superior Temporal Sulcus Lower Surface in Preterm Children with Low-risk of Neurodevelopmental Impairments.

Objective: Prematurity is a risk factor of brain damage in the perinatal period and consequently subjects with premature birth could present neurodevelopmental and cognitive long-lasting impairments. The current study investigates the possible sulcal abnormalities in low-risk premature children without perinatal complications.

Participants and Methods: Measures of surface and maximum depth were obtained using Anatomist/ Brainvisa 3.0.2. High-resolution 3-D T1-weighted MRI data sets were acquired in 20 low-risk preterm children, mean gestational age (GA) 32 weeks, and in 20 controls group-matched for age at scan, gender, manual laterality and parental education. A primary sulcus, the parieto occipital fissure (maturation at 23 weeks of GA) and a secondary sulcus, the superior temporal sulcus (maturation at 32 weeks of GA) were compared between groups.

Results: For the surface measure of the superior temporal sulcus, we found a significant group effect ($F(1, 38) = 5.133$, $P = 0.029$) and a significant interaction type of sulcus and group ($F(1, 38) = 5.404$, $P = 0.026$). For the parieto occipital fissure there were no significant results related to surface measure. No effects were observed for the sulcal maximum depth for both sulci.

Conclusions: Our results showed that the more immature sulcus at birth showed lower surface in low-risk preterm children and no differences were found regarding the primary sulcus. Prematurity per se seems to affect the brain cortical folding development.

Correspondence: *Leire Zubiaurre-Elorza, MsC, Department of Psychiatry and Clinical Psychobiology, University of Barcelona, Casanova, 143, Barcelona 08036, Spain. E-mail: lzubiaurre@ub.edu*

Other

P.M. VANZELLA, M.E. BENASSI-WERKE, N.G. GERMANO & M.G. MENEZES-OLIVEIRA. Prevalence and Categories of Absolute Pitch in Music Schools in Brazil.

Objective: This study surveys, through the use of questionnaires, the prevalence of absolute pitch (AP) among music students in two Brazilian universities. It also investigates: particularities in hearing perception among self-declared AP possessors (regarding sensitivity to different timbres); the relationship between AP and age of beginning of musical training; the type of music training received by AP and non-AP students when learning musical notation and solfège; the presence of this cognitive ability in family members of self-declared AP students.

Participants and Methods: 263 undergraduate music students of the University of Brasília (130) and the State University of Sao Paulo (133) answered to questions about musical education, family background, and details of their hearing perception.

Results: Prevalence of AP in the sample was 7.22% and there was no difference between the two universities ($\chi^2=0.65$, $p>0.05$). Significant variants in the students' ability to produce and identify tones were observed. In both universities the age of beginning of musical training in the group of AP possessor (mean=7.18±2.61) was significantly lower than among the non-possessors (mean=11.55±4.02), ($F=21.18$, $p<0.05$). No relation was established between the type of training received and acquisition of the trait. No difference in the number of family members with AP was detected between the groups of AP and non-AP students.

Conclusions: Our results of prevalence of AP are similar to results reported by investigations in North America. This study also confirms previous investigations which show that prevalence of AP are higher among those who started musical training around 6 years old. Apparently, a specific type of musical training alone is not a determinant for the manifestation of this cognitive ability.

Correspondence: *Patrícia M. Vanzella, Music, Universidade de Brasília, R. Des. Mamede, 322, Sao Paulo 01444-030, Brazil. E-mail: pvanzella@yahoo.com*

N. ROJO, J. AMENGUAL, E. CAMARA, M. JUNCADELLA, S. SCHNEIDER, J. MARCO-PALLARES, F. RUBIO, J. MONTERO, M. VECIANA, T. MÜNTE & A. RODRIGUEZ-FORNELLS. Music-supported therapy induces plasticity in the sensorimotor cortex in chronic stroke patients as revealed by fMRI.

Objective: In the present project we investigated the mechanisms underlying the effectiveness of Music-supported Therapy (MST, Schneider et al., 2006) in a sample of chronic stroke patients as a neurorehabilitation technique. This MST approach has been developed recently in order to improve the use of the affected upper extremity after stroke. The rationale behind this therapy is that motor amelioration will occur because music-supported training involves precise auditory feedback and may promote auditory-motor coupling (Bangert et al., 2005). Preliminary behavioral data has shown positive effects of this intervention (Schneider et al., 2006). To investigate the physiological mechanisms underlying the effects of MST the present project evaluated possible reorganization of the sensorimotor system using functional neuroimaging.

Participants and Methods: A longitudinal trial of MT therapy in chronic stroke patients has been carried out ($N = 12$) with mild to moderate chronic motor deficit after stroke (mean 2.5 years after stroke). This group received intensive MST of the paretic upper extremity (30 min each day, 4-weeks). Functional neuroimaging evaluation was carried out before and after MST treatment. Motor function was evaluated using 3-D movement analysis and behavioral motor tests.

Results: Preliminary results have shown that the behavioral motor improvement (e.g., speed and quality of movement) was accompanied by signs of neuroplastic reorganization in the sensorimotor cortex (intra-individual pre-post fMRI comparisons). This suggests that MST, like

other recent motor rehabilitation techniques (e.g., constraint-induced therapy) leads to neural reorganization.

Conclusions: The discussion of these results will be framed considering the possible physiological mechanisms (feedback, audiomotor coupling) underlying the efficacy of MST and the possible benefits of this innovative neurorehabilitation tool in acute and chronic stroke patients. Correspondence: *Nuria Rojo, Universitat de Barcelona, Feixa Llarga s/n, L'Hospitalet de Llobregat (Barcelona) 08907, Spain. E-mail: nrojojit7@hotmail.com*

L. KÕÖTS, J. ALLIK & A. REALO. The Episodic and Autobiographic Memory Scale: Its Relations to Affective Experience and Personality.

Objective: An instrument to assess the phenomenology of episodic memory, the Episodic and Autobiographic Memory Scale (EAMS), was constructed and analysed with a pilot study. Relying on prior studies (e.g., Tulving, 2002; Sutin & Robins, 2007) an item pool of 183 items was composed; it included items about re-experiencing, temporal context, site, sensory details, emotional experience, coherence, perspective, rehearsal, remembering dreams, and mental time travel; participants assessed most of these separately for one specific episode and general memory. Additionally the earliest childhood memory and several landmark events were evaluated.

Participants and Methods: Altogether 109 students (92 women and 17 men) from 18 to 36 years ($M = 21.2$, $SD = 3.5$) completed the EAMS, Estonian version of PANAS-X (Allik & Realo, 1997) for affective experience, and the Estonian Personality Item Pool NEO (EPIP-NEO; Mõttus, Pullmann, & Allik, 2006) for personality traits.

Results: Preliminary principal components analysis indicated that the meaning structure of the EAMS could be described with five factors: Sensory Details & Involvement (Cronbach's $\alpha = 0.92$), Re-experiencing & Emotional Intensity ($\alpha = .89$), Valence ($\alpha = .92$), Context & Vividness ($\alpha = .86$), Mental Time Travel & Rehearsal ($\alpha = .88$). Openness to Experience was significantly related to all EAMS dimensions; correlations ranged from .25 to .40 ($p < .05$). Mental Time Travel & Rehearsal was related to Positive Affect ($r = .35$; $p < .05$).

Conclusions: After replication with larger samples the EAMS can prove to be a promising tool to evaluate episodic memory and its relations to personality and emotions.

Correspondence: *Liisi Kõöts, MA, Psychology, University of Tartu, Tügi 78, Tartu 50410, Estonia. E-mail: liisi.koots@ut.ee*

Invited Plenary: Confabulation and the Creation of Reality

Speaker: Armin Schnider

4:00–5:00 p.m.

A. SCHNIDER. Confabulation and the Creation of Reality.

Confabulation, the emergence of memories of events and experiences which in reality never took place, have puzzled clinicians for over a century. There are different forms, which partly of fully dissociate from each other, both functionally and anatomically: 1) simple provoked confabulations, i.e. intrusions in memory tests; 2) momentary confabulations that patients produce upon questioning; 3) fantastic confabulations that are illogical and nonsensical; 4) behaviourally spontaneous confabulations which reflect a confusion of reality in thinking, are often concordant with the patient's spontaneous behaviour, and which are associated with disorientation. This talk focuses on this latter form, which constitutes a natural model for how the brain creates reality in thinking. In behaviourally spontaneous confabulation, actions are intermittently guided by memories that may have justly guided their behaviour in the past but which do not pertain to true ongoing reality. This failure appears to result from an inability to suppress the interference of memories that do not pertain to now. Lesions involve the posterior

medial orbitofrontal cortex (area 13) or structures directly connected with it. A recent study showed that disorientation and behaviourally spontaneous confabulations are tightly associated with deficient extinction capacity – the ability to integrate negative prediction errors into behaviour. Thus, rather than invoking high-level monitoring functions, the human brain seems to make use of an ancient biological faculty, extinction, to keep thought and behaviour in phase with reality.

Correspondence: *Armin Schnider, M.D., Dept. of Clinical Neurosciences, University Hospitals of Geneva, 26 Av. de Beau-Sejour, Geneve 14 CH-1211, Switzerland. E-mail: armin.schnider@hcuge.ch*

**Invited Plenary:
The Application of Cognitive Neuroscience to
Problems in Everyday Life.**

**Presented by Barbara Wilson, recipient of the INS
Award for Lifetime Achievement**

5:00–6:00 p.m.

B. WILSON. The Application of Cognitive Neuroscience to Problems in Everyday Life.

This presentation begins by describing the models, methods and approaches of cognitive neuroscience. This is followed by a discussion of

clinical neuropsychology and the extent to which cognitive neuroscience informs the work of neuropsychologists who are concerned with understanding and alleviating the everyday problems of people who have sustained an insult to the brain. The core of the paper looks at the ways in which cognitive neuroscience has contributed to assessment and treatment in the past, how it is contributing today, and how it is likely to contribute in the future. Although the major influences have come from two main sources, namely theories of cognitive functioning and neuroimaging techniques, studies of emotion are becoming increasingly influential both in the field of rehabilitation and in the field of cognitive neuroscience. The paper concludes with a description of the current practice of clinical neuropsychologists and considers to what extent their practices are guided by findings from cognitive neuroscience.

Correspondence: *Barbara Wilson, Medical Research Council Cognition and Brain Sciences Unit, Hills Road, Addenbrooke's Hospital, Cambridge CB2 2QQ, United Kingdom. E-mail: barbara.wilson@mrc-cbu.cam.ac.uk*

FRIDAY MORNING, JULY 31, 2009

**Invited Symposium:
Vascular Impairment From The Neonatal Stage Till
The Late Years**

Chair: Liina Vahter

8:30–9:15 a.m.

L. VAHTER, K. GROSS-PAJU & A. KOLK. Vascular Impairment from the Neonatal Stage till the Late Years.

Symposium Description: This symposium is aimed to give an overview about vascular impairment in early childhood and symptoms, prevalence and prognosis following stroke, vascular dementia, Alzheimer disease and mixed dementia.

Cerebrovascular diseases are an important cause of acquired brain injury and cognitive disturbances in case of neonates and children. The morbidity of a stroke lasts a lifetime, influencing the child and his/her family's quality of life. The plasticity of a young brain can only support reorganization of the cognitive functions, but not more complex skills. Children are developing different cognitive deficits over time, hence the long-term follow-up is very important. During the symposium the characteristics of the childhood stroke are described, in addition the results of the study are reported where long-term cognitive outcome of children with perinatal and childhood stroke was examined and the changes in cognitive profile after applying an individual neurorehabilitation program were observed.

Alzheimer disease is the type of dementia most frequently described in literature, also during the time more knowledge has become available about pure vascular dementia. In addition there is mixed type of dementia, so the suspicion that maybe these syndromes mentioned before describe only one disease with different courses. Different aspects about clinical course, diagnosing and neuropsychological changes are discussed and theoretical aspects are revised.

Cognitive impairment following the stroke must be screened and appropriately treated to maximize the outcome of the treatment and re-

habilitation. More evidence-based rehabilitation programs and guidelines for both childhood and adult stroke management are required.

Correspondence: *Liina Vahter, West-Tallinn Central Hospital, Paldiski rd 68, Tallinn 10617, Estonia. E-mail: liina.vahter@ltk.ee*

A. KOLK & M. ENNOK. Vascular impairment following the childhood stroke.

Objective: Cerebrovascular diseases are an important cause of cognitive dysfunction in neonates and children. The aim of the study was to examine long-term outcome of cognitive problems in children with perinatal and childhood stroke.

Participants and Methods: 20 children (13 perinatal stroke (PS), 7 childhood stroke (CS)) were tested on two occasions with NEPSY test battery (mean interval was 2.29 yrs). The mean age (in years) of children with PS was 6.86 on first and 8.64 on second testing, and 8.21 and 10.04 respectively in CS group. The mean age at the time of stroke for PS group was 5.49 years. The cognitive performances of the two groups were compared with 20 age and sex-matched healthy controls.

Results: Children with cerebrovascular diseases demonstrated impairment in all cognitive domains during the first testing. Children with PS had impairment mostly in visuospatial, sensorimotor and language skills while the CS children had more prevalent problems with memory. Only very few test scores were improved during the second examination.

Conclusions: Cognitive impairment following the stroke must be screened and appropriately treated to maximize the rehabilitation and its outcome. Childhood stroke may lead to a significant cognitive decline. Children with PS had more severe cognitive impairment than children with CS. Cognitive outcome was not directly associated with motor outcome, although neonatal group showed less cognitive dysfunction following mild hemiparesis. There was no significant differences in executive functions. Cognitive deficits seem to be persistent and children make only a limited recovery over the 2-year follow-up period.

Correspondence: *Liina Vahter, West-Tallinn Central Hospital, Paldiski rd 68, Tallinn 10617, Estonia. E-mail: liina.vahter@ltk.ee*

K. GROSS-PAJU. Vascular dementia and Alzheimer's disease – two different diagnoses or one syndrome?

Objective: Alzheimer's disease is the type of dementia most frequently described in literature (Salloway & Correia, 2009). During the time more knowledge and diagnostic options have become available to diagnose pure vascular dementia.

Participants and Methods: Therefore the prevalence, diagnostic obstacles and treatment possibilities of these two syndromes has changed over the time. In addition there is mixed type of dementia where there are both strokes and symptoms of Alzheimer's type of dementia present, so a suspicion may rise that maybe these syndromes described earlier represent only one disease with different course types. Therefore the prevalence, diagnostic obstacles and treatment possibilities of these two syndromes has changed over the time. In addition there is mixed type of dementia where there are both strokes and symptoms of Alzheimer's type of dementia present, so a suspicion may rise that maybe these syndromes described earlier represent only one disease with different course types.

Results: This lecture is aimed to give an overview about symptoms, prevalence and prognosis following stroke, vascular dementia, Alzheimer's disease and mixed dementia.

Conclusions: Different aspects about clinical course, diagnosing and neuropsychological changes are reviewed, theoretical aspects are revised and practical issues are discussed.

Correspondence: *Liina Vahter, West-Tallinn Central Hospital, Paldiski rd 6S, Tallinn 10617, Estonia. E-mail: liina.vahter@ltk.ee*

**Paper Session 3:
Adult Traumatic Brain Injury**

8:30–10:00 a.m.

J. PONSFORD, S. RAJARATNAM, M. ROPER, C. ZIINO, D. PARCELL & M. SCHONBERGER. Fatigue following Traumatic Brain Injury: Its Nature and Causes.

Objective: Despite the fact that fatigue is reported by up to 70 percent of individuals with moderate to severe traumatic brain injury (TBI), there has been relatively little research investigating its nature and causes. This study aimed to examine the relationship between self-reported fatigue and demographic and injury-related factors, mood, information processing speed, selective attention and vigilance and sleep disturbance following TBI.

Participants and Methods: The study focused on a group of 130 individuals with moderate to severe TBI, living in the community, and 80 healthy controls, matched for age, gender and educational background. Measures included the Fatigue Severity Scale, Visual Analogue Scale for Fatigue and Causes of Fatigue Questionnaire, Epworth Sleepiness Scale, Pittsburgh Sleep Quality Index, the Hospital Anxiety and Depression Scale and a range of neuropsychological measures of attention and speed of information processing.

Results: Findings indicated significantly higher levels of subjective fatigue in individuals with TBI, caused by both physical and mental activities. There was no significant association with demographic or injury severity variables, but a significant association with performance on complex attentional tasks and with psychophysiological stress (blood pressure changes) whilst performing such tasks, and with depression and anxiety. Subjective fatigue was also associated with sleep disturbance and daytime sleepiness.

Conclusions: Fatigue represents a significant and pervasive problem, associated with poorer functional outcome following TBI. Implications of these findings for the management of fatigue following TBI will be discussed.

Correspondence: *Jennie Ponsford, PhD, School of Psychology, Psychiatry and Psychological Medicine, Monash University, Wellington Road, Clayton, Melbourne, VIC 3800, Australia. E-mail: jennie.ponsford@med.monash.edu.au*

T. MALOUF, R. LANGDON, E.A. SHORES & M. COLTHEART. Awareness Deficits and their Relations with Executive Functioning and Memory Processes.

Objective: Awareness deficits are commonly seen in patients following a traumatic brain injury (TBI). Previous literature has suggested that the frontal lobes may play a role in mediating self-awareness, however very few studies to date have found a significant relationship between standard neuropsychological measures of executive functioning and awareness (Hart, 2005; Bogod et al. 2003). Other research has found that cognitive difficulties, such as memory deficits (Aimola, 1999), co-occur with awareness deficits. Currently there is growing consensus that awareness is not a unitary concept, which may account for the inconsistent findings in previous studies. The present study investigated the role of different domains of awareness and their relationship to executive functioning and memory.

Participants and Methods: Thirty-six participants who had recently sustained a TBI of least moderate severity were seen during their inpatient hospital admission. All participants were administered a series of standard neuropsychological tasks including measures of executive functioning and memory. Awareness was measured using the 'Insight Interview' (a new tool developed for this study in which different domains of awareness are measured and scored independently).

Results: Participants with awareness deficits generally performed worse than the participants without such deficits on tasks of executive functioning and memory (both verbal and visual). Significant differences between aware and unaware participants with regard to the different domains of awareness were also identified on tasks of executive functioning.

Conclusions: Executive function and memory measures may be useful predictors of awareness deficits in the acute stages following TBI. Executive measures also appear to be more closely related to awareness of the functional consequences of deficits following brain injury.

Correspondence: *Tania Malouf, BSc - Psychology (Hons), Macquarie Centre for Cognitive Science, Macquarie University, Level 4, Building C5C, Macquarie University, NSW 2109, Australia. E-mail: tmalouf@maccs.mq.edu.au*

L.M. HIMANEN, R. PORTIN, S. HURME, H. AHONEN & O. TENOVUO. Life expectancy and vocational outcome of patients with traumatic brain injury: a 30 year follow-up study.

Objective: The aim of the study was to evaluate major risk factors for early retirement and shortened survival in patients with traumatic brain injury (TBI).

Participants and Methods: The study group included 192 patients with TBI (mean age 39.0 years). Cognitive testing was carried out on the average two years after the injury. The severity of the TBI was assessed retrospectively according to the duration of posttraumatic amnesia. Cox's regression and logistic regression analysis were used in the analysis, and the survival of the patients was also compared with the general population using standardized mortality ratio (SMR). General cognitive decline was measured using the Mild Deterioration Battery (MDB).

Results: During follow-up of three decades, 39.1 % patients had died, and of the rest 42.8 % patients had retired soon after TBI, 46.2 % retired prematurely and 11.0 % completed a normal working career. Survival of patients was significantly associated with age ($p < 0.001$), sex ($p = 0.029$) and early retirement ($p = 0.012$). Mortality was higher in older patients (HR: 0.30), in males (HR: 1.81) and in early retired patients (HR: 1.91). Early retirement was associated with age ($p = 0.010$), cognitive impairment ($p < 0.001$) and severity of injury ($p = 0.010$). Mortality was higher in the study group than in the general population (SMR: 10.8).

Conclusions: Normal working career seems to be rare after TBI and premature retirement is associated with cognitive impairment and injury severity. The death rate is greatly increased among the patients with chronic sequelae of TBI.

Correspondence: *Leena M. Himanen, PhLic, University of Turku, Variovuorenkatu 5 as 5, Turku 20700, Finland. E-mail: ls.himanen@pp1.inet.fi*

J. BOLDOC-TEASDALE, P. JOLICOEUR & M. MCKERRAL. What can electrophysiology tell us about recovery after mild TBI? Visuospatial deficits in the acute and chronic post-injury phases.

Objective: Up to 15% of individuals who have sustained a mild traumatic brain injury (mTBI) show persistent cognitive symptoms (attention and memory) after the acute post-injury phase. Although studies have shown that these patients perform normally on neuropsychological tests, cognitive symptoms often compromise patients' return to pre-injury activities. The purpose of this study was to develop more precise markers for the diagnosis of post-mTBI deficits in attentional functions. We have designed a new task that allows us to track the processes involved in the deployment of visual spatial attention via different electrophysiological components (P3a, P3b, N2pc, and SPCN).

Participants and Methods: A group of 15 mTBI patients was tested twice: 1-3 months post-trauma (acute phase), and 6 months post-trauma (expected post-recovery period). Their data were compared to that of 15 normal controls paired for age, gender, education.

Results: Relative to controls, results indicated that patients in the acute phase showed a significant decrease in the amplitudes of the SPCN and P3b despite normal neuropsychological results. Decreased amplitudes for the N2pc and P3a in these patients were also obtained. There was an increase over time in the amplitudes of all components in mTBI patients, suggesting that recovery processes were present 6 months post-injury. However, components related to higher-level attentional processing remained affected, and were related to symptomatology.

Conclusions: These results highlight different levels of functional damage in a group of mTBI patients still in recovery. Hence, while visual attention is compromised mainly in the early post-mTBI stage, the ability to orient attention and process information remains impaired.

Correspondence: *Julie Bolduc-Teasdale, Université de Montréal, 6550, avenue Wilderton, app. 402, Montréal, QC H3S 2L5, Canada. E-mail: julie.bolduc.teasdale@umontreal.ca*

R. GREEN, B. COLELLA & D. MIKULIS. Traumatic brain injury as a neurodegenerative disorder - progression of gray and white matter loss following resolution of acute injury.

Objective: To provide evidence of increased global atrophy, white matter lesion progression and hippocampal volume loss in the sub-acute stages of injury

To provide evidence that atrophy has associated cognitive effects

Participants and Methods: 35 patients with moderate to severe traumatic brain injury (TBI); quantitative MRI and diffusion tensor imaging at 4.5, 12 and 24 months post-injury; verbal and visuospatial memory testing at same time points

Results: Atrophy was observed in quantitative whole brain measures as was progression of white matter lesions. Right hippocampal volume loss was associated with poorer visuospatial memory recovery; left hippocampal volume loss was associated with poorer verbal memory recovery.

Conclusions: The brain is not stable after moderate and severe traumatic brain injury; ongoing deleterious neurological changes continue after acute neurological events have resolved. These neurological changes are associated with poorer recovery. Gray matter loss in the hippocampi is likely secondary to damage to adjacent white matter networks. Implications for behavioural interventions are discussed.

Correspondence: *Robin Green, PhD, Toronto Rehab, 550 University Ave, Toronto, ON M6R2W5, Canada. E-mail: green.robin@torontorehab.on.ca*

**Symposium 3:
The Impact of Very Early Brain Insult on
Development**

Chair: Sarah Knight

8:30–10:00 a.m.

S. KNIGHT, V. ANDERSON, R. SAVARIRAYAN, A. BIALOCERKOWSKI, S. REILLY, D. CHONG, A. GREENSMITH & A. DA COSTA. Craniosynostosis: Neurodevelopmental Functioning in Infants Prior to Surgical Intervention.

Objective: Single-suture craniosynostosis (SSC) is a common developmental disorder that is characterised by premature fusion (typically in utero) of one of the sutures separating the bones of the skull. This condition results in distorted and restricted growth of the underlying brain and cranial reconstructive surgery is typically indicated to improve normal brain growth potential. These conditions carry a well-documented risk of neurodevelopmental delay. However, the nature, extent, and associated risk factors of neurodevelopmental delay in SSC are not well understood. This study sought to investigate neurodevelopmental functioning in infants with untreated ICS. Predictive factors for developmental status, including psychosocial, genetic and cranial morphology, were explored.

Participants and Methods: Forty infants with untreated SSC aged 5 to 16 months (M=9.5, SD=3.0 months) were assessed on the Bayley Scales of Infant and Toddler Development – 3rd edition (BSID-III). Genetic, cranial morphology and social risk data were also collected.

Results: Infants with untreated SSC displayed significantly poorer gross motor skills than the normative population ($p < .001$). Performance in all other neurodevelopmental domains (cognition, language, fine motor abilities, social-emotional, behaviour) was commensurate with normative sample estimates. The relative contributions of social risk, genotype and cranial morphology are presented.

Conclusions: At a broader clinical level, infants with untreated SSC have significantly poorer gross motor abilities than their non-afflicted peers, whilst other developmental skills at this stage of development appear in keeping with normative population estimates. These findings demonstrate that early onset brain insult is associated with detrimental developmental sequelae in the early infancy phase.

Correspondence: *Sarah J. Knight, BAsc(Hons), Australian Centre for Child Neuropsychology Studies, Murdoch Childrens Research Institute, Psychology Department, Royal Children's Hospital, Parkville, VIC 3052, Australia. E-mail: sarah.knight@mcri.edu.au*

A. DA COSTA, V. ANDERSON, S. KNIGHT, A. HOLMES, D. CHONG & A. GREENSMITH. Craniosynostosis: Neuropsychological Outcomes During Late Infancy and Early Childhood Following Surgical Intervention.

Objective: Single-suture craniosynostosis (SSC) is a congenital skull deformity characterised by restricted and distorted cranial growth due to premature fusion (typically in utero) of one of the sutures separating the cranial bones. This disorder compromises normative brain growth processes during a critical phase of early development. Cranial vault expansion and remodelling is performed in most cases to improve brain growth capacity and cosmesis. There is increasing empirical evidence that infants with SSC display developmental delays prior to surgical intervention. It remains controversial as to whether these delays persist thereafter. There is also very limited scientific literature on the longer-term developmental outcomes in this population. This study will investigate the early and long-term neuropsychological sequelae of SSC at two time-phases; during late infancy (post-treatment) and early childhood. Risk factors for neuropsychological outcome (age at surgery, operative and non-operative management) will also be examined.

Participants and Methods: Forty-three infants with surgically repaired SSC aged 13 to 41 months ($M=22.6$, $SD=5.7$ months) were assessed on the Bayley Scales of Infant Development-2nd edition. Twenty children aged 3 to 6 years ($M=4.6$, $SD=1.1$ years) with surgically-repaired SSC were assessed on age-appropriate measures of general intelligence (IQ).

Results: Infants with SSC displayed significantly lower cognitive ($p<.001$) and motor ($p<.001$) abilities than normative population averages. Children with SSC displayed significantly lower intellectual skills (IQ) than the normative population ($p<.05$).

Conclusions: Findings suggest that early-onset brain growth disruptions have detrimental neuropsychological sequelae during infancy, of which persist into the early childhood years.

Correspondence: Sarah J. Knight, BAsC(Hons), Australian Centre for Child Neuropsychology Studies, Murdoch Childrens Research Institute, Psychology Department, Royal Children's Hospital, Parkville, VIC 3052, Australia. E-mail: sarah.knight@mcri.edu.au

L. CROWE, V. ANDERSON, C. CATROPPA & F. BABL. Traumatic Brain Injury in Very Early Childhood: Cognitive, Behavioural and Social Outcomes.

Objective: Research examining traumatic brain injury (TBI) suggests that younger age at injury is associated with poorest outcomes, consistent with the early vulnerability model. However, very few studies have investigated the impact of TBI in very early childhood (children under age 3), who are in fact the most likely to sustain a TBI. This study aimed to investigate the developmental impact of very early childhood TBI on children's cognitive, behavioural and social functioning.

Participants and Methods: The sample included 40 children with TBI sustained before age 3 ($m = 15$ months) who were tested 3 years after injury ($m = 60$ months). An age-matched control group without TBI were also recruited ($n = 20$). Children with TBI were grouped according to injury severity: 1) moderate and severe; 2) mild. Children were tested on cognitive, behavioural and social measures.

Results: Group comparisons showed that children with TBI performed poorer on cognitive measures than age matched peers. There were minimal differences between the groups found on behavioural and social measures.

Conclusions: Findings highlight the vulnerability of the developing brain to TBI particularly in relation to cognitive factors. The possible long-term trajectory of the cognitive impairments will be discussed and the possible future impacts on behavioural and social skills.

Correspondence: Sarah J. Knight, BAsC(Hons), Australian Centre for Child Neuropsychology Studies, Murdoch Childrens Research Institute, Psychology Department, Royal Children's Hospital, Parkville, VIC 3052, Australia. E-mail: sarah.knight@mcri.edu.au

C. MOLLOY, P. ANDERSON, L. DOYLE & V. ANDERSON. Visual Function and Visual Perception Impacts Academic Achievement.

Objective: Deficits in visual function have been shown to be significantly more common in high risk preterm children than in normal birth peers. However, the contribution of these difficulties to other cognitive and academic outcomes remains unclear. This study aimed to elucidate the relationship between several aspects of visual dysfunction with performance in reading, spelling, and arithmetic.

Participants and Methods: The sample included 137 children aged 14-16 years. Eighty-eight children were born extremely low birth weight (<1000 grams) or very preterm (<28 weeks gestation) and 49 normal birth weight children were controls. A battery of visual tasks and academic ability in reading, spelling, and arithmetic were assessed.

Results: Preterm adolescents demonstrated significantly poorer visual acuity, depth perception, and visual perception (visual form constancy, visual figure-ground, and visual closure) than normal birth weight controls. Scores of reading, spelling, and arithmetic, were significantly lower for preterm children compared to normal birth weight adolescents. Clinical impairments in visual perception and visual acuity were associated with academic performance in reading, spelling, and arithmetic.

Conclusions: This study demonstrates that preterm adolescents are at risk for impairments in visual function, visual perception, and academic achievement. Furthermore, impairments in visual functioning are predictive of academic achievement in reading, spelling, and arithmetic.

Correspondence: Sarah J. Knight, BAsC(Hons), Australian Centre for Child Neuropsychology Studies, Murdoch Childrens Research Institute, Psychology Department, Royal Children's Hospital, Parkville, VIC 3052, Australia. E-mail: sarah.knight@mcri.edu.au

M. SPENCER-SMITH, V. ANDERSON, P. ANDERSON, R. JACOBS & L. COLEMAN. Developmental Timing of Brain Insult Impacts Differentially on Attention Processes.

Objective: Developmental timing of early brain insult (EBI) has been identified as a key predictor of functional outcome in animal studies and recent child studies. Few studies have examined whether outcome varies for specific cognitive processes. This study systematically examined timing of EBI effects on attention processes, which emerge early in development and are important for everyday functioning.

Participants and Methods: The large sample included 138 children aged 10-16 years with EBI. Children were grouped into six EBI groups, defined by growth spurts in neurological processes: (1) Congenital ($n=33$): 1st-2nd trimester; (2) Perinatal ($n=25$): 3rd trimester-1 month post-birth; (3) Infancy ($n=19$): 2 months-2 years; (4) Preschool ($n=17$): 3-6 years; (5) Middle Childhood ($n=28$): 7-9 years; (6) Late Childhood ($n=16$): 10-16 years. Children with different mechanisms of brain insult were recruited to enable examination of EBI sustained from gestation through to late childhood. Groups were similar for brain insult characteristics identified on MRI. As expected, mechanism of brain insult and seizure history differed between groups. Children were assessed for a range of attention processes.

Results: Children with EBI before age 3 demonstrated compromised attention, while children with EBI after age 3 performed closer to normal expectations. Outcomes varied for specific attention processes, with differences between groups particularly evident on high level processes such as shift attention and working memory.

Conclusions: Children with brain insult are at risk for impairments in attention, especially when EBI is sustained before age 3. Outcomes for specific attention processes differ according to the developmental timing of EBI. Correspondence: Sarah J. Knight, BAsC(Hons), Australian Centre for Child Neuropsychology Studies, Murdoch Childrens Research Institute, Psychology Department, Royal Children's Hospital, Parkville, VIC 3052, Australia. E-mail: sarah.knight@mcri.edu.au

S.J. KNIGHT, A. DA COSTA, L. CROWE, C. MOLLOY, M. SPENCER-SMITH & V. ANDERSON. The Impact of Very Early Brain Insult on Development.

Symposium Description: Neuropsychological outcomes following early brain insult may be predicted by a number of factors, including severity of the insult and associated medical complications, psychosocial factors, and age and time related variables. In this symposium, the neuropsychological sequelae associated with disruption to brain development very early in life will be investigated in a range of clinical disorders. Risk and protective factors to neuropsychological outcome will also be examined. The first paper in this symposium will examine the nature, extent and predictive factors for neurodevelopmental functioning of infants with the congenital skull deformity, craniosynostosis. The subsequent paper will add to our understanding of functional outcome in these patients by following children with craniosynostosis who have undergone surgical treatment (cranial vault expansion) as toddlers and at preschool age. The third paper in this session will investigate the developmental impact of very early childhood TBI (prior to age three) on children's cognitive, behavioural and social functioning at preschool age. The fourth paper will discuss visual functioning in children born preterm as well as factors predictive of academic achievement. The final paper addresses the current assumption that early brain insult is associated with a greater capacity for functional recovery, and examines attention

processes in children with brain insult sustained from gestation through to late childhood. This symposium equips clinicians and researchers working with infants and young children who have sustained brain insult with an understanding of the key developmental and predictive factors associated with functional outcome.

Correspondence: *Sarah J. Knight, BAsc(Hons), Australian Centre for Child Neuropsychology Studies, Murdoch Childrens Research Institute, Psychology Department, Royal Children's Hospital, Parkville, VIC 3052, Australia. E-mail: sarah.knight@mcri.edu.au*

**Invited Symposium:
Fast, Focused, or the Fabulous Four: Teasing Apart
the Elements of Visual Attention**

Chair: Thomas Habekost

8:30–10:00 a.m.

T. HABEKOST, T. HABEKOST, T. HABEKOST, K. FINKE, R. STARRFELT, P. STENNEKEN & S. VANGKILDE. Fast, Focused, or the Fabulous Four: Teasing Apart the Elements of Visual Attention.

Symposium Description: In the last ten years quite a number of studies have used Bundesen's Theory of Visual Attention (TVA; Psychological Review 1990) to investigate attention disturbances after brain damage. TVA is a mathematical model that accounts for a large part of the cognitive literature on normal visual attention as well as a wide range of findings from single-cell studies in monkeys (Bundesen, Habekost, and Kyllingsbæk, Psychological Review 2005). For investigations of brain damage TVA based assessment offers many advantages: high sensitivity, specificity, reliability, and validity. For example the method makes it possible to quantify how fast visual processing occurs, how focused attention is, and how many visual objects can be perceived simultaneously. Since the introduction of the method in 1999 a broad variety of neuropsychological conditions have been studied. The symposium offers an overview of this emerging research field including recent examples of studies on neurodegenerative diseases, dyslexia, pure alexia, and pharmacological manipulations of visual attention.

Correspondence: *Thomas Habekost, Ph.D., Psychology, University of Copenhagen, Linnæsgade 22, Copenhagen 1361, Denmark. E-mail: thomas.habekost@psy.ku.dk*

K. FINKE, P. REDEL, C. SORG & P. BUBLAK. Attentional Deficits in Neurodegenerative Diseases: an Analysis of Visual Processing Capacity and Spatial Attention Based on Bundesen's Theory of Visual Attention (TVA).

Objective: In order to systematically assess attentional alterations in neurodegenerative diseases, such as different states of probable Alzheimer's disease (MCI and AD) and Huntington's disease (HD) we used a parameter-based approach based on Bundesen's (1990) 'theory of visual attention' (TVA). In HD, we found severe, progressive reductions in visual attentional capacity (perceptual processing speed and VSTM storage capacity). Furthermore, a leftward spatial bias in the distribution of attentional weights (causing rightward extinction) was related to clinical indicators of the disease severity, such as the severity of the underlying genetic pathology. In Alzheimer's disease, a similar combination of impairments in attentional capacity and of biased spatial attention was present that reflects a graded pattern of attentional performance in MCI and AD. Early impairments (found already at the MCI stage) included an elevation of visual perceptual thresholds indicating a deficit in pre-attentive processing while processing speed and VSTM storage capacity showed a significant decline for AD patients, only. Furthermore, already in MCI patients, spatial attentional selection was biased, either to the left or the right hemi-field. Consistent with the biased-competition assumption that the relative activity levels of left- and right-sided brain areas are responsible for spatially biased behav-

our, a significant correlation between the laterality of this attentional bias and that of hypometabolism in temporo-parietal junction areas was found. Since furthermore relationships to other neuro-cognitive measures demonstrate the ecological validity of the TVA-based parameters, we conclude that their assessment can decisively contribute to the diagnosis of cognitive deficits in neurodegenerative diseases.

Correspondence: *Thomas Habekost, Ph.D., Psychology, University of Copenhagen, Linnæsgade 22, Copenhagen 1361, Denmark. E-mail: thomas.habekost@psy.ku.dk*

R. STARRFELT. Too Little, Too Late: Reduced Visual Span and Speed Characterize Pure Alexia.

Objective: Visuo-perceptual processes are of course an integral part of visual attention, and assessment based on the Theory of Visual Attention (TVA) can aid in the understanding of these processes. We have used TVA-based testing to investigate long standing hypotheses regarding the core deficit in pure alexia and the visual recognition processes important for fluent word reading. Our aim was to compare alphabetical accounts of pure alexia (i.e. the suggestion that only word or letter processing is affected in this disorder) with perceptual accounts that attribute pure alexia to a more fundamental perceptual deficit affecting nonalphabetic visual stimuli also. We assessed the patients' visual capacity (apprehension span and processing speed) using brief displays of single and multiple letters and digits (in different conditions). Compared to age- and education-matched controls, all patients showed reduced processing speed for single letters and single digits. In addition, all patients showed reduced visual apprehension span for both kinds of stimuli compared to controls. We have been able to show perceptual deficits not selective to letter and word processing in these five patients, and suggest that their reading deficit is attributable to their reduced visual speed and span. In essence, for the purposes of fluent reading, patients with pure alexia see too little too late.

Correspondence: *Thomas Habekost, Ph.D., Psychology, University of Copenhagen, Linnæsgade 22, Copenhagen 1361, Denmark. E-mail: thomas.habekost@psy.ku.dk*

P. STENNEKEN, J. EGTEMEIR, W.X. SCHNEIDER & K. FINKE. Specifying the Underlying Deficit in Developmental Dyslexia: An Application of the Theory of Visual Attention.

Objective: Starting point of the present project was to explore whether the Theory of Visual Attention (TVA) can be applied to the study of a behaviorally complex developmental deficit like the impaired acquisition of written language (developmental dyslexia). Despite of the clinical heterogeneity, there is accumulating evidence for a specific and in sub-groups of dyslexia isolated impairment in tasks requiring visual attention. This empirical evidence, however, stems from a variety of tasks tapping different aspects of attention, leaving the question whether single components of visual attention be identified that are specifically impaired in dyslexia. We used a whole-report and a partial-report paradigm in investigating a group of adult dyslexics and matched normal readers. Analyses were based on the estimated parametric values of perceptual processing speed, visual working memory storage capacity and the top-down control and the spatial distribution of attentional weights. Possible reductions in the parametric values of the dyslexic group compared to the control group were taken as markers for the underlying deficit. The main finding concerns a significantly reduced perceptual processing speed in dyslexic persons while their working memory storage capacity was comparable to that of normal readers. Ongoing investigations of dyslexic children strengthen these findings. In addition, the relation of the parameter estimates to measures of written language processing is explored. In general, the present study supports the relevance of visual attention in disorders of written language acquisition and demonstrates that the TVA provides a suitable tool for specifying the underlying deficit.

Correspondence: *Thomas Habekost, Ph.D., Psychology, University of Copenhagen, Linnæsgade 22, Copenhagen 1361, Denmark. E-mail: thomas.habekost@psy.ku.dk*

S. VANGKILDE, C. BUNDESEN & J.T. COULL. Differential Effects of Nicotine on Discrete Components of Visual Attention.

Objective: Nicotine is an important cholinergic neurotransmitter that has been linked to various cognitive functions. Several studies have observed attentional modulations after nicotine, but the roles played by nicotine and other cholinergic substances in attention remain unclear. The aim of the present pilot study was to identify at which point in the attentional process nicotine exerts its effects.

Participants and Methods: In a double-blind, counterbalanced, cross-over design, nine healthy nonsmokers (mean age 26 years) completed two sessions (45 minutes each) after chewing 2 mg nicotine gum or a placebo gum. The experimental paradigm was a letter recognition task with varied stimulus durations terminated by pattern masks. The temporal threshold of conscious perception (t0), visual processing speed (C), storage capacity of visual short-term memory (K), and attentional selectivity (alpha) were measured by use of Bundesen's (1990) Theory of Visual Attention.

Results: As compared with placebo, nicotine caused a significant 40% decrease in the t0-parameter ($t[8] = 6.06, p < .001, r = .91$) and a 14% decrease in the C-parameter ($t[8] = 3.12, p = .01, r = .74$). The K-parameter remained unchanged in both conditions. Five subjects showed a marked decrease in selectivity (increase in the alpha-parameter) after nicotine, but this change did not reach significance.

Conclusions: These preliminary data suggest that increased levels of nicotine in the brain (a) advances the point in time at which encoding of information into visual short-term memory is begun, but (b) decreases the rate of encoding and possibly also the attentional selectivity.

Correspondence: *Thomas Habekost, Ph.D., Psychology, University of Copenhagen, Linnesgade 22, Copenhagen 1361, Denmark. E-mail: thomas.habekost@psy.ku.dk*

T. HABEKOST. TVA Based Assessment: A General Introduction.

Objective: An increasing number of research groups use Bundesen's Theory of Visual Attention (TVA; Psychological Review 1990) to investigate attention disturbances after brain damage. The present talk gives an introduction to the TVA model and explains how it can be used to assess attentional function. Illustrated by a study of 26 right hemisphere stroke patients, it is argued that the test method provides strong sensitivity, specificity, reliability, and validity. The talk also includes a general overview of the studies published to date within this emerging research area.

Correspondence: *Thomas Habekost, Ph.D., Psychology, University of Copenhagen, Linnesgade 22, Copenhagen 1361, Denmark. E-mail: thomas.habekost@psy.ku.dk*

**Invited Symposium:
Searching for the Etiology of ADHD Using EEG,
Genetics and Measures of Executive Function.**

Chair: Solveig Jonsdottir

9:15–10:30 a.m.

S. JONSDOTTIR, H. HELGADÓTTIR, H. PÁLMASSON & S. JONSDOTTIR. Searching for the Etiology of ADHD Using EEG, Genetics and Measures of Executive Function.

Symposium Description: Attention deficit hyperactivity disorder (ADHD) is a common neurodevelopmental disorder constituting approximately fifty percent of referrals to child and adolescent mental health clinics. The main diagnostic features of ADHD are age inappropriate symptoms of inattention, motor restlessness and impulsivity. In spite of years of research the etiology of ADHD remains unknown. Recent advances in the areas of neurophysiology, genetics and neuropsychology have given hope that interdisciplinary research will advance our understanding of the causal pathways of this com-

plex phenomenon. Electrophysiological studies have shown abnormalities in the EEG power spectrum of children and adults with ADHD. Family, twin and adoption studies have shown that ADHD is highly heritable. Cognitive studies have indicated that ADHD is associated with impaired functioning of the frontostriatal circuit and executive dysfunction. In this symposium the speakers will present three studies. Helgadottir will report on an ongoing EEG research on brain functions in children with ADHD. Pálmason will present the results of a recent study focusing on gene x environment interaction. Jonsdottir will discuss the findings of a study on the relationship between executive function and impaired language ability in children with ADHD.

Correspondence: *Solveig Jonsdottir, Ph.D., Neurology, Landspítali-University Hospital, Grensás, Reykjavík 108, Iceland. E-mail: soljonsd@landspitali.is*

H. HELGADÓTTIR, G. BALDURSSON, N. BLIN, B. BRYNJÓLFSDÓTTIR, EMILSDÓTTIR, G.B. GUDMUNDSDÓTTIR, G.H. JÓHANNESSON, M. LORANGE, P. MAGNÚSSON, P. NEWMAN, K. JOHNSEN & .. GUDMUNDSSON. Electrophysiology of AD/HD.

Objective: Attention Deficit/Hyperactivity Disorder (AD/HD) is a neuropsychiatric condition, affecting 5%–10% of school-age children. Current diagnostic assessment relies primarily on observations of the child's behavior, as reported by parents and schoolteachers, which may be highly subjective. The need for an objective and independent test for AD/HD is well recognized, and has been uplifted by the discovery of an underlying central nervous system (CNS) dysfunction in individuals with AD/HD. Electroencephalograms (EEG) provide objective and useful measures of ongoing brain activity and several studies show that EEG may have a role in AD/HD diagnosis.

Our pilot study (N=46) showed that we are able to distinguish between a group of AD/HD children and a control group with 85% accuracy (sensitivity:83%; specificity:87%), using EEG recordings. This led to a construction of an EEG database, which consists of 19 channel EEG recordings from 800 children in the age of 6-13 years. The Statistical Pattern Recognition Technique (SPRT), where all the EEG channels are analyzed together, is used to determine which features of the EEG signal best separate the groups. This database is currently being worked on and the first results will be presented.

By using EEG measurements and SPRT it is anticipated that the diagnostic process of AD/HD will result in a higher degree of sensitivity and specificity than currently possible. EEG is sensitive to various neurotransmitters, for instance the GABA and the noradrenergic systems. Relating the EEG activity to the underlying metabolism could give valuable information regarding the pathology of AD/HD.

Correspondence: *Solveig Jonsdottir, Ph.D., Neurology, Landspítali-University Hospital, Grensás, Reykjavík 108, Iceland. E-mail: soljonsd@landspitali.is*

H. PÁLMASSON, D. MOSER, J. SIGMUND, C. VOGLER, S. HANIG, A. SCHNEIDER, C. SEITZ, A. MARCUS, J. MEYER & C. FREITAG. Attention-Deficit/Hyperactivity Disorder Phenotype Is Influenced by a Functional Catechol-O-Methyltransferase (COMT) Variant.

Objective: Attention-Deficit/Hyperactivity Disorder (ADHD) is a common neuropsychiatric disorder characterized by inattention, motor activity and impulsiveness. Findings from genetic studies indicate that the heritability in ADHD is around 70 - 80%. The catechol-O-methyltransferase (COMT) gene plays a crucial role in the metabolism of catecholamines in the frontal cortex, it is localized in the chromosomal region 22q11.2, coding for two enzymes, soluble (S-COMT), and membrane bound (MB-COMT). A single nucleotide polymorphism (Val158Met SNP) encodes the amino acids methionine (Met) or valine (Val). Carrying the Met/Met-genotype leads to a 3- to 4fold reduction of COMT activity compared to the Val/Val-genotype. The COMT gene

plays a crucial role in the metabolism of catecholamines in the frontal cortex, which has been implicated in ADHD and Conduct Disorder (CD) and the aim of the present study is to assess if the COMT Val158Met SNP is a risk factor for ADHD, ADHD symptom severity and co-morbid CD.

The main results of the study are that COMT Val158Met SNP is associated with ADHD, with the Met allele being over transmitted in our sample. Secondly, that smoking during pregnancy had significant influence on ADHD symptom severity and those with the COMT Met/Met genotype had the most severe ADHD symptoms in our sample. Finally, ADHD symptom severity and adverse early family circumstances during the first three years of life are positive predictors of lifetime CD in our sample.

Correspondence: *Solveig Jonsdottir, Ph.D., Neurology, Landspítali-University Hospital, Grensás, Reykjavík 108, Iceland. E-mail: soljonsd@landspitali.is*

S. JONSDOTTIR. Why Is ADHD So Frequently Associated with Specific Language Impairment (SLI)?

Objective: Many neurodevelopmental disorders, including ADHD, have been associated with impaired functioning of the frontostriatal circuit and executive dysfunction. Specific language impairment (SLI) is a neurodevelopmental disorder which is frequently associated with ADHD. The reason why these two common disorders so often co-occur is not known. SLI is characterized by a deficit in the production or comprehension of language despite normal cognitive development and educational opportunities. The disorder has a strong genetic basis but relatively little is known of its neural correlates. Tests of verbal fluency are frequently utilized to study executive function in children and adults with brain disorders. These tests most commonly examine the ability to produce words within a specific category (semantic verbal fluency) or starting with a particular letter (phonemic verbal fluency), within a time constraint. Previous studies have shown that temporal systems mediate semantic fluency whereas prefrontal structures are more associated with phonemic fluency. The main purpose of this study was to examine the relationship between semantic and phonemic verbal fluency and language ability in children with ADHD and other neurodevelopmental disorders. Participants were 68 children referred for neuropsychological assessment at a tertiary clinic for child and adolescent psychiatry. Tests assessing language ability and semantic and phonemic verbal fluency were administered. Results showed that only phonemic verbal fluency but not semantic verbal fluency was associated with the language ability of the children. These findings indicate that impaired language ability is related to prefrontal dysfunction which might help explain why SLI so frequently co-occurs with ADHD and other common neurodevelopmental disorders.

Correspondence: *Solveig Jonsdottir, Ph.D., Neurology, Landspítali-University Hospital, Grensás, Reykjavík 108, Iceland. E-mail: soljonsd@landspitali.is*

Poster Session 3:

Epilepsy, Toxic Disorders, Stroke/Aneurysms, Other Medical Conditions, Visuospatial, Executive

10:00–11:00 a.m.

Behavioral Neurology

S. CAVACO, A. MARTINS DA SILVA, P. SOARES PINTO, E. COUTINHO, E. SANTOS, A. BETTENCOURT, C. PINTO, A. GONÇALVES, F. GOMES, C. PEREIRA, B. MARTINS, J. CORREIA & C. VASCONCELOS. Subclinical neurological involvement in Behçet's disease.

Objective: 1) to characterize the neuropsychological profile of Behçet's disease patients with (Neuro-BD) and without (BD) neurological manifestations; 2) to identify which clinical, psychopathological, and genetic variables are related with neuropsychological performance; and 3) to explore the association between cognitive functioning and neuroimaging findings in BD patients.

Participants and Methods: Fifteen Neuro-BD and 35 BD patients in the non-active phase of their illness underwent a neurological examination, performed a comprehensive battery of neuropsychological tests, and answered the Hospital Anxiety and Depression Scale. HLA-B*51 genotyping was also performed. Patients' neuropsychological performances were compared to those of healthy demographically matched subjects. Within one month from testing date, a subset of 20 BD patients underwent a Magnetic Resonance Imaging (MRI) scan.

Results: Fifty three percent of Neuro-BD and 40% of BD patients were impaired at least on one neuropsychological measure (i.e., Digit Span – forward). Poorer cognitive functioning in Neuro-BD was associated with parenchymal involvement, whereas in BD it was related with presence of white matter changes in the frontal lobes, history of headache complaints, or higher levels of anxiety and depression. Current prednisone intake had a positive impact on neuropsychological performance. Disease duration, time since onset of neurological manifestations, or presence of HLA-B*51 allele had no significant influence.

Conclusions: Our results indicate that Behçet's disease may affect cognitive abilities in the absence of overt neurological symptoms. These findings point to an insidious course of neurological involvement.

Correspondence: *Sara Cavaco, Centro Hospitalar do Porto - Hospital S. António, Largo Abel Salazar, Porto 4099-001, Portugal. E-mail: saracavaco@yahoo.com*

A. GIGI & S. RUSS. Error Rate and Sequence Learning in Parkinson's Disease.

Objective: Impaired implicit learning is believed to depend on the basal ganglia (BG). This can be measured by serial reaction time (SRT) test performance. Patients with Parkinson's disease (PD) suffer from a BG dysfunction. However, previous studies using SRT-test with PD yielded contradictory findings. One of the possible reasons is frontostriatal-circuits intactness in PD.

Participants and Methods: In the present study we tested PD patients and controls in SRT-task using error rates as a frontal performance indicator. Patients were divided into two subgroups in accordance to error rates. Patients who scored errors up to the mean error rate of the control group were designated as normal error rate PD group (NEPD) while the rest were included in error rate group (EPD).

Results: Controls and NEPD showed implicit learning on the SRT-task while EPD didn't.

Conclusions: To our knowledge this is the first study to use error rates as a dividing line to create distinct subgroups of patients, hereby approaching PD performance on the SRT task in a new light. Results are discussed in term of the BG-thalamocortical circuits linking the BG to prefrontal areas, specifically the anterior cingulate cortex (ACC) which has an important role in error processing and adjustments of performance control.

Correspondence: *Ariela Gigi, PhD, Ariel University Center, Ariel 44837, Israel, Ariel 44837, Israel. E-mail: ariela@ariel.ac.il*

R.O. HÄNNINEN, J. SUHONEN, N. FORSS & R. HARI. False Familiarity of Unfamiliar Faces and Palinoptic Perseveration.

Objective: We present a case study: A 31-year-old female patient started to consider unfamiliar faces as familiar, and having palinoptic perseverations of these misrecognitions as well.

Participants and Methods: A patient suffered a massive venous thrombosis of the superior sinus sagittalis, accompanied in the beginning by a mild left-sided hemiparesis. The patient were examined with an interview, the neuropsychological perceptual tests and face memory test.

Results: She had no general difficulties in face perception and she correctly discriminated one face from another and identified emotional expressions of other people. However, she had casual difficulties in memorizing and recognizing faces. Once while walking, she felt seeing her mother four times. She cheerfully waved to the first "mother", but then realized, that this person could not be her mother who was working else-

where at that time. But anyway, even at close distance this person looked like her mother. She then met two other persons who also appeared like her mother. Finally, when a group of persons got off from a buss near her, she noticed that they all had her mother's faces, regardless of sex, size and clothing.

Conclusions: We suggest, that the patient's basic disorder was not the perception of faces, but rather false recognition of unfamiliar faces and palinoptic perseveration due to a disorder of right frontal lobe.

Correspondence: *Ritva O. Hänninen, Licentiate of Psychology; Neurological Department, Central Hospital of Central Finland, Keskussairaalantie 19, Jyväskylä 40620, Finland. E-mail: ritva.hanninen@ksshp.fi*

E. KIM, B. AHN, B. LEE & D.L. NA. Constricted intentional field in a patient with normal pressure hydrocephalus: A single case study.

Objective: To learn whether the patient with frontal dysfunction associated with normal pressure hydrocephalus (NPH) has bilateral intentional deficits and whether the lengths produced in proximal versus distal space and in centrifugal versus centripetal directions are different.

Participants and Methods: A 82-year-old man with NPH conducted the following experiments before shunt operation. In Experiment 1, the blindfolded subject was asked to produce 10cm lines successively along a horizontally located ruler centrifugally from mid point to the most lateral reach of subject's index finger. In Experiment 2, the blindfolded subject was asked to estimate distances while the examiner moved the subject's index finger at the starting point in proximal or distal space, moving centripetally or centrifugally.

Results: In Experiment 1, the mean production length and the ratio of maximal lateral exploration to the subject's possible maximal lateral reach were below mean-SD of controls. The lengths became hypometric as the movements were made in more distal space. In Experiment 2, there were no significant differences in length perceptions between proximal and distal space. Same experiments performed 5 months after shunt operation showed somewhat improvements.

Conclusions: Our patient produced hypometric lengths with constricted motor exploration in both hemispaces. The successive hypometria as a function of spatial location cannot be attributed to sensory-attentional or mental representational deficits since there was no difference in length perception (Experiment 2) between proximal and distal space. Rather, it can be interpreted as a motor-intentional deficit.

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Correspondence: *Eun Joo Kim, PNUH, 1-10 Ami-dong, Seo-gu, Busan 602-739, Korea, South. E-mail: eunjookim@pusan.ac.kr*

B.H. LEE, S.H. KIM, J.H. YOON, M.K. SUH, S.J. KANG, H. AHN & D.L. NA. Neural correlates of artistic drawing in patients with right hemisphere stroke.

Objective: The changes in artistic drawing after brain injuries have been reported to be related to specific brain lesions. However, the prior studies investigating anatomical correlates for this artistic drawing were based on a few cases, especially those of professional artists. This study aimed to investigate whether hemispatial neglect affects artistic drawing and to see if the brain lesions correlate with the subdomains of the artistic aspects.

Participants and Methods: Drawing performances of 382 patients with right hemisphere stroke (212 patients with neglect and 170 without neglect) were retrospectively examined. The drawing task consisted of two figures (Two Daisy figure, modified Ogden Scene figure) that had been included in our neglect test battery. The artistic aspects were rated by the five raters on a five-point scale in the following four categories: creativity, level of apparent efforts, fidelity to the intended subject, and bizarreness. Lesions on MRI or CT were manually mapped on the standard T1-weighted MRI templates.

Results: Neglect patients were rated to have more creativity, higher degree of divergence from the intended subject, and bizarreness but lower

level of apparent effort than non-neglect patients. The associated lesion with all artistic categories except for creativity corresponded to brain areas related to neglect. Regarding the creativity, when the analysis was performed in all stroke patients, patients with high scores in creativity had more damage to the frontal cortex than those with lower scores in creativity. When the analysis was restricted to the patients with neglect, however, patients with less parietal damage showed higher degree of creativity.

Conclusions: The neural correlates for the artistic drawing in right hemisphere stroke patients corresponded to brain areas related to neglect. However, higher creativity was associated with more damage to the frontal cortex.

Correspondence: *Byung H. Lee, MA, Neurology, Samsung Medical Center, Sungkyunkwan University School of Medicine, 50 Ilwon-dong, Gangnam-gu, Seoul 135-710, Korea, South. E-mail: byuryhan@hanmail.net*

T. SHIBATA, M. MATSUI, S. KOBAYASHI, R.C. CHAN & T. SHIBATA. Study of neurological soft signs in Japanese patients with schizophrenia.

Objective: Neurological soft signs are minor neurological abnormalities in sensory and motor performance identified by clinical examination. The first purpose of this study attempted to examine the prevalence and type of neurological soft signs in Japanese normal people. The second aim was to examine the prevalence and type of neurological soft signs of schizophrenic patients based on the prevalence and type of neurological soft signs in the normal people.

Participants and Methods: Participants were 44 normal native Japanese people (11 men, 33 women) and 20 Japanese inpatients diagnosed as schizophrenia using ICD-10 diagnosis criteria (12 men, 8 women). The mean daily medication dosage, which was converted to risperidone-equivalent dosage, was 5.2(SD;3.8) mg. Neurological soft signs were evaluated using short version of the Cambridge Neurological Inventory, including motor coordination, sensory integration, and disinhibition.

Results: Neurological soft signs in all subscales were recognized in schizophrenic patients, but not normal people. In seven neurological soft signs (mirror movements in right hand, mirror movements in left hand, extinction, stereognosis in right hand, stereognosis in left hand, blink during saccade, head movement during saccade), more schizophrenic patients significantly exhibited their signs than normal people.

Conclusions: This study suggests normal frequency of neurological soft signs in Japanese people. In addition, it suggests that patients with schizophrenia show more neurological soft signs than normal controls. Further studies need to investigate the ability of neurological soft signs to discriminate between patients with schizophrenia and normal controls. Correspondence: *Tamiko Shibata, bachelor, occupational therapy, Shibata hospital, 5-1 Eiraku-cho, Takaoka-city, Toyama 933-0843, Japan. E-mail: hitaata@hotmail.com*

Drug/Toxin-Related Disorders (Including Alcoholism)

A.B. FAGUNDO, E. CUYAS, A. VERDEJO-GARCIA, O. KHYMENETS, K. LANGOHR, R. MARTÍN-SANTOS, M. FARRÉ, M. SALAMERO & R. DE LA TORRE. Verbal Fluency Impairment in Ecstasy Users: the Effects of Cognitive Subcomponents, 5-HTT and COMT Polymorphisms.

Objective: There is evidence of verbal fluency impairment as a major cognitive correlate of ecstasy use; however, little is known about its specific mechanisms. We studied: (1) The processes underlying these deficits by examining two cognitive subcomponents of verbal fluency: *clustering* (words within the same subcategory) and *switching* (changes of subcategory); (2) A possible association between ecstasy use and verbal fluency in subjects genotyped for 5-HTT (5-HTTLPR and 5-HTTVNTR) and COMT (*val^{108/158}met*, *rs165599* and *rs2097603*) polymorphisms.

Participants and Methods: Ecstasy polydrug users (n=30) and non-ecstasy users (n=41) were evaluated in both semantic (*animals*) and phonemic (*F.A.S*) fluency. Genotyping was performed by PCR (*5-HTT*) and TaqMan polymerase assay (*COMT*).

Results: Ecstasy users had poorer semantic fluency performance than controls (p=0.003). *Clustering/switching* analysis revealed that this impairment was associated with poorer *clustering* (p=0.003) (reflecting semantic network disorganization), which were further modulated by *COMT rs165599* polymorphism (p=0.001). A specific effect of the *5-HTTLPR* polymorphism on *switching* performance was found (p=0.003), suggesting a serotonin modulation of frontal-executive flexibility.

Conclusions: Semantic verbal fluency deficits in ecstasy users may result in reductions of spontaneous speech at a clinical level. Based on the impaired *clustering/switching* strategies observed, it might be proposed that both semantic knowledge and retrieval are impaired in ecstasy users. Furthermore, we showed a gene-mediated vulnerability for executive *switching* abilities that may endorse prevention strategies in individuals at-risk of ecstasy use. Our analysis of *clustering/switching* has highlighted the importance of choosing sensitive neuropsychological tools and underscores the significance of the assessment of cognitive domains outside of episodic memory in ecstasy users.

Correspondence: Ana B. Fagundo, Psychology, Human Pharmacology and Clinical Neurosciences Research Group-Neuropsychopharmacology Program, Institut Municipal d'Investigació Mèdica (IMIM), c/ Dr. Aiguader 88, Barcelona 08003, Spain. E-mail: afagundo@imim.es

S.M. KOSKINEN, J. AHVENINEN, T. KUJALA, J. KAPRIO, B.F. O'DONNELL, D. OSIPOVA, R.J. VIKEN, R. NÄÄTÄNEN & R.J. ROSE. A Longitudinal Twin Study of Effects of Adolescent Alcohol Abuse on the Neurophysiology of Attention and Orienting.

Objective: Long-term functional brain effects of adolescent alcohol abuse remain uncertain, partially because of the difficulty in distinguishing inherited deficits from neuronal effects of ethanol and other detrimental habits such as tobacco smoking. We used a longitudinal twin-study approach to determine neurocognitive effects of adolescent alcohol abuse, as measured with the auditory event-related potential (ERP) component P3, a putative marker of genetic vulnerability to alcoholism.

Participants and Methods: Twin pairs (N=180) selected for their concordance/discordance for alcohol-related problems at age 18½ were recruited from a cohort containing all twins born 1975–1979 in Finland. Alcohol use and tobacco smoking were assessed with questionnaires at ages 16, 17, 18½ and ~25, and by a structured psychiatric interview concurrent with the ERP testing at mean age 25.7. During ERP recordings, subjects were instructed to detect target sounds within a train of frequent “standards”, and to ignore occasional “novel” sounds. To distinguish inherited and non-genetic familial factors from ethanol effects, ERP and self-reported alcohol use measures were incorporated into a hierarchical multivariable regression analysis.

Results: The novel-sound P3 amplitude correlated negatively with self-reported alcohol use, but no similar effect was observed for the target-tone P3. The variance of the novel-sound P3 amplitude was attributed to gene-environment/amplitude-environment interactions.

Conclusions: In a large sample of adult twin pairs, concordant and discordant for adolescent alcohol abuse, selected from a representative base population, our results suggest that adolescent alcohol use is associated with subtle neurophysiological changes in attention and orienting, as reflected by the decreased novel-sound P3 amplitude.

Correspondence: Sini M. Koskinen, M.A.(Psych.), Department of Psychology, Cognitive Brain Research Unit, Niittykatu 4 e 27, Espoo 02200, Finland. E-mail: sini.koskinen@helsinki.fi

P. RAPELI, H. ALHO, C. FABRITIUS & H. KALSKA. Correlates of Attention and Memory Performance in Opioid-dependence Treated with Methadone.

Objective: Opioid-substitution treatment (OST) with methadone is a efficient treatment for opioid-dependence (OD) Although OST patients treated with methadone, in general, show remarkable psychosocial recovery, there is evidence for cognitive impairment among them even after years in treatment. Little is known about correlates of attention or memory impairment among them.

Participants and Methods: We examined attention and memory performance of 39 OD patients treated with methadone. All methadone treated patients in study (n = 39) had been in treatment at least for one year. Most patients had also benzodiazepine comedication.

Results: Methadone dose correlated positively with simple reaction time and decision time in go/nogo – task (r = .41 and .38, p = 0.010 and 0.020, respectively). The correlations remained practically the same when benzodiazepine equivalent dose was taken into account by semi-partial correlation analysis. There were no significant correlations between drug doses and memory performances. However, patients with Benzodiazepine dose of 20 mg or more (n = 17) scored worse on the story recall saving percentage than those with lower doses or none benzodiazepine medication (n = 22) ; mean 90.3 ± 11.7 % vs. 81.6 ± 11.8 %, respectively (F = 5.21, p = 0.028).

Conclusions: A high dose methadone is associated with longer reaction times than lower doses. A high dose of benzodiazepine medication is associated with reduced memory consolidation among methadone treated OD patients. However, the dose-effect for benzodiazepine may not be linear.

Correspondence: Pekka Rapeli, Helsinki University Central Hospital, Teravakkokuja 4, Vantaa FI 01350, Finland. E-mail: pekka.rapeli@kolumbus.fi

S. SHIN, N. KIM & E. JANG. A Comparison of Internet and Alcohol Addiction of Attachment among Industrial Workers in Urban Korea.

Objective: To understand the features of internet addiction as a addictive disorder, this study compared internet addiction with alcohol addiction which has been one of the traditional substance addiction.

Participants and Methods: The subjects were male workers (n=139) at a company in Incheon, Korea. Participants were assessed for internet addiction, alcohol addiction, attachment, psychopathology and demographic data by Self-rating questionnaires in September 2006.

Results: We compared three groups, which were internet addiction group (N=9), alcohol addiction group (n=48), and neither of the problems (n=78). The mean levels of anxiety (F(2,132) = 5.17, P < .01) and avoidance (F(2,132) = 8.78, P < .001) attachment dimension were the highest for the internet addiction group. The internet addiction group were the most depressed, anxious, obsessive, and psychotic (F=8.99~11.87, P < .001) . Avoidance attachment was more strongly correlated with internet addiction (r = .37, P < .001) than alcohol addiction (r = .23, P < .01), and psychopathology were more strongly correlated with internet addiction (r = .35 ~ .38) than with alcohol addiction (r = .16 ~ .2119). Finally we estimated the structural model which showed good fitness ($\chi^2(710924, N = 139) = 1132.27, P < .001, RMSEA = .06, CFI = .96, NFI = .92, NNFI = .96$). Anxious attachment had an indirect effect on alcohol addiction through the effect of depression. Avoidance attachment had both of the direct and indirect effect on internet addiction through the effect of psychosis.

Conclusions: Internet addiction was more strongly associated with insecure attachment and psychopathology than alcohol addiction was.

Correspondence: Sang-Eun Shin, Psychiatry, Seoul Metropolitan Eunpyeong Hospital, Baengyeonsan-gil 93, Eunpyeong-gu, Seoul 122-913, Korea, South. E-mail: shin914@gmail.com

M.J. FERNANDEZ-SERRANO, M. PEREZ-GARCIA & A. VERDEJO-GARCIA. Effects of intensity of alcohol vs. cannabis, cocaine and heroin use on executive function performance.

Objective: To analyze the specific contribution of alcohol vs other substances which motivated treatment in a sample of polysubstance abusers

(cannabis, cocaine and heroin) to executive functioning tasks performance. We used a novel measure of intensity of drug exposure, which results from the ratio between amount and duration of each drug use (i.e., higher amount during shorter time result in increases of the intensity parameter).

Participants and Methods: Sixty SDI with a mean abstinence of 8 months, and 30 drug-free controls.

Instruments: A selective protocol of neuropsychological tests aimed to assess executive functions: Verbal fluency (FAS), Letter Number Sequencing (LNS), Similarities (SIM), Stroop (STR), Five Digit Test (5DT), Iowa Gambling Task (IGT).

Statistical Analysis: We used a hierarchical multiple regression in order to examine the specific contribution of (i) intensity of alcohol use, the most important substance of co-abuse in our sample, and (ii) intensity of other substances use to neuropsychological performance.

Results: Alcohol use intensity predicted performance on "FAS" and "LNS". The intensity of other substances predicted performance on "FAS", "LNS", "SIM" and "IGT". Cannabis consumption intensity was the best predictor for "FAS" and "IGT" and cocaine was the best predictor for "LNS". Drugs use intensities failed to predict "STR" and "5DT" performance.

Conclusions: Intensity of alcohol, cannabis and cocaine use had a similar impact of executive functions. High exposure to these drugs during short time periods may have common detrimental effects on the executive system.

Correspondence: *María J. Fernandez-Serrano, Psychology, Personalidad, Evaluación y Tratamiento Psicológico, Universidad de Granada, Campus de Cartuja, s/n, Granada 18071, Spain. E-mail: mijfer@ugr.es*

Epilepsy/Seizures

U. BOSHKOV, L. HAATAJA, M. PELTOLA, A. MATTILA & T. KORHONEN. Elements of Attention in Children with Benign Childhood Epilepsy with Centrottemporal Spikes.

Objective: Previous studies have found inconsistent evidence of the presence and the nature of attention difficulties in children with benign childhood epilepsy with centrottemporal spikes (BCECTS). They have usually focused at the variety of cognitive functions, and were not specifically designed to test attention. The aim of the present study was to examine attention in children with BCECTS in four components of Mirsky's et al. attention-model (focus/execute, sustain, shift, encode).

Participants and Methods: The participants were 12 children aged between 6 to 12 years, who had the primary diagnosis of epilepsy (BCECTS) according to the classification of the International League Against Epilepsy. The epilepsy children were on single monotherapy. The attention performances and behaviour were compared to 18 gender-, age- and IQ-level-matched healthy controls. All children attended mainstream school and they had no other neurological or psychiatric diagnosis. Full-scale IQ was at least 80. The attention test battery consisted of 7 standardized tests which measured the four elements of attention. The behaviour of the children was assessed with parent and teacher rating scales.

Results: At the group level, the BCECTS children scored lower than the normative sample in all components of attention, but the difference was not statistically significant. The findings of the case-by-case analysis suggested that minor attentional problems in children with BCECTS concentrated on sustaining and shifting attention, but focusing attention was intact. Subject's IQs, academic achievement or age had only minor or no significant effect on attention performances.

Conclusions: The findings of the present study indicate that attentional problems in BCECTS children, as measured in this study, are not definite. However, a distinct tendency towards attentional difficulties in some individuals suggests that neuropsychological screening is recommended in clinical practice in children with BCECTS.

Correspondence: *Ulla Boshkov, University of Turku, Rajatie 4 B 19, Helsinki 00730, Finland. E-mail: ulla.boshkov@kolumbus.fi*

C. GROTE & B. PYYKKONEN. A Validation Of A Popular WAIS-III Short Form in Patients With Epilepsy.

Objective: The WAIS-III manual asserts that administration requires 45-90 minutes (Wechsler, 1997). Longer test times have been demonstrated in certain clinical populations (Ryan, Lopez & Werth, 1998). Due to logistic and clinical consideration shorter forms have been developed and short forms of the WAIS-III, have demonstrated strong correlations to full WAIS-III index scores in a number of populations including TBI, dementia, and non-clinical populations (Axlerod, 2002). Short forms have not been validated in patients with epilepsy. The current study assesses the correlation between indices of the Ward Seven Subtest WAIS-III Short Form and 11 subtest WAIS-III in patients with epilepsy.

Participants and Methods: This archival examination included 106 clinically referred patients with a reported history of epilepsy administered the 11 subtest WAIS-III. Pearson's R correlation coefficients between the full and short form FSIQ, VIQ, and PIQ indices were calculated.

Results: Bivariate correlation coefficients were calculated between FSIQ, VIQ, and PIQ indices of the full and short form WAIS. All correlations were significant ($p < .000$). Short form indices accounted for 68.9%, 96.8%, and 33.8% of the variance in the full FSIQ, VIQ and PIQ indices respectively.

Conclusions: As expected, all scores were significantly correlated. The strength of the relationship between the full and short forms indices revealed a strong relationship between the full and short form verbal indices, while consistent with previous literature, less robust for correlations for FSIQ and PIQ were noted. Questions remain regarding the clinical use of these shortened forms in patients with epilepsy. Related clinical implications will be discussed.

Correspondence: *Benjamin Pyykkonen, Ph.D., Rush University Medical Center, 1653 W. Congress Parkway, 310 Rawson, Chicago, IL 60187. E-mail: benjamin_pyykkonen@rush.edu*

C. GROTE & B. PYYKKONEN. Improved Cognitive Performance Following Cranial Resection for the Treatment Epilepsy.

Objective: As localization procedures and surgical interventions for the treatment of epilepsy have become more sophisticated, larger numbers of patients with epilepsy choose focused resection as a treatment for seizures. Outcome studies reveal decreased seizure activity following these surgeries. The effect these procedures have on verbal and visual memory has been well documented in the literature, yet the impact on other cognitive domains remains less clear.

Participants and Methods: This archival study examined 11 patients undergoing cranial resection for the treatment of epilepsy who were administered the WAIS-III as part of comprehensive evaluations before and after surgical resection.

Results: A repeated measures ANOVA was conducted to compare pre and post surgery WAIS-III Index scores (VC, PO, WM, and PS). The main effect for time approached significance, Wilk's Lambda = .073, $F(1, 4) = 3.46$, $p = .073$. Post-hoc tests revealed significant improvement in PO, WM, and PS from time 1 to time 2 ($p = .020$; $p = .021$; and $p = .026$ respectively). The difference in VC from Time 1 to 2 was not significant ($p = .317$).

Conclusions: In contrast to expectations, significant improvement in cognitive performance was noted following surgical resection for the treatment of epilepsy. This improvement was noted in WAIS-III PO, WM, and PS indices. The reasons for this improvement are not clear. Potential explanations include decreased seizure activity and reduction in antiepileptic medications following these surgeries. Further examination including specific assessment of medication effects, ongoing seizure activity, and surgery location is indicated.

Correspondence: *Benjamin Pyykkonen, Ph.D., Rush University Medical Center, 1653 W. Congress Parkway, 310 Rawson, Chicago, IL 60187. E-mail: benjamin_pyykkonen@rush.edu*

E. HESSEN. Health concerns predicts poor quality of life in seizure-free epilepsy patients.

Objective: Most studies of quality of life (QOL) in seizure-free epilepsy patients suggest normal or near-normal function. Previous

studies on QOL in well controlled epilepsy have not investigated determinants for QOL from a database that includes a wide range of health related and epilepsy related variables, as well as demographical data, neuropsychological data, data from a comprehensive personality inventory and results from a QOL-questionnaire. Thus, the aim of this study was to analyze predictors of QOL based on such a range of variables.

Participants and Methods: Adults with epilepsy on antiepileptic (AED) monotherapy and without epileptic seizures for at least two years ($n = 158$) were assessed with the QOLIE-89.

Results: The main findings were that QOL in well controlled epilepsy patients was in the normal range and that presence of substantial health related concerns was a significant predictor of poor QOL.

Conclusions: The findings that substantial health concerns predict poor QOL may have clinical implications, as seizure-free epilepsy is a relatively benign condition, and careful information and counselling about this may alleviate health concerns and improve quality of life.

Correspondence: Erik Hessen, Cand. psych., PhD, Neurology, Akershus University Hospital, Oslo, Lorenskog 1478, Norway; E-mail: erik.hessen@nevropsykologi.no

P.A. KLAAS & I. TUXHORN. Timing is Everything: The Effects of Age of Onset and Seizure Duration on Cognitive Development in Children with Temporal Lobe Epilepsy.

Objective: Epilepsy in childhood is a heterogeneous disorder and while its presence increases the risk of cognitive impairment, its multifactorial nature precludes assignment of responsibility to one variable. This study sought to determine the impact of medical variables such as age at onset of epilepsy and duration of epilepsy on intellectual and mnemonic functioning in children with Temporal Lobe Epilepsy (TLE).

Participants and Methods: 33 children with TLE (19 Left, 14 Right) between the ages of 6 and 15 were seen for pre-surgical evaluation. Each received the Wechsler Intelligence Scale for Children-III and the Children's Memory Scale as a part of their pre-surgical battery.

Results: The groups did not differ significantly in age, gender, age of onset or duration of epilepsy. For the Left TLE group, significant negative correlations with age of onset and duration for Full Scale IQ and the Verbal Comprehension Index Score ($p < .05$) were seen. A significant negative correlation with delayed Verbal Memory was also found ($p < .05$). In the right TLE group, duration of seizures was negatively and significantly correlated with Full Scale IQ, Verbal Comprehension, Processing Speed and the Verbal Immediate Index from the CMS. Age of onset was significantly correlated with Verbal Comprehension only in this sample. Regression analysis found that duration of seizures was the strongest predictor of the Wechsler Index scores. The two groups had normal distributions of IQ and memory scores.

Conclusions: These findings are somewhat contrary to those found by Cormack et al (2007). There are some slight differences to the studies in that children who were unassessable were not included in our sample. These results are not entirely supportive of the role age of seizure onset has in overall development of memory and intellectual ability. This may suggest that other variables may play an equally important role in the development of cognitive ability in children with TLE. This research is limited by its small sample size.

Correspondence: Patricia A. Klaas, Ph.D., Psychiatry and Psychology, Cleveland Clinic Foundation, 9500 Euclid Ave., P-57, Cleveland, OH 44195. E-mail: klaasp@ccf.org

S.S. LAH, E. MEIEROTTO, K. DIAMOND, A. MOHAMED, Z. THAYER & L. MILLER. Autobiographical Memory in Patients with Partial Epilepsy: Impact of Accelerated Forgetting.

Objective: Patients with epilepsy have deficits in autobiographical memory that are not explained by poor performance on standard anterograde memory tests (Lah et al., 2006). We have found that a

proportion of epilepsy patients have difficulties recalling information after a long (1 or 7 days) delay (Diamond et al., 2008). In this study, we aimed to establish whether this difficulty with longer-term consolidation might be related to impairments in autobiographical memory.

Participants and Methods: Twenty four patients with partial epilepsy were examined using a battery of tests, including recall of a list of words after long delays as well as structured autobiographical memory interviews (Levine, Svoboda & Moscovitch, 2005), in which they were asked to recall in detail a particular event from recent (last year) and distant past. The interviews were taped, transcribed and scored. Patients were selected for this study (a) if they showed accelerated forgetting (AF) on both days (percent recall > 1.5 SD below NC mean; $n=5$) or (b) if their memory was normal (No-AF) on both days (recall within 1 SD of NC mean; $n=6$).

Results: There was little difference between the groups in the amount of details recalled from distant autobiographical memories. On the other hand, while the AF group showed tendency to recall a smaller amount of autobiographical details about memories from the most recent compared to more remote events, the No-AF group showed the opposite pattern.

Conclusions: This preliminary investigation raises the possibility that accelerated forgetting may play a role in autobiographical memory deficits. Correspondence: Suncica S. Lah, PhD, Psychology, Sydney University, Mungo Mac Callum Building, Room 422, The University of Sydney, Sydney; NSW NSW 2006, Australia. E-mail: sunnyl@psych.usyd.edu.au

K. RANTANEN, K. ERIKSSON & P. NIEMINEN. Cognitive Impairment in Preschool Children with Epilepsy.

Objective: In earlier studies on neurocognitive functions and childhood epilepsy children with additional neuroimpairments or mental retardation are usually excluded from study groups. The purpose of this study was to describe the full range of intellectual performance in a population based cohort of preschool children with epilepsy. The study was planned to determine: 1) frequency of cognitive impairment, 2) level of cognitive abilities and 3) epilepsy related factors that correlated with cognitive impairment.

Participants and Methods: Study group consisted of population-based cohort ($N=64$) of preschool children (3-6 years) with active epilepsy from the Pediatric Neurology Unit at Tampere University Hospital. Total of 26 children had uncomplicated epilepsy and 38 complicated epilepsy. Medical data and results from previous psychological evaluations (Bayley Scales of Infant Development, Wechsler's Primary and Preschool Scale of Intelligence-Revised) were reviewed retrospectively from children's medical records.

Results: Cognitive function was considered within normal or borderline range for 45 %; mild to moderately retarded for 34 %; severe to profoundly retarded or neurologically devastated for 16 % were, and unknown for 5 %. Children with complicated epilepsy had significantly lower IQs than children with uncomplicated epilepsy (mean IQ 62.2 vs. 91.3, $p < .001$). Intellectual impairment was related to seizure frequency ($p < .01$) and age at the onset of seizures ($p < .05$).

Conclusions: The results concur with earlier studies on cognitive impairment in childhood epilepsy. Cognitive function was normal in about half of the children. Cognitive impairment was associated with complicated (i.e. symptomatic) epilepsy, age at the onset of epilepsy, and poor seizure control. Correspondence: Kati Rantanen, Lic.A. (Psych.), Department of psychology, University of Tampere, Kalevantie 5, Tampere 33014, Finland. E-mail: kati.rantanen@uta.fi

K. RICHARDSON, S. LAH, Z. THAYER & L. MILLER. Neuropsychological Rehabilitation for Patients with Epilepsy: The Effectiveness of a Memory Training Program.

Objective: Epilepsy is often associated with impaired memory functioning, but there has been little research into the effectiveness of memory training for these patients. This study aimed to (i) investigate the suitability of a newly developed program for memory rehabilitation in outpatients with epilepsy and (ii) identify factors associated with favourable memory outcome.

Participants and Methods: Thirty-five patients with a history of seizures who experienced everyday memory difficulties participated in a group-based memory training program that involved six weekly, two-hour sessions. They learned about memory and influential factors, practiced strategies and completed homework. Effectiveness of training was investigated using a waitlist control, crossover design. Outcome measures were (1) objective: alternate forms of the Rey Auditory Verbal Learning Test (RAVLT) and prospective memory tasks; and (2) subjective: questionnaires assessing everyday and prospective memory. Baseline measures of attention and seizure variables were also obtained.

Results: Repeated measure analyses revealed significant post-training improvement in RAVLT scores and subjective ratings of prospective memory, with gains maintained at 3-month follow-up. No significant effect of ongoing seizure activity, history of temporal lobectomy or site of epileptic focus was found, but better selective attention and fewer antiepileptic drugs at baseline were independently associated with improvements on the RAVLT.

Conclusions: Overall, these results indicate that patients with epilepsy benefit from a relatively short, group-based memory training program. Future studies might investigate longer-term outcomes, as well as the relationship between these results and real world memory performance. Correspondence: *Kylie Richardson, School of Psychology, University of Sydney, A15 - Brennan MacCallum Building, University of Sydney, Sydney, NSW 2006, Australia. E-mail: kylierichardson@gmail.com*

I. TUDESCO, L.J. VAZ, R.S. CENTENO, L. CABOCLO, E.T. YACUBIAN, A.C. SAKAMOTO & O.A. BUENO. Neuropsychological Assessment of Patients with Temporal Lobe Epilepsy after Corticoamygdalohippocampectomy.

Objective: Patients with temporal lobe epilepsy (TLE) with hippocampal sclerosis (HS) usually have deficits in long-term memory (episodic and semantic), while working memory is preserved. The aim of this study is to compare neuropsychological outcome at six months follow-up in patients with medically refractory unilateral mesial temporal lobe epilepsy (MTLE) due to hippocampal sclerosis (HS) after corticoamygdalohippocampectomy (CAH).

Participants and Methods: Ten patients with Left-MTLE (34.9 ± 8.4 years), literate and right-handed were submitted to neuropsychological assessment to investigate verbal and nonverbal memory, language, and working memory tasks. The data were submitted to ANOVA followed by Tukey test.

Results: After CAH, patients with left-MTLE showed better performance on verbal fluency phonetic (FAS) ($p < 0.03$) and visual reproduction ($p < 0.005$) tasks, but showed a worse performance on paired associates (unrelated words), both in immediate ($p < 0.02$), and delayed ($p < 0.004$) recall, as well as in operation-word span task ($p < 0.003$), a measure of the episodic buffer (a working memory component), after assessment six months CAH.

Conclusions: CAH improved performance of on verbal fluency phonetic and nonverbal memory, suggesting that performance of these tasks was impaired by the contralateral spreading of seizures originating in the left hemisphere. The evaluation of working memory, largely unexplored in this population, indicated which patients with Left-MTLE had a significant loss in subcomponent buffer episodic of working memory. Impaired in tests of unrelated pairs associated (hard words) suggests the importance of the hippocampus also for association of novel stimuli.

Correspondence: *Ivanda Tudesco, Psychobiology, Unifesp, Rua Napoleao de Barros, 925, Sao Paulo 04024002, Brazil. E-mail: ivandasouza23@hotmail.com*

I. WRIGHT, P. ROJAS-FRIAS, S. SIMBLETT & C. DOODY. Material-specific Lateralisation of Hippocampal Activation during Verbal and Non-verbal Memory Encoding: An fMRI Study.

Objective: Patients with medial temporal lobe epilepsy (MTLE) suffering medically refractory seizures can be offered surgery to remove a unilateral portion of the MTL, in particular the hippocam-

pus. Surgery yields a seizure-free outcome in 60-70% of cases (Wiebe et al., 2001), however memory deficits can result with a differential decline in verbal and non-verbal memory following left and right resection respectively (Binder et al., 2008; Figueiredo et al., 2008). Mapping hippocampal memory functions is therefore desirable when planning surgical resection to minimize post-operative deficits. The aim of this research was to develop and test verbal and non-verbal stimuli to assess material-specific function of the hippocampi during episodic memory encoding. It was hypothesised that the memory paradigms would invoke hippocampal activation and, more specifically, it was predicted that encoding of verbal and non-verbal stimuli would invoke greater left and right hippocampal activation respectively.

Participants and Methods: Twelve healthy participants took part in a recognition memory paradigm employing incidental encoding. Event-related fMRI was performed while participants made perceptual or semantic judgements about verbal and non-verbal stimuli. Immediately following this, participants completed recognition tasks outside of the scanner. Activation maps were created by contrasting hits (items correctly identified as being seen during scanning) with misses.

Results: Imaging analysis revealed significant hippocampal activation during successful encoding of verbal and non-verbal stimuli as hypothesised. Bilateral hippocampal activation was found during successful encoding of both verbal and non-verbal stimuli.

Conclusions: If optimized, event-related memory paradigms such as the ones developed in this research have the potential to be used as part of a non-invasive way of assessing pre-operative hippocampal function in patients with MTLE.

Correspondence: *Sara Simblett, University of Bristol, Flat 13 The Laureate, Bristol BS1 3DG, United Kingdom. E-mail: sarasimblett@hotmail.com*

Executive Functions/Frontal Lobes

T. AKAMATSU, H. FUKUYAMA & T. KAWAMATA. The effects of single and mixed cues on choice reaction in Parkinson's disease.

Objective: The purpose was to examine the speed or accuracy of choice reaction with or without sensory distracters in patients with PD.

Participants and Methods: The participants were 30 idiopathic PD patients with an average age of 60.4 ± 9.8 years and 20 healthy age-matched controls. All of the subjects were informed about the details of the study, and they agreed to participate with written informed consent. Neuropsychological and psychometric examinations were performed on all subjects. The paradigm using a computerized task was based on a game, "paper-rock-scissors." Four types of sensory cues were employed: simple visual cues, auditory cues, visual cues with auditory distracters, and auditory cues with visual distracters. Subjects were instructed to win, draw, or even lose the games and were required to respond as soon as possible after the sensory cues.

Results: When bradykinesia was taken into account, the PD patients had slower motor reactions. Further, when asked to lose in response to auditory cues, they displayed a significant delay in cognitive processing as compared to the healthy controls (HC), with a greater delay in the presence of a visual distracter. The error rates in the PD group were significantly higher than those in the HC group.

Conclusions: PD patients are more influenced in choice reaction than the HC and by visual rather than auditory cues, especially under conditions with stimulus-response incompatibility that requires overriding habitual behavior.

Correspondence: *Tomoko Akamatsu, Bukkyo University, 96 Kitahananobou-cho, Murasakino, Kita-ku, Kyoto 603-8301, Japan. E-mail: akamatsu@bukkyo-u.ac.jp*

V. FREITAS, C. MARUTA, M. GUERREIRO & I.P. MARTINS. Subjective Memory Questionnaire: An Appraisal of Executive Functioning?

Objective: Memory complaints are common in the elderly and a criteria for the diagnosis of Mild Cognitive Impairment (MCI). Yet, these

complaints are so common and unspecific that clinicians have difficulty to know when to proceed to further assessment. Subjective memory questionnaire (SMQ) has not been consistently associated with objective memory assessment, but rather with symptoms of depression or anxiety. The authors studied the cognitive correlates of SMQ in a sample of adults (≥ 50 years of age) followed in GP clinics CNS disorders.

Participants and Methods: 334 consecutive patients of six GP clinics centres in a metropolitan area were invited to participate. Informed consent was obtained and MMSE excluded cognitive impairment. Subjects were tested with a battery of memory (CVLT-9) and executive function tests (Verbal Fluency, Stroop Test, Symbol Search, TMT) and scales for memory complaints (SMQ), depression (GDS) and independence on daily living activities. Participants' age ranged between 50 and 92 years old (65.6 yrs on average), with 6.9 (+ 4.2) years of literacy, 63% female.

Results: We found an effect of age, sex and literacy in the performance of executive tests ($p < .05$). Significant memory complaints were common (59%) and moderately related to depressive symptoms ($r = .493$; $p < .01$). SMQ was not related to subjects' age, literacy or objective memory tests ($p > .05$) with the exception of immediate and delayed visual memory. There was a significant correlation between SMQ and all tests of executive functions. Performance in Symbol Search and Verbal Fluency (Animals) is related to cognitive complaints ($p < .05$). The other correlations didn't persist after correction for depressive symptoms.

Conclusions: SMQ scale as it is designed is more related to depressive symptoms and executive functions than memory. A detailed subtest analysis may demonstrate which items are sensitive to memory functions.

Correspondence: *Vanda Freitas, Laboratory of Language Research, Molecular Medicine Institute, Faculty of Medicine of Lisbon, Av. Professor Egas Moniz, Lisbon 1649-028, Portugal. E-mail: vfilips@gmail.com*

A. HATANPÄÄ, T. KORHONEN, V. NÄRHI & J. WESTERHOLM. The Difficulties of Executive Functions in Adolescents with Mild Mental Retardation.

Objective: Executive functions (EF) are mental control processes that enable self-control necessary for the attainment of a future goal. It has been suggested that deficits in EFs are common to persons with mild mental retardation (MMD), causing problems in adaptive functioning. Studies on EFs of persons with MMD are few, and conducted with measures on which no attempts to control for the basic cognitive skills are done.

Participants and Methods: Two groups of adolescents, with MMD ($n=41$), and controls ($n=64$) was studied. EFs was assessed with six pairs of measures, of which the basic skills needed in EF measure was controlled for by a simpler task. Statistical analysis were conducted with Analysis of Covariance. Also a questionnaire on problems in EFs was used.

Results: Control group outperformed MMD group on all measures. Adolescents with MMD had deficits in relative to controls on 4 of the 6 (working memory, inhibition, motor sequencing and organization; all p 's $< .05$) measures of EFs when the basic skills were controlled for. Both parents and teachers evaluated adolescents with MMD having deficits in EFs relative to controls.

Conclusions: The results strengthen the earlier observations on EF deficits in MMD, as they were evident even when basic skills were controlled for. Deficits in EFs in adolescents with MMD were also observed in everyday living.

Correspondence: *Anne-Mari Hatanpää, University of Turku, Kultakallio 2 C 13, Noormarkku 29600, Finland. E-mail: anne-mari.hatanpaa@elisanel.fi*

S.C. LANTING, B.L. BROOKS, G.L. IVERSON, A.M. HORTON & C.R. REYNOLDS. Base Rates of Low Scores on the Test of Verbal Conceptualization and Fluency (TVCF) in Adults.

Objective: Knowing the prevalence of low scores on a battery of executive functioning tests supplements clinical interpretation. The purpose of this study is to examine the base rate of low scores on a battery of executive functioning measures in healthy adults.

Participants and Methods: Participants were 332 healthy adults between the ages of 20 and 59 ($M=33.0$, $SD=10.5$) from the Test of Verbal Conceptualization and Fluency (TVCF; Reynolds & Horton, 2006) standardization sample. The TVCF consists of four tests of executive functioning (i.e., Category Fluency, Letter Naming, Classification, and Trails C) that provide five age-adjusted T scores. The prevalence of low scores was examined in the total sample and was stratified by educational level (i.e., ≤ 12 , 13-15, and 16+ years).

Results: When the five T scores were considered simultaneously, 33.7% of healthy adults had one or more scores 1SD below the mean and 3.0% had one or more scores 2SD below the mean. When considering the prevalence of low scores across levels of education, there were some modest differences between those with 12 or fewer years when compared to those with at least university education (16+ years).

Conclusions: Consistent with the existing literature on other test batteries, at least one low subtest score (i.e., $<1SD$) on the TVCF is common in healthy adults. The prevalence of low scores on the TVCF decreases with higher levels of education, although the differences associated with education were relatively small.

Correspondence: *Grant L. Iverson, Ph.D., Psychiatry, University of British Columbia, 2255 Wesbrook Mall, Vancouver, BC V6T 2A1, Canada. E-mail: giverson@interchange.ubc.ca*

G.L. IVERSON, S.C. LANTING, K.E. FERGUSON, M. ROBERGE, M. PARKINSON & R.A. OLSON. Return to Work in Brain Tumor Patients is Associated with Neuropsychological Test Performance.

Objective: Return to work following treatment for brain tumors can be influenced by numerous factors, including disease prognosis, physical or language impairments, mental health issues, and cognitive impairment. The purpose of this study was to determine if neuropsychological test performance could differentiate patients with brain tumors who returned to work from those who did not.

Participants and Methods: Participants were 33 patients diagnosed and treated for primary or metastatic brain tumors. They completed the cognitive scales from the Ruff Neurobehavioral Inventory (RNBI), the Wechsler Adult Reading Test (WTAR), and an abbreviated version of the Neuropsychological Assessment Battery (Stern & White, 2003). Nine of the participants were working and 24 were not.

Results: The two groups did not differ in diagnosis (primary versus metastatic), age, education, reading ability, estimated premorbid IQ, or self-reported cognitive or language problems as measured by the RNBI. Those who were not working performed significantly more poorly on 4/15 neuropsychological tests: Digits Forward (Cohen's $d=.81$, large effect), Driving Scenes ($d=.98$), Oral Production ($d=1.0$), and Story Learning Immediate Recall ($d=.93$). These four scores were entered into a Logistic Regression which yielded an overall 88% correct classification rate. Nearly all of the subjects who were not working were correctly identified (i.e., 96%, 23/24).

Conclusions: In this sample, patients treated for brain tumors who did not return to work could be differentiated on the basis of their neuropsychological test performance but not on any other clinical or demographic variable. Replication on a larger sample is recommended.

Correspondence: *Grant L. Iverson, Ph.D., Psychiatry, University of British Columbia, 2255 Wesbrook Mall, Vancouver, BC V6T 2A1, Canada. E-mail: giverson@interchange.ubc.ca*

C.H. VLAHOU, M.H. KOSMIDIS, M. PASHALIDOU, S. MITROUSI & V.P. BOZIKAS. Learning Strategies as an Indication of Executive Verbal Memory: A Comparison of Patients with Schizophrenia, Patients with Multiple Sclerosis and Healthy Controls on a Greek CVLT-type Task.

Objective: Previous studies have indicated that difficulty in the use of learning strategies, such as semantic clustering, is associated with deficits in prefrontal regions and executive functioning. We sought to verify this by investigating the potential dissociation between patients with known executive dysfunction and those with memory difficulties despite a more subcortical presentation.

Participants and Methods: We administered a Greek word list learning test (based on the CVLT-II) to 21 patients with schizophrenia, 15 patients with multiple sclerosis (MS) and 46 healthy controls.

Results: We found a group effect for number of words recalled on all variables examined: learning trials 1 and 5, short and long delayed free recall trials, recognition, and learning slope. Post hoc comparisons attributed these group effects to poorer performance of the schizophrenia group compared to the control group on all variables, and poorer performance of the MS group (relative to controls) on trial 5, recognition and learning slope. When examining the semantic clustering strategy, we found fewer clusters in the schizophrenia group relative to the control group on trial 5 and on both short and long delayed free recall (despite equivalent clustering on trial 1); the MS group, however, did not differ from the control group on any measures of clustering.

Conclusions: Our findings support the hypothesis of frontal/executive functioning involvement in the use of clustering as a recall strategy on a widely-used word list learning task and highlight the importance of determining the underlying mechanisms for poor performance in a particular patient or patient group above and beyond test scores.

Correspondence: *Mary H. Kosmidis, Ph.D., School of Psychology, Aristotle University of Thessaloniki, University Campus, Thessaloniki 54124, Greece. E-mail: kosmidis@psy.auth.gr*

M. KUUSISTO, P. NIEMINEN & L. KLEEMOLA. Executive Functions of Children with Specific Language Impairment at Age 7-9.

Objective: Previous studies show that children with specific language impairment (SLI) have deficits in other cognitive abilities besides the language skills. From clinical experience we also know that they may have problems in executive functioning too. Although language abilities are important as a tool of executive functions (EF), there are comparatively few studies concerning executive functioning of children with SLI. The aim of the present study was to describe the executive functioning among children with SLI in everyday life situations.

Participants and Methods: Study group consisted of 22 children (aged 7-9 years) with SLI (subtypes phonologic-syntactic dysphasia, verbal dyspraxia, semantic-pragmatic disorder) from Tampere University Hospital. Controls (n=22) were age, gender and SES matched healthy children. EF were assessed using the Behavior Rating Inventory of Executive Function (BRIEF, Parent and Teacher Forms) – the Finnish version. Intellectual capacity was controlled with WISC III. Statistical analysis was carried out using T-test and correlations.

Results: Differences between the study and the control group in executive functions assessed by parents and teachers were statistically significant (min. $p < .05$) in most of the subscales of the BRIEF (Shift, Emotional Control, Initiate, Working Memory, Plan/Organize and Monitor). However also differences between the groups were statistically significant in verbal IQ (88/107, $p < .001$), performance IQ (95/107, $p < .05$) and total IQ (91/107, $p < .01$). Correlations between IQ and EF in the study and the control group were inconsistent.

Conclusions: Children with SLI have more problems than healthy controls in executive functioning assessed by parents and teachers. This finding has implications for the professional work with children with SLI. Correspondence: *Marika Kuusisto, Tampere University, Pispankatu 1A 22, Tampere 33240, Finland. E-mail: marika.kuusisto@pispala.net*

Y. MOLINA, R. CORREIA, L. TABARES, A. NIETO & J. BARROSO. Switching Contribution to an Efficient Phonetic Verbal Fluency Production.

Objective: Clustering and switching are considered to be the main components of phonetic verbal fluency tasks and to rely upon different neural networks. Since major results come from clinical populations research, our goal is to understand the former components' contributions to the phonetic verbal fluency performance in non-clinical populations.

Participants and Methods: From a sample of 27 healthy individuals aged 30 to 50, two groups were selected according to their performance in the fluency phonetic task administered (COWAT). High and low performance groups (10 subjects each) were paired by age and education. We analyzed the strategies employed such as number of clusters, cluster mean size and number of switches (Robert 1998 & Troyer 2000). Participants' processing speed was also measured (PC-Vienna System).

Results: Statistically significant differences between high and low performance groups were found regarding the number of clusters ($F(1,19)=10.165$; $p=.009$) and switches ($F(1,19)=40.621$; $p=.000$) production. The high-performance group showed a greater number of these "change" components but no differences were found in cluster mean size. There were no significant differences in terms of processing speed between groups, neither cognitive nor motor reaction times.

Conclusions: These results show that a better performance in phonetic fluency task is associated to a greater number of clusters and switches, but not to a bigger cluster size. Thus, those strategies related to cognitive flexibility seem to play a more significant role for an efficient phonetic verbal fluency performance than lexico-semantic and processing speed components.

Correspondence: *Yaiza Molina, Psychologist, Neuropsychology Unit, Faculty of Psychology, University of La Laguna, Campus de Guajara, La Laguna 38205, Spain. E-mail: ymolina@ull.es*

E. NUNEZ CASTELLAR, L. VAN DEN BOSSCHE, W. NOTEBAERT & W. FIAS. Error Processing in Social Contexts: Cooperation and Competition in Interaction with Biological and Non-Biological Agents.

Objective: Several ERP studies have recently shown that similar mechanisms for error processing are active in response to both self-generated errors and errors committed by others (Van Schie et al., 2005; Bates et al, 2005; Milner et al., 2004; De Bruijn et al., 2007). The aim of this study was to test whether at the behavioural level the same pattern of results can be found and whether the social context and the nature of the agent involved in the interaction can modulate these mechanisms.

Participants and Methods: For this purpose, participants had to execute a flanker task alternatingly either with a computer program or with a human couple in cooperative and competitive contexts. Monetary reward was offered to the best couples in the cooperative situation and to the best participants in the competitive context.

Results: A repeated measures ANOVA 2 (social context: cooperation vs. competition) x 2 (agent: biological vs. non biological) revealed that in the cooperative context, in which the participant's reward depended on the computer performance, no differences were found between the post error slowing in interaction with biological and no biological agents. In contrast, these differences reached significance in the competitive situation where the participant's reward depended mainly on his own performance.

Conclusions: These results suggest that the post-error slowing is modulated by the nature of the agent involved in the social interaction.

Correspondence: *Elena Nunez Castellar, Experimental Psychology, Ghent University, Henri Dunantlaan 2, Ghent 9000, Belgium. E-mail: elenapatricia.nunezcastellar@ugent.be*

T.S. RIVERO, G.E. GINANI, P. COVRE, M.C. MIRANDA, S.A. BOLOGNANI & O.F. BUENO. Relationship Between Videogame Use and Measures of Sustained Attention in Brazilian Adolescents: Faster is Better?

Objective: The objective of the present study was to evaluate the influence of the videogame use in the performance of a sustained attention test: The Conners Continuous Performance Test (CPT-II), a widely used test to measure vigilance and inhibition of responses.

Participants and Methods: A total of 239 adolescents have been evaluated, age between 12 and 17 years (12-13: N=123, 14-15: N=77, 16-17: N=43), 133 female and 106 males, 120 used play videogame (VG) and 119 do not (NVG). These adolescents are part of an ongoing study

that aims to characterize the performance of Brazilian adolescents in the CPT-II. All subjects performed the CPT-II and answered a questionnaire on habits of videogame use. To evaluate the age, gender and use of videogame effects, analysis of variance with age-groups as factors were applied for each of the individual.

Results: There were no interactions between sex, age and use of videogame effects. However, significant differences between VG and NVG were found for commission errors (VG: 19.77 ± 7.65 , NVG: 15.70 ± 8.04 ; $F=6.46$; $p<0.012$), hit rate (VG: 342 ± 54 , NVG: 385 ± 72 ; $F=10.58$; $p<0.001$), detectability index (VG: 0.45 ± 0.36 , NVG: 0.63 ± 0.43 ; $F=4.85$; $p<0.029$) and response style (VG: 0.54 ± 0.42 , NVG: 0.85 ± 1.28 ; $F=4.31$; $p<0.039$). VG group showed a better speed performance (Hit Rate), but NVG have fewer commission errors, better ability to detect the aim stimuli (detectability index) and the better speed/accuracy trade-off shown by the response style index.

Conclusions: Results of this study suggest that videogame use is associated with an increase of impulsivity in adolescents shown by more commission errors (lesser inhibition), lower capacity of stimuli discrimination (lesser detectability), and greater disposition to take more risks.

Correspondence: *Thiago S. Rivero, Master, Psychobiology, Universidade Federal de São Paulo, Rua Bom Pastor 1715, São Paulo 04203052, Brazil. E-mail: thiagorivero@gmail.com*

T. SAUNAMÄKI, S. HIMANEN & M. JEKONEN. Executive dysfunction in patients with obstructive sleep apnea syndrome.

Objective: Executive dysfunction is one of the most affected cognitive domains in patients with obstructive sleep apnea syndrome (OSAS). However, it has been claimed that executive dysfunction in OSAS may also be explained by attentional capacity deficits, slowed information processing and decreased short-term memory span. The aim of this study was to clarify whether OSAS patients have impaired executive functions and to identify the domains that are most affected.

Participants and Methods: A full-night polysomnography and a comprehensive neuropsychological assessment concentrating on executive functions were conducted in 40 newly-diagnosed OSAS patients and 20 healthy controls. Possible attentional deficits were controlled by including in the test battery not only executive subtests (e.g. Trails B of Trail Making Test and Digit Span backwards), but also subtests that measure attentional capacity (Trails A of Trail Making Test and Digit Span forwards).

Results: All patients and controls were men. The groups did not differ statistically significantly in terms of age, education or intelligence quotient. According to the apnea-hypopnea index patients had mild to severe OSAS. Patients showed poorer performance than controls in the copy of the Rey-Osterrieth Complex Figure test, in the Trails B of Trail Making Test and in the Intra-Extra Dimensional Set Shifting test.

Conclusions: OSAS patients have lower visuospatial organizational skills and mental set shifting than healthy controls. Our results suggest that mild executive dysfunction occurs in OSAS and that is not explained by reduced processing speed only.

Correspondence: *Tiia Saunamäki, Neurology and Rehabilitation, Tampere University Hospital, P O Box 2000, Tampere 33521, Finland. E-mail: tiia.saunamaki@uta.fi*

R. KILPINEN, T. SAUNAMÄKI, S. HIMANEN & M. JEKONEN. Information Processing, Reaction Time and Motor Speed in Patients with Obstructive Sleep Apnea Syndrome.

Objective: It is well known that obstructive sleep apnea syndrome (OSAS) is associated with slowed information processing and motor speed and increased reaction time. However, it is still unclear what level of information processing is affected. The aim of this study was to find out whether OSAS patients have reduced information processing and motor speed and increased reaction time compared to healthy controls.

Participants and Methods: A full-night polysomnography and a comprehensive neuropsychological assessment were conducted in 12 newly-diagnosed OSAS patients and in 12 healthy controls. Possible changes

in information processing, reaction time and motor speed were examined using both conventional neuropsychological tests and computerized tests. Reaction time and motor speed were measured using the Reaction Time Test from the Cambridge Neuropsychological Test Automated Battery (CANTAB). Measures of information processing included the Rapid Visual Information Processing Test (CANTAB) and various other tests.

Results: All subjects were right-handed men. The groups did not differ statistically significantly in terms of age, education or intelligence quotient. The severity of sleep apnea according to the apnea-hypopnea index ranged from mild to severe. Patients had slower motor speed and information processing than controls. Reaction time did not differ statistically significantly between the groups.

Conclusions: OSAS patients showed mild slowing in motor speed and in more complex and time-pressured cognitive performance.

Correspondence: *Riikka Kilpinen, Tampere University Hospital, PO Box 2000, Tampere 33521, Finland. E-mail: riikka@kilpinen.eu*

L.J. VAZ, R. IEIRI & O. BUENO. Stress-Induced Cortisol Effects on Executive Function in Healthy Young Men.

Objective: Stress-induced cortisol releases and sympathetic nervous system responses have been implicated on memory performance. However few studies verified stress effects on executive function. So we investigated how executive function performance might be affected by stress response.

Participants and Methods: Forty healthy young men performed five neuropsychological tests (trail making test, stroop interference test, zoo map test, random number generation, and counting span task) after their exposure to cold pressor stress test (CPS) or a control condition. Salivary cortisol, blood pressure and heart frequency were measured. Half of the participants underwent to CPS (stressed participants), a procedure that has been shown to reliably produce a stress response, and the other half were submitted to a control warm water exposure (control participants). The data were submitted to ANOVA and effect size (Cohen d) were calculated.

Results: The stressed participants were split into those who did (responders, $N = 11$) and those who did not (nonresponders, $N = 13$) show a cortisol response. The salivary cortisol measured fifteen minutes after CPS or control condition were $1.71 \pm 0.87 \mu\text{g/dL}$, $0.50 \pm 0.17 \mu\text{g/dL}$, and $0.49 \pm 0.31 \mu\text{g/dL}$, mean \pm SD, to responders, nonresponders and control participants respectively. Sympathetic nervous system responses were detected only to responders participants. Both, the cortisol responders and nonresponders did not significantly differ on executive function performance compared to control group ($p>0.05$; mean Cohen d were -0.13 and 0.13 to responders and nonresponders, respectively).

Conclusions: These results suggest that acute stress-induced cortisol enhancement do not affects executive function.

Correspondence: *Leonardo J. Vaz, PhD, Psychobiology, Unifesp, Rua Napoleao de Barros, 925, Sao Paulo 04024002, Brazil. E-mail: leo.epm@gmail.com*

D. VUCINIC & G. MIJALKOVIC-STOJILJKOVIC. Frontal Lobe Functions in Patients with Juvenile Myoclonic Epilepsy.

Objective: Some neuropsychological and behavioral studies suggest frontal dysfunctions in patients with juvenile myoclonic epilepsy (JME). It correlates with mesiofrontal and prefrontal dysfunctions confirmed with recent neuroimaging studies and conjoint adaptational problems.

Participants and Methods: Frontal cognitive functioning in 58 JME patients was investigated. Adolescents aged 15-34 years are divided into two groups: A-37 patients with JME duration > 5 years, and B-21 patients with epilepsy lasting < 5 years. No inter-group difference in mean seizure onset was shown. Complete long-term seizure freedom was noted in 73.3% (A) vs. 69.2% (B). Battery of seven neuropsychological tests sensitive to frontal lobe dysfunction was administered. Behavioral markers were assessed with specific rating scales.

Results: The performance of our patients was not uniform. No strong association of clinical parameters with results was concluded. One third

of patients scored within normal limits on all tests. Approximately one fifth of JME patients showed impairment on ≥ 4 tests. Almost half of the patients was impaired on ≤ 3 tests. The highest number of deficits were found on tests measuring mental flexibility, cognitive speed and perseverative tendencies. No inter-group differences regarding to JME duration were found. However, it was noticed better verbal fluency and TMT B achievements in group A. As dominant behavioral problem we consider instabile effectiveness, interpersonal relationships and self-control.

Conclusions: JME in adolescents is associated with selective impairment of frontal functions in sizable number of patients. Test performance was not significantly related to the JME duration. Frontal deficits may have maladaptive behavioral consequences of personality dysfunction.

Correspondence: *Dragana Vucinic, Child Neurology, Clinic of Neurology and Psychiatry for Children and Youth, Glamocka 2, Belgrade +38111, Serbia. E-mail: dragana.vucinic.npk@gmail.com*

E. VUOKSIMAA, L. HOKKANEN, A. TUULIO-HENRIKSSON, L. PULKKINEN, J. KAPRIO & R.J. ROSE. Effects of sex, co-twin's sex, and pubertal development on Trail Making Test performance: A population-based study of 1847 adolescent Finnish Twins.

Objective: Executive functioning in young adolescents is understudied. We asked whether sex, co-twin's sex, and pubertal development affect adolescents' performance on Trail Making Test (TMT).

Participants and Methods: We used children's version of TMT, which in addition to Parts A and B adds Part C to control for knowledge of alphabetic order. Subjects were 1847 Finnish twins, aged 14 years, drawn from population-based longitudinal FinnTwin12 study.

Results: Boys performed faster than girls in part A, whereas girls performed faster in parts B and C. The sex difference in parts B and C was not evident when we analyzed only subjects who made no errors in these parts. Among girls, accelerated pubertal development was associated with better performance on TMT. Furthermore, girls with twin brothers performed faster in part A than girls with twin sisters. This difference remained after controlling for birth weight, pubertal development, maternal age at twins' birth, and computer game experience ($p = .013$). Among boys, only computer game playing experience was associated with performance in TMT: boys who reported no playing of computer games, especially at age 12, performed slower than other boys.

Conclusions: There were sex differences in all three parts of TMT. The slower performance of boys in parts B and C possibly stems from poorer knowledge of alphabetization. Effects of masculinization could account for faster performance among girls with opposite sex co-twins versus girls with same-sex co-twins. Our results underscore the need for further research concerning sex, sibling effects, and pubertal development on executive functioning.

Correspondence: *Eero Vuoksimaa, MPhyc, Department of Public Health, University of Helsinki, Mannerheimintie 172 (PL 41), Helsinki 00014 Univ Helsinki, Finland. E-mail: eero.vuoksimaa@helsinki.fi*

Medical Conditions (HIV/AIDS, MS and other Medical Conditions)

J.A. MUÑOZ-MORENO, M. CHERNER, C.R. FUMAZ, A. PRATS, M.J. FERRER, N. PÉREZ-ÁLVAREZ, E. NEGREDO, M. GAROLERA & B. CLOTET. Depressive Symptoms May Influence in the Diagnosis of Neurocognitive Disorders in HIV Infection.

Objective: Three disorders coexist in HIV-infected people with neurocognitive impairment (NCI): asymptomatic neurocognitive impairment (ANI), mild neurocognitive disorder (MND), and HIV-associated Dementia (HAD). Neurocognitive complaints, together with neurocognitive functioning assessment, play a relevant role in this diagnosis classification. As depressive symptoms have been related to neurocognitive complaints, we aimed to study the association between depression and HIV-related neurocognitive disorders.

Participants and Methods: A total of 132 participants were included in this observational study. Neurocognitive functioning was evaluated by a neuropsychological battery assessing 7 significant areas in HIV infection. Subjects were classified according to the diagnosis of ANI, MND and HAD. The assessment of emotional status included depression, measured by Beck Depression Inventory (BDI). Percentages of patients showing self-reported neurocognitive complaints and depression scores were compared using ANOVA, non-parametric and Chi Square tests.

Results: Of the total, 63 (47.7%) participants showed NCI, with the following diagnosis distribution: ANI: 28 (44.5%) subjects; MND: 26 (41.2%); HAD: 9 (14.2%). Neurocognitive complaints were referred by 57 (43.18%) participants, 36 (55.5%) of them from subjects with NCI (as expected, 0% in ANI group, 100% in MND and HAD). Means of depression scores were highest in MND group: ANI: 6.57 (± 6.62); MND: 10.5 (± 8.11); HAD: 8.16 (± 8.37); $p=0.21$. When comparisons were performed considering depression scores with respect to subjects in one group versus the rest, the comparison involving MND group was the only which revealed statistical differences: MND (median [IQR]): 9 (4;15.5); non-MND: 6 (1;12); $p=0.04$.

Conclusions: Our data find an association between depression and HIV-related MND. The diagnosis classification for HIV-related neurocognitive disorders is strongly related to neurocognitive complaints, but depression must be considered as a potential confounder factor.

Correspondence: *Jose A. Muñoz-Moreno, MS, HIV Unit, Lluïta contra la SIDA Foundation - Germans Trias i Pujol University Hospital, Ctra. del Canyet, SN, Edifici Maternal, 2a Planta, Badalona (Barcelona) 08916, Spain. E-mail: jmunoz@flsida.org*

M. GARCIA-VALDECASAS COLELL, A. DEL BARCO, M. BORGES, J. IBÁÑEZ, P. DUQUE & G. IZQUIERDO. Bateria Neuropsicológica Breve (BNB) as a Neuropsychological Screening Tool for Cognitive Impairment in Multiple Sclerosis Patients.

Objective: We collected data from 304 MS patients (relapsing-remitting, secondary progressive, primary progressive) followed in the Virgen de la Macarena Hospital at the Neurology and Neuropsychology Department (Seville, Spain).

Participants and Methods: We used the BNB (Bateria Neuropsicológica Breve), which consists in 4 subtests testing different cognitive functions essentially at a subcortical level. This test was defined by Pablo Duque, and standardized testing over 1000 healthy individuals, proving standards of validity, reliability and reproducibility. The median age was 37,52 years old and the median education level was 14,63 years.

Results: We consider pathological every score obtained in any subtest that is below the 5th percentile, considering the standards shown by the BNB. We found out that 21,3% of the patients scored in this percentile in the categorical evocation subtest, 4,2% considering the total time in the PASAT subtest, 2,9% for total score in PASAT, 7,2% in immediately recall memory test, 9,8% in delayed recall memory test, and 22,03% patients of a total number of 304 obtain it is SDMT subtest. It is worth underlining that 16% of the patients obtained very low scores in one of the subtests, 11% in 2 of the subtests, 6,37% in 3 of them and around 1% in all of the subtests.

Conclusions: Our results show that 30,52% of our cohort failed in at least one of the subtests. We conclude that around one third of our patients showed cognitive impairment characterized by a deficit of sustained attention (slowing down of the information processing speed) and deficiencies in the verbal memory, mainly retrieval information processes, that mostly interfere in daily life activities.

Correspondence: *Macarena Garcia-Valdecasas Colell, Unidad de Esclerosis Múltiple, Virgen Macarena Hospital, Avda.Fedriani, n3, Policlínico 1a planta, Seville 41009, Spain. E-mail: macarena.valdecasas@gmail.com*

S. LAATU, R. RINNE & J. KIVILAHTI. The Effects of Rivastigmine on Cognitive Impairments in Multiple Sclerosis: A Case Study.

Objective: Cholinergic medication is not commonly used among MS patients with cognitive impairments. In other neurodegenerative diseases,

like Alzheimer's disease, cholinergic medication is commonly used and the effects on cognition have been found to be positive. According to the present theoretical view, MS is regarded as a diffuse and dynamic neurodegenerative disease, which affects the functions of the neurons in many ways. During the disease progress alterations in many neurotransmitters may happen. We hereby suggest that cholinergic medication may have a positive influence on the cognitive functions in MS.

Participants and Methods: A 61 years old man with MS and significant cognitive deficits was studied. The neurological examination and neuropsychological tests were performed before the starting of acetylcholinesterase inhibitor (rivastigmine), and six months later. At the beginning the dose of rivastigmine was 1.5 mg/day and after one month 1.5 mg x 2.

Results: During the six months, the symptoms of MS continued to progress. Some of the neuropsychological symptoms - deficits in executive functions, functions of working memory and attention - progressed. Most of the episodic memory functions remained stable. Semantic memory functions, including understanding of concrete and abstract concepts and their interrelations, improved. The spouse of the patient reported improvements in the mood and sense of humor of the patient as well as in his ability to make contact with other people and show interest in his daily life.

Conclusions: According to our preliminary results, cholinergic medication may have positive effects on the cognitive functions of MS patients. Correspondence: *Sari Laatu, PhD, Masku Neurological Rehabilitation Centre, Seppäläntie, Masku 21250, Finland. E-mail: sari.laatu@ms-liitto.fi*

A. CAVALCANTI, F.H. SANTOS, S. BOLOGNANI, C.A. LEN, R.M. VIANA, D. LANDUCCI-MOREIRA, D. DRUMOND, O.F. BUENO & M. HILARIO. Neuropsychological Assessment of Young Adults who Presented Sydenham's Chorea in Childhood.

Objective: to evaluate long term neuropsychological outcome of young adults who presented rheumatic fever with Sydenham's chorea (SC) in childhood or adolescence.

Participants and Methods: Participants were recruited by telephone and/or mail from our files and were included in one of three groups according to medical history: 1) rheumatic fever and SC, 2) rheumatic fever without SC and 3) control group (healthy children and adolescents). Inclusion criteria were: current age \geq 18 years-old, 5 years without any symptom of rheumatic fever and SC, absence of neuropsychiatric disease or drug use. Cognitive functions were assessed through a comprehensive battery, including tests of IQ, attention, verbal and visual memory, visuospatial skills, motor and executive functions. Health related quality of life (HRQOL) was measured by the Health Related Survey - Short Form 36 (SF-36), and socioeconomic level was assessed by a specific instrument for Brazilian population.

Results: There were included 20 patients with SC in remission, 23 patients who presented rheumatic fever without SC and 19 healthy individuals. All three groups were homogeneous according to age, gender, education, socioeconomic level, and IQ scores. Significant lower scores were observed for the SC group in tests demanding attention and working memory, mostly in tasks involving visuospatial skills. No significant differences were found concerning HRQOL scores.

Conclusions: Patients with medical history of SC in childhood or adolescence should be followed into adulthood. Our findings show that some patients, even later in life, may present poorer performance in tasks demanding cognitive skills such as attention, working memory and visuospatial functions.

Correspondence: *Silvia Bolognani, BA Specialist, Psicobiologia, UNIFESP Universidade Federal de Sao Paulo, Alameda Santos 545 ap 102, Sao Paulo 01419-000, Brazil. E-mail: silvia_bolognani@yahoo.com*

J. HOTTE-BERNARD, M. PAGEAU, F. LEPORE & D. SAINT-AMOUR. Is Spatial Attention Affected in Amblyopia?

Objective: Amblyopia is classically defined as reduced visual acuity in one eye not attributable to structural ocular anomalies, suggesting a cortical origin. It has been recently suggested that visual attention might be affected in amblyopia but empirical data are missing. Using a Posner paradigm we tested the hypothesis that orienting spatial attention is altered in amblyopia.

Participants and Methods: Twelve adults with normal vision and 4 amblyopic adults participated in this preliminary study. Under monocular viewing, observers were instructed to detect as quickly as possible a precued target that might appear in one of two locations. To control for the reduced vision of the amblyopic eye, auditory cross-modal cueing and high-contrast stimuli were used. Posner effect was obtained by subtracting reaction time of valid trials from RT of invalid trials.

Results: In normal observers, a strong Posner effect was found for visual cueing ($p < 0.01$, mean valid RT = 410 ms, mean invalid RT = 472 ms) but this effect, although significant ($p < 0.05$), was reduced by about a factor of 3 for auditory cueing. Interestingly, in amblyopic observers, the Posner effect was larger in the amblyopic eye as compare to the fellow eye, or the normal eye. No significant difference was found between the fellow and normal eyes.

Conclusions: Preliminary findings suggest an alteration in the orientation of visual attention in amblyopia. Further experiments are needed to understand the nature of this effect by addressing more specifically the benefits of a valid orienting cue, the costs of an invalid cue, and the time course of shifts of attention.

Correspondence: *Judith Hotte-Bernard, B.A., centre de recherche, CHU Sainte-Justine, 3175 Cote-Sainte-Catherine, Montreal, QC H3T 1C5, Canada. E-mail: judith.hotte-bernard@umontreal.ca*

K. MÄKI, M. HIETANEN & U. SALMINEN. Cognitive Performance After Aortic Surgery Using Deep Hypothermic Total Circulatory Arrest.

Objective: Major neurological complications associated with surgery for dissection of ascending aorta or aortic arch using deep hypothermic total circulatory arrest (DHCA) are well described, but the information on neuropsychological performance is still limited. The aim of this study was to assess the neuropsychological function and whether some cognitive domains are most vulnerable in association with DHCA.

Participants and Methods: Six aortic surgery patients (mean age 54 years, range 31-74, 5 men, one woman) operated using DHCA were studied 6-8 months post-operatively. An extensive neuropsychological battery covering cognitive domains of reasoning, memory, attention, executive function, language, and visual skills was administered. In addition, patients and their informants filled questionnaires evaluating mood, quality of life, memory, and executive function. The performance of DHCA patients will be compared with patients undergoing cardiac surgery without hypothermia (coronary by-pass surgery on- and off-pump), and normal controls. The preliminary results were clinically evaluated by two neuropsychologists.

Results: Four patients showed mild cognitive changes, especially susceptibility to general error-proneness, reduction in phonemic fluency, and ineffectiveness in word list learning. One patient was considered to be cognitively intact. One patient was depressed but none of the patients reported significant reduction in experienced quality of life.

Conclusions: Domains of executive function and attention seemed to be most sensitive to show mild changes after aortic surgery using DHCA. Whether these findings are truly related to DHCA, and not better explained by other factors, will be shown when comparisons with other cardiac surgery patient groups and normal controls are available.

Correspondence: *Kaisa Mäki, Neurology, Helsinki University Central Hospital, PL 302, Helsinki 00029, Finland. E-mail: kaisa.maki@hus.fi*

M. MÖLLER BÖHM, A. FLÖTER RÅDESTAD & A. BARTFAI. Differential effects of testosterone and estrogen replacement on fatigue, cognitive speed and memory function.

Objective: To investigate the effect of testosterone in addition to estrogen replacement therapy (ERT) on cognitive functions in oophorectomized women. The main hypothesis is that testosterone enhances the effect of estrogen on memory functions and also has a beneficial effect on fatigability. We also hypothesize that estrogen/testosterone enhances cognitive functions more in women with lower cognitive pretreatment levels.

Participants and Methods: Women with surgically induced menopause ($n=50$, mean age: 54.0 ± 2.9 years) were randomly assigned to treatment

with estradiol valerate in combination with testosterone (TU) or placebo for 24 weeks in a double-blind, cross-over study. The women were assessed with self-report questionnaires regarding memory and well-being and neuropsychological tests for visuomotor speed, fatigability, verbal and spatial episodic memory and incidental learning before, at time of cross-over and after the treatment.

Results: Estrogen had a positive effect on immediate and delayed retention of logical prose and free recall of digits, while testosterone did not have any positive effect on cognitive functions. On the contrary there was a trend for testosterone to decrease the positive effect of estrogen on memory functions. Women with low pre treatment memory functions showed better treatment effects of estrogen while testosterone had no differential effect on memory. Estrogen had a positive effect on women showing initially higher fatigability, but a negative effect on those who showed no fatigue.

Conclusions: Testosterone has no positive effect on cognitive functions while estrogen has positive effects on memory and fatigability, especially at low pretreatment levels. The results indicate that it can be worthwhile considering pre treatment levels when evaluating the effect of ERT on cognitive functions.

Correspondence: *Marika Möller Böhm, Dep of clinical sciences, Karolinska institute, Kullbergska hospital, Med clinic, box 110, Katrineholm 64122, Sweden. E-mail: marika.moller.bohm@all.se*

S. TALVITIE, M. HIETANEN, J. TÖRNVALL, S. SOINILA & H. THORÉN. Pediatric Facial Fractures without Acute Brain Injury and Cognitive Performance in Early Adulthood.

Objective: In spite of facial fractures' frequent association with other injuries such as traumatic brain injury, a minority of patients may sustain facial fractures without evident brain trauma. The aim of the present study is to examine the neuropsychological performance of patients in early adulthood with pediatric facial fracture (PFF) without acutely diagnosed brain injury on the basis of clinical signs and brain scan (CT).

Participants and Methods: Thirteen patients (mean age 25 years, 6 female) with PFF without diagnosed brain injury were studied with a comprehensive neuropsychological examination covering different cognitive domains (WAIS-III, WMS-R, TM, Stroop, Bourdon Wiersma, fluency, Benton-C, RAVLT, cancellation, Purdue Pegboard) and questionnaires concerning executive functions, depression and alcohol consumption (BDI II, BADS). The performance of the patients was compared with that of matched control subjects (mean age 26 years, 6 female). All patients went through a neurological examination and brain scanning (MRI).

Results: Statistical analyses were carried out by using an independent samples t-test. Compared to control subjects, patients with PFF recalled fewer words in RAVLT interference list (8 vs 6 words, $p < 0.05$). The performance of patients in TMA was faster than that of the controls (22 vs 33 sec, $p < 0.05$). The patients' performance was almost significantly ($p = 0.05-0.07$) worse in Bourdon-Wiersma dual task and in some subscores of RAVLT. Patients reported greater use of alcohol than control subjects ($p < 0.05$).

Conclusions: PFF without acutely diagnosed brain injury may cause mild cognitive difficulties evident later during brain maturation, and may lead to risk for increased alcohol consumption.

Correspondence: *Sanna Talvitie, MPsych, Unit of Neuropsychology, Department of Neurology, Helsinki University Central Hospital, Säterinkatu 16 A 26, Espoo 02600, Finland. E-mail: sstalvit@gmail.com*

L. VAHTER, M. BRASCHINSKY, M. KALS, S. HALDRE & K. GROSS-PAJU. The Prevalence of Cognitive Dysfunction in the Estonian Population of Hereditary Spastic Paraplegia.

Objective: The hereditary spastic paraplegias (HSPs) are neurodegenerative disorders of the motor system characterized by slowly progressive lower limb spasticity. The information about the prevalence of the cognitive dysfunction in HSP is inconsistent. The aim of the study was to screen persons with HSP for the subjective cognitive complaints and possible cognitive problems.

Participants and Methods: Participants. 48 persons from the population based epidemiological study cohort with definite HSP diagnosis. Age (mean, SD) 49.9 (13.9), 81 % (39/48) had pure and 19 % (9/48) complex form of HSP.

Methods: Single item interview detecting possible cognitive problems, neuropsychological test battery, Beck Depression Inventory and Mini-Mental State Examination (MMSE) were included.

Results: Results. Only 19% of studied persons had subjective complaints on cognitive problems. Statistically significant differences in subtests measuring later recall in verbal memory and symbol digit modalities subtest between subjects with HSP and normal population were identified. Five out of 48 persons with HSP scored MMSE 24 or less. Subjective memory complaints did not have any statistically significant correlations with any of the neuropsychological measures.

Conclusions: Conclusions. Our results show that cognitive problems are not major complaint for the persons with HSP, being prevalent only in 19 % of the Estonian HSP population. Subjective memory complaints did not have any statistically significant correlations with any of the neuropsychological measures. However cognitive dysfunction was present in 44.7 – 63.8 %, more affecting memory and information processing speed. Dementia in HSP is rare.

Correspondence: *Liina Vahter, West-Tallinn Central Hospital, Paldiski rd 6S, Tallinn 10617, Estonia. E-mail: liina.vahter@ltkh.ee*

Stroke/Aneurysm

A.M. BRANDS, L. BREDEN, R.S. STRAVER & J.M. HENSELMANS. Cognitive Functioning after Transient Ischemic Attack.

Objective: A Transient Ischemic Attack (TIA) is caused by a reduction in blood supply to a particular area of the brain, resulting in transient neurologic dysfunction. Symptoms vary widely from person to person, depending on the area of the brain involved. Although neurological symptoms persist, by definition, for less than 24 hours, patients often report longlasting fatigue and concentration problems suggestive of cognitive decline. To date, only few studies addressed this topic with inconsistent results. Therefore the aim of this study is to assess cognitive performance in TIA patients without comorbid neurological disorders.

Participants and Methods: 36 TIA-patients (age: 65.5 ± 6.5 ; mean time of testing after TIA: 1 month) were compared with 36 age and education matched controls. Cognition was studied by extensive neuropsychological assessment with eleven tests, covering five major cognitive domains, i.e. 'abstract reasoning', 'speed of information processing', 'memory', 'attention and executive functioning' and 'visuoconstruction'.

Results: TIA-patients performed slightly worse on almost all neuropsychological tests compared to controls (effect sizes 0.3-0.6), but this reached significance only for the domain "attention and executive functioning" ($p = 0.03$) and tended to be significant for "visuoconstruction" ($p = 0.05$).

Conclusions: TIA-patients seem to be able to reach similar levels of performance as controls of the same age do, but have a diminished ability to efficiently process unstructured information. Although the magnitude of the cognitive decrements is mild to moderate, it is important to note that even mild forms of cognitive dysfunction might hamper everyday activities, since they can be expected to present problems in more demanding situations.

Correspondence: *Augustina M. Brands, PhD, neuropsychology, Hofpoort Hospital RPC, Blekerijlaan 3, Woerden 3447 GR, Netherlands. E-mail: i.brands@altrecht.nl*

T. KAURANEN & E. POUTIAINEN. Symptom Awareness and Executive Dysfunction Predict Return to Work in First-Ever Cerebral Infarction.

Objective: Previous studies have found neuropsychological and psychological factors highly important determining cognitive and functional

outcome after stroke. However, usually stroke subgroups have not been differentiated and occupational outcome have not been examined. The aim of this clinical follow-up study was to examine the effect of acute phase neuropsychological symptoms on occupational outcome of first-ever cerebral infarction on patients under age of 65.

Participants and Methods: Preliminary analysis was run on 71 consecutive patients, who were examined within two weeks after infarction with a neuropsychological examination including measures of executive functions, attention, memory, visuomotor speed, visual and language skills, depression and symptom awareness. Six months post-infarction occupational status of patients was collected.

Results: Six months post-infarction 58% (41/71) of patients had not returned to work. Both symptom unawareness and executive dysfunction was found to separately predict return to work (Student t, both $p < .001$). Together the two variables (unawareness of symptoms and executive dysfunction) predicted inability to work 6 months post-infarction correctly four times out of five (79.5 % correct, logistic regression, $R^2 = .259$).

Conclusions: Early neuropsychological examination predicts occupational outcome at six months after cerebral infarction.

Correspondence: *Tatu Kauranen, Helsinki University, LKS neu pkl PLS041, Rovaniemi 96190, Finland. E-mail: tatu.kauranen@lshp.fi*

S. KIRJAVAINEN, E. POUTIAINEN, S. MUSTANOJA & T. TATLISUMAK. Is Site of an Ischemic Brain Lesion Associated with Subtype of Executive Functioning.

Objective: Recent studies have suggested that executive functioning (EF) may have independent but moderately correlated subtypes such as inhibition, set shifting and working memory updating. To date, clinical studies and especially studies of anatomical correlates of such subtypes are sparse. The aim of this study was to examine if the site of an ischemic lesion is associated with a particular subtype of executive functioning.

Participants and Methods: Subjects were 18-65 year old consecutive inpatients in Helsinki and Lapland central hospitals with first-ever ischemic stroke. Structural lesions were measured with CT or MRI at the acute state. EF was measured with a neuropsychological examination six months after stroke. Inhibition was measured with Stroop, set shifting with TM-B and working memory with WMS-R/digit span backwards. 40 patients measured this far were compared to Finnish normative sample and divided into five EF subtype groups (intact, inhibition, set shifting, working memory and all EF defected) using 1.5 sd cut-off.

Results: Analyses of preliminary data found no clear division of different EF subtypes along with a site of a lesion. Yet, interestingly relationship between EF subtype and deep white matter (DWM) lesion was significant (χ^2 ; $p < .05$). Inhibition deficit was found in 60% of patients with left DWM lesion, in 13% with right DWM lesion, and in 19% of patients without DWM lesion.

Conclusions: These preliminary results do not give clear association of brain lesion site with subtype of executive functioning.

Correspondence: *Süri Kirjavainen, Psychology, University of Helsinki, Laivanvarustajankatu 5 B 29, Helsinki 00140, Finland. E-mail: süri.kirjavainen@helsinki.fi*

J. MIRALBELL, J. SORIANO, E. LÓPEZ-CANCIO, J. ARENILLAS, L. DORADO, M. BARRIOS, C. CÁCERES, M. ALZAMORA, G. PERA, A. DÁVALOS & M. MATARÓ. Framingham Stroke Risk Profile and Cognitive Function: Preliminary Results from a Population-Based Study in the Mediterranean Area.

Objective: Previous population-based studies suggest a relationship between stroke risk and cognitive function. The "Mediterranean paradox" refers to a lower incidence of coronary heart disease than would be predicted by classical risk factors in southern European countries compared to northern countries. The Barcelona-ASIA-Neuropsychology is the first population-based study ($n=1050$) that describes the relationship between stroke risk and cognitive function in a Spanish sample.

Participants and Methods: Participants were a subsample of 117 stroke-free adults aged 50-65 years-old. The 10-year stroke risk percentage was assessed using the REGICOR tables which are a modified and validated version of the Framingham Stroke Risk Profile for Spanish population. We used correlation and inter-groups comparison to relate the 10-year stroke-risk profile to multiple cognitive domains.

Results: 10-year stroke risk of the sample was low to moderate. In unadjusted model, stroke risk was related to lowered profile in visuoconstructive functions ($r_p = -0.324$; $p = 0.001$) and motor speed and coordination ($r_p = -0.301$; $p = 0.002$). After statistical adjustment for age and sex, no significant associations were found between higher stroke risk profile and poor performance in any of the cognitive domains.

Conclusions: In stroke- and dementia-free individuals aged 50-65 years with a low to moderate 10-year stroke risk, higher stroke risk is related with lowered performance in two cognitive domains. We cannot assure that this association is independent from sex or ageing. The cognitive profile differs from the ones observed in other population-based studies held in northern countries. The low age of the sample and/or the Mediterranean Paradox could account for this discrepancy.

Correspondence: *Júlia Miralbell, Graduate, Psychiatry and Psychobiology, University of Barcelona, 94th Padua Street 1st 4th, Barcelona 08006, Spain. E-mail: juliamiralbell@gmail.com*

I. RICO, M. FONT, A. CARVAJAL, M. JUNCADELLA & J. KRUPINSKI. Cognitive performance in asymptomatic patients for surgery after carotid endarterectomy: a preliminary study.

Objective: Stenosis of the carotid arteries is a major risk for subsequent stroke. Carotid endarterectomy (CEA) was demonstrated to be effective in the prevention of stroke, especially in symptomatic patients with a high-grade stenosis. In respect to cognitive function following CEA, prospective studies obtained opposing results: improvement in cognitive function was found frequently, although no differences or decline were reported as well. The aim of the present study was to examine the effect of CEA on cognition in a selected group of patients undergoing CEA.

Participants and Methods: Twenty-three patients undergoing CEA for asymptomatic high-grade unilateral or bilateral carotid stenosis for surgery (Nascet Criteria) were assessed with a set of neuropsychological tests one day prior to CEA and 3 or 6 months after intervention in several domains. All patients scored 24 or greater on Mini-Mental State Examination.

Results: The effects of CEA on cognitive function were analysed using ANOVA for repeated measures. Two main results were found: patients showed a significant decline in Forward and Backward Digits tests as measures of attention and working memory function, respectively, at follow-up independently of assessed timing. None of the tests scores showed significant improvement between the first and follow-up test.

Conclusions: A decreased performance in attention and/or working memory in patients after CEA may be associated with changes of hemodynamical perfusion or postoperative embolic events, although impaired cerebral perfusion appears to preferentially affect attention. More recently, decline in cognitive function after surgery is being increasingly reported, our preliminary results are in agreement with these studies.

Correspondence: *Imma Rico, Graduate, Neurology, Hospital Universitari de Bellvitge, Idibell, Feixa Llarga, S/N, L'Hospitalet de Llobregat 08907, Spain. E-mail: immaripo@gmail.com*

N. ROJO, M. JUNCADELLA & F. RUBIÓ. Neuropsychological alterations in patients with posterior cerebral artery stroke: a preliminary study.

Objective: Strokes in posterior cerebral artery (PCA) represent between 5 and 10 percent of all the cerebrovascular diseases (Brandt, Steinke et al., 2000). The clinical manifestations of these injuries produce a varied semiology: motor, sensitive, visual, neuropsychological and behavioral deficits. The main objective of this study was to describe the neuropsychological alterations produced by a stroke in the PCA and the establishment of a neuroanatomical relation with respect to the different alterations.

Participants and Methods: Ten patients suffering from a stroke on the right PCA territory and ten healthy subjects were included in the study. Both groups were matched with respect to age, gender and educative level. A battery of neuropsychological tests were administered to both groups in order to evaluate cognitive functions.

Results: The patient group showed a low performance with respect the control group on tasks of visual memory, facial recognition, and also on visual-spatial ability, visual-constructive ability and unilateral neglect. Most of the cognitive alterations of the patients group had a correlation with neuroanatomical changes supported by the literature.

Conclusions: After a stroke on the right PCA, various types of neuropsychological alterations can be observed: finger agnosia, unilateral neglect, topographic disorientation, prosopagnosia, spatial acalculia, visual memory, and visual-spatial and visual-constructive ability.

Correspondence: *Nuria Rojo, Universitat de Barcelona, Feixa Llarga s/n, L'Hospitalet de Llobregat (Barcelona) 08907, Spain. E-mail: nrojofit7@hotmail.com*

E. RUUSKANEN, M. LAHOSALO, J. KETTUNEN, L. NURMI, A. KOIVISTO & M. JEHKONEN. Predictors of Discharge to Home after Thrombolytic Treatment in Right Hemisphere Infarct Patients.

Objective: The aim of the study was to assess the association between thrombolysis and length of hospital stay after right hemisphere (RH) infarct. A further concern was to identify which cognitive functions were predictive of discharge.

Participants and Methods: The study group consisted of 78 patients with first RH infarct. Thirty-four patients had thrombolysis. Neuropsychological examinations were performed within 10 days of onset. The cognitive predictors tested were visual neglect, immediate visual memory, visual search and reasoning and visuoconstructive abilities, which were assessed with the Behavioural Inattention Test, the Visual Reproduction subtest of the WMS-R, and the Picture Completion and the Block Design subtests of the WAIS-R, respectively. The outcome variable was time from stroke to discharge to home. Statistical analyses were performed using the Cox regression model.

Results: Discharge time ranged from three to 48 days (Md = 6.0) in thrombolytic patients, and from one to 134 days (Md = 7.0) in non-thrombolytic patients. Thrombolysis did not show a statistically significant ($p = 0.175$) association with discharge time. Statistically significant single predictors were poor immediate visual memory ($p = 0.013$), defects in visual search and reasoning ($p = 0.035$) and visuoconstructive defects ($p = 0.001$), which lengthened the hospital stay. Visual neglect ($p = 0.071$) showed a non-significant trend towards a longer hospital stay.

Conclusions: Common cognitive defects connected to RH stroke were statistically significant single predictors of longer hospital stay. Thrombolytic treatment was not significantly associated with discharge time.

Correspondence: *Eija-Inkeri Ruuskanen, Neurology and Rehabilitation, Tampere University Hospital, P O Box 2000, Tampere 33521, Finland. E-mail: eija-inkeri.ruuskanen@pshp.fi*

J.J. SORIANO, J. MIRALBELL, J. LÓPEZ, E. LÓPEZ-CANCIO, N. BARGALLÓ, J.F. ARENILLAS, L. DORADO, M. BARRIOS, C. CÁCERES, M. ALZAMORA, G. PERA, A. DÁVALOS & M. MATARÓ. White Matter Lesions, Cardiovascular Risk Factors and Cognition in a Healthy Sample Between 50 and 65 Years-old.

Objective: More than half of all elderly individuals have some degree of white matter lesions (WML) on magnetic resonance imaging (MRI). Previous population-based studies suggest a relationship between the severity of WML and cardiovascular risk factors. Additionally, cerebral WML have been associated with cognitive dysfunction. Our aim is to study the prevalence of WML in stroke- and dementia-free individuals and its relationship with stroke risk and cognition.

Participants and Methods: Participants were a preliminary sample of 117 stroke-free adults aged 50-65 years from the Barcelona-ASIA Neuropsychology study. We defined the presence of WML as evidence of

early confluent or confluent white matter hyperintensities in deep white matter. Stroke risk was assessed using the REGICOR tables, a modified and validated version of the Framingham Stroke Risk Profile for Spanish population. We applied inter-groups comparison to evaluate differences in stroke risk factors and cognitive function between participants with and without WML.

Results: The prevalence of WML in our sample was 18%. We found no statistical differences in age or cardiovascular risk factors between participants with and without WML. Cognitive performance of the participants with WML was poorer in semantic verbal fluency ($t = 3.13$; $p = 0.003$) and a visual discrimination task ($z = -2.71$; $p = 0.007$).

Conclusions: The prevalence of WML in our sample is similar to previous population-based studies. These preliminary results suggest an influence of WML in semantic fluency and visoperceptive function in a healthy sample aged 50-65 years with low to moderate stroke risk.

Correspondence: *Juan J. Soriano, Psychiatry and Clinical Psychobiology, Universitat de Barcelona, Passeig de la Vall d'Hebron, 171, Barcelona 08035, Spain. E-mail: juan.jose.soriano@ub.edu*

K. TURUNEN, E. POUTIAINEN, S. MUSTANOJA & T. TATLISUMAK. Effects of First-Ever Cortical or Subcortical Brain Infarction on Memory and Executive Function.

Objective: Subcortical infarcts impair cognition if compared to controls, but the rate of cognitive decline is less clear if compared to cortical infarcts. The aim of this study was to examine if subcortical infarction impairs cognition as considerably as cortical infarction.

Participants and Methods: Subjects were consecutive inpatients in Helsinki University Central Hospital and Lapland Central Hospital, from the working population, and had first-ever ischemic stroke. Total of 85 patients had an infarction limited to either cortical areas (no subcortical grey matter involvement) or subcortical areas, and to either right or left side of the brain verified by CT or MRI. A neuropsychological examination, including measures of memory (WMS/LM, list learning) and executive function (TMA, word fluency, WMS-R/Dsp), was performed in the acute state.

Results: In Mancova with size of infarction as a covariate, a significant effect on memory was found for the location of infarction ($p < .05$). Although subsequent Ancovas did not reach significance, examination of estimated group means revealed more impaired memory in patients with subcortical infarcts when compared with cortical infarcts. No significant difference on executive function was found for the cortical vs. subcortical location of infarction. When the side of infarction was studied with Mancova and subsequent Ancovas, the patients with left sided infarcts were more impaired in memory and executive function in contrast to those with right sided infarcts ($p < .02$).

Conclusions: Subcortical infarcts can cause marked deterioration in cognitive functioning in the acute state, especially in the memory domain.

Correspondence: *Katri Turunen, University of Helsinki, Biomedicum 2U / Clinical Research Unit, PB 705, Helsinki 00029 HUS, Finland. E-mail: katri.turunen@helsinki.fi*

Visuospatial Functions/Neglect/Agnosia

L.L. BAYLIS & G.C. BAYLIS. The Effect of Asynchronous Presentation in Auditory Extinction: Two Different Processes in Extinction?

Objective: A number of studies (e.g., di Pellegrino et al., 1997) have shown that visual extinction is maximal when the two stimuli are presented at exactly the same time, despite the fact that patients do not subjectively experience them as being simultaneous. This finding has supported theories of extinction that focus on the production of tokens from the individual visual qualia. The present experiment was to determine if the same was true for auditory extinction.

Participants and Methods: These are persons with auditory extinction following brain damage due to stroke. They were presented with auditory stimuli (“T” and “O”) spoken in male or female voice, via loudspeakers to their left or right. The onset of the two stimuli were manipulated to produce six asynchrony conditions - three different temporal leads to each side - and a simultaneous presentation.

Results: When all types of extinction trials are pooled the same result is seen as in visual extinction. That is, auditory extinction is maximal when the stimuli are simultaneous. However, when trials are separated according to whether the stimuli are the same or different, a different pattern emerges. The extinction caused by stimuli that are the same is indeed maximal at simultaneity. However, the (lesser) extinction seen with non-identical stimuli may be maximal with a small ipsilesional lead.

Conclusions: These results suggest that the (lesser) extinction seen when two different stimuli are presented may be due to a qualitatively different process than that seen when two identical stimuli are presented. The extinction seen with identical stimuli may be due to failure to create an item token in the contralesional field when an identical stimulus is present ipsilesionally. However, the extinction seen with non-identical stimuli may be related to orienting to the ipsilesional side. Thus extinction due to identical stimuli may be due to a different process to the extinction seen when stimuli are non-identical.

Correspondence: *Leslie Baylis, D.Phil., Psychology, University of South Carolina, Barnwell College, Columbia, SC 29208. E-mail: baylist@mailbox.sc.edu*

I.S. BERNARDINO, M. VAN ASSELEN & M. CASTELO-BRANCO. Dissociation of local/global visual preference and performance in Williams Syndrome.

Objective: Williams syndrome (WS) is characterized by visuospatial impairment often described as reflecting a local processing bias. However, these evidences are controversial, which may also be compounded by the large variability in performance that has been found across studies. To investigate local processing bias in WS and define whether this bias determines performance in global-local tasks.

Participants and Methods: A preference task (match to sample similarity) and a performance task (requiring identification of local or global similarity) were conducted in 15 WS subjects using Navon hierarchical figures. Performance of WS group was compared to a chronological (n=15) and mental age-matched control group (n=15).

Results: The preference task demonstrated that 7 WS subjects showed a local bias, while 9 subjects performed like controls, exhibiting a global preference. Performance on the preference task was significantly correlated with education level and intelligence level. In the performance task WS subjects with a local processing bias made significantly more errors in the global condition than the WS subjects with a global preference.

Conclusions: Our results suggest that the local bias is not homogeneous across WS subjects, thus reflecting the great variability described in other studies. By comparing WS subjects with a global bias to WS subjects with a local bias, we showed that the education level and the level of intelligence are important factors in defining the processing style. Additionally, the local processing preference found in some WS subjects seems to be related to their global processing deficit, both being commonly correlated with the education level.

Correspondence: *Inês S. Bernardino, Visual Neuroscience Laboratory, IBILI, Azinhaga de Santa Comba, Celas, Coimbra 3000-354, Portugal. E-mail: inesb@sapo.pt*

C. GERLACH & K.O. TOFT. Now you see them, now you don't: How to produce a category-effect the way you want it.

Objective: Variability in findings regarding category-effects in visual object processing may be accounted for by differences in task requirements. According to the Pre-semantic Account of Category Effects (PACE) (Gerlach, 2008, ISBN:978-87-7684-274-1) category-effects can arise at two stages in visual object recognition. These stages are:

(i) shape configuration, where visual elements are bound into elaborate shape descriptions in which the relationships between the objects' constituent parts are specified, and (ii) selection, where the configured shapes are matched with representations stored in visual long-term memory. Whether category-effects are observed at these stages, and which direction they take, will depend on task parameters like difficulty, stimulus characteristics (silhouettes, full line-drawings, fragmented forms), stimulus exposure duration as well as interactions between these parameters.

Participants and Methods: 12 specific hypotheses are derived from PACE regarding the presence and direction of category-effects. These hypotheses are tested by means of performance on object decision tasks (deciding whether pictures represent real objects or nonobjects) which differ in difficulty, exposure duration and stimulus type.

Conclusions: Preliminary data generally support the hypotheses: Processing of natural objects is generally more efficient at short stimulus exposures whereas processing of artefacts is generally more efficient at long stimulus exposures. Likewise, natural objects are generally processed more efficiently than artefacts when stimuli are presented as silhouettes or fragmented forms. However, when the demand on perceptual differentiation is high and viewing conditions are optimal artefacts are processed more efficiently than natural objects.

Correspondence: *Christian Gerlach, University of Aarhus, Tuborgvej 164, Copenhagen NV 2400, Denmark. E-mail: cge@dpu.dk*

J. KETTUNEN, M. LAIHOSALO, E. RUUSKANEN, L. NURMI, A. KOIVISTO, P. DASTIDAR, J. OLLIKAINEN & M. JEHKONEN. Incidence of left visual neglect after thrombolytic treatment in acute right hemisphere stroke patients.

Objective: The association between thrombolytic treatment and left visual neglect (VN) following acute right hemisphere (RH) brain infarct has received little attention. The aim of this study was to evaluate the incidence of VN after thrombolytic treatment in RH patients.

Participants and Methods: The study group consisted of 78 RH patients who underwent a neuropsychological, a neurological (National Institute of Health Stroke Scale; NIHSS, Barthel Index; BI) and a neuro-radiological examination. VN was evaluated with six conventional subtests of the Behavioural Inattention Test (BIT). The criterion for VN was failure in at least two of these six tests.

Results: Neglect was present in 22% of the RH patients, 28% in the non-thrombolytic group (T-) and 14% in the thrombolytic group (T+). A statistically significant difference was found between the T- and T+ groups in stroke severity ($p = 0.01$), but not in VN ($p = 0.15$) or BI ($p = 0.95$). The T- group had more severe stroke than the T+ group ($p = 0.01$).

Conclusions: Our results suggest that thrombolytic treatment might decrease the presence of VN, but statistically significant differences were not found.

Correspondence: *Mervi Jehkonen, PhD, Department of Psychology, University of Tampere, Kalevantie 5, University of Tampere 33014, Finland. E-mail: mervi.jehkonen@uta.fi*

A. ALZAMORA, M. LAIHOSALO, T. SAUNAMÄKI, P. KUIKKA & M. JEHKONEN. Driving Ability in Stroke Patients with Residual Visual Inattention: A Pilot Study.

Objective: A pilot study was conducted with three right hemisphere infarct patients with residual visual inattention in order to assess their driving ability.

Participants and Methods: All three patients had acute visual neglect, which was re-assessed in connection with an evaluation of their driving ability. The neuropsychological examination consisted of six conventional subtests of the Behavioural Inattention Test (BIT) and two computerized visual tests from the Vienna Test System: the Peripheral Perception Test (PPT) and the Signal Detection Test (SDT). Driving ability was assessed by a multidisciplinary team and included an on-road driving evaluation by a licensed driving instructor.

Results: All patients performed adequately in the BIT subtests. In the PPT all patients had normal visual fields, but they made omissions on both sides. In the SDT their visual search was slightly poorer on the left than on the right side. All patients passed the on-road driving test and were considered capable of driving.

Conclusions: This pilot study suggests that it is possible for infarct patients to recover from neglect to such a degree that they can regain their driving ability. It also underlines the importance of adopting a multidisciplinary approach to assessing patients with residual visual inattention. More research is needed to determine whether there is a risk that these patients' visual attentional performance may become too poor in subnormal operator states (e.g. tired) or in more demanding driving tasks (e.g. at night or in poor weather conditions).

Correspondence: *Mervi Jehkonen, PhD, Department of Psychology, University of Tampere, Kalevantie 5, University of Tampere 33014, Finland. E-mail: mervi.jehkonen@uta.fi*

V.W. MARK & A.J. WOODS. A Novel Use of the Cancellation Test to Assess Cognitive Change after Acute Brain Injury.

Objective: Cancellation tests are generally used in brain injury to assess either spatial attention or cognitive speed. More recently, executive functions have been explored with cancellation tests. Recent work [Mark et al, JINS 2008; 14(suppl 1):287] showed that controls maintain efficient search organization on cancellation even when their spatial working memory is stressed by not allowing their target markings to be seen ("invisible cancellation"). We hypothesized that brain injury patients with worse search organization during invisible vs. visible cancellation would show less cognitive recovery due to impaired executive control.

Participants and Methods: 7 adult neurorehabilitation inpatients with acute brain injury were evaluated with a touchscreen computer on visible vs. invisible cancellation. Each test version was administered twice in an ABBA design. The outcome measure was the change in the average quantified search efficiency measure ("best r" regression coefficient; Mark et al, Neurology 2004) between visible vs. invisible cancellation.

Results: 6/7 patients either showed no change or improved in their best r during invisible cancellation. In contrast, the other patient's best r became 16% worse during invisible cancellation. Furthermore, while the first 6 patients' Functional Independence Measure (FIM) cognitive efficiency scores from admission to discharge were ≥ 0.4 , the last patient's FIM cognitive efficiency was 0 (i.e., unimproved).

Conclusions: Changes in search efficiency between visible vs. invisible cancellation may reflect the integrity of problem-solving skills that are relevant to neurologic recovery during rehabilitation. The touchscreen cancellation test may provide a useful prognostic assessment of cognitive skills important to functional recovery separate from spatial attention or speed. Further research is warranted to determine how the changes between visible vs. invisible cancellation are related to functional recovery and other cognitive measures.

Correspondence: *Victor W. Mark, M.D., Physical Medicine and Rehabilitation, University of Alabama at Birmingham, 619 19th Street South, SRC 190, Birmingham, AL 35249-7330. E-mail: vmark@uab.edu*

L.J. NURMI, J. KETTUNEN, M. LAIHOSALO, E. RUUSKANEN & M. JEHKONEN. Right Hemisphere Infarct Patients and Healthy Controls: Comparing Starting Points in Cancellation Tasks of the Behavioural Inattention Test.

Objective: The aim was to compare starting points (SP) in cancellation tasks of the Behavioural Inattention Test (BIT) between right hemisphere (RH) infarct patients and healthy controls. Furthermore, the reference value for a normal starting point was defined for each task.

Participants and Methods: The study included 70 RH infarct patients, 15 of whom had visual neglect (N+) and 55 did not (N-). The control group included 33 healthy volunteers (H). The SPs were compared in three BIT cancellation tasks. SP was expressed as distance from the median line of the stimulus display. Reference values were obtained by calculating the mean and standard deviation of the SPs for healthy subjects.

Results: In each task, the N+ group started the cancellations mainly from the right. Most SPs in the N- and H groups were located on the left, slightly more so in the H group. Initiating most of the tasks (2 or more) outside the reference value was exceptional among the H subjects, but typical among the N+ patients. In the N- group one third of the patients started the majority of the tasks outside the reference value.

Conclusions: Nearly one third of the N- patients showed an exceptional tendency to start cancellations outside the reference value, which may indicate the presence of mild visual inattention. In order to identify this subgroup, the SPs should be evaluated qualitatively in connection within clinical assessment of neglect.

Correspondence: *Laura J. Nurmi, Psychology, University of Tampere, Kalevantie 5, University of Tampere 33014, Finland. E-mail: laura.j.nurmi@uta.fi*

L.J. NURMI, M. RANNISTO & M. JEHKONEN. Sensitivity of the Behavioural Inattention Test in Assessing Chronic Neglect.

Objective: This case study examined patients in the chronic phase of right hemisphere (RH) stroke to determine the sensitivity of the Behavioural Inattention Test (BIT) in assessing chronic neglect. Seven cases with chronic neglect symptoms are introduced.

Participants and Methods: Peripersonal visual neglect was assessed using the six conventional BIT subtests. The criterion for neglect was failure in at least two of the subtests. Neglect severity was scored on a scale from 0 to 6 (0 = no neglect, 1 = visual inattention, 2 = mild neglect, 3-4 = moderate neglect, 5-6 = severe neglect). Behaviour was observed in real-life situations by a neuropsychologist, and the patients were interviewed about their self-reported neglect symptoms in order to evaluate personal and extrapersonal neglect.

Results: Time since stroke onset ranged from 2 years 4 months to 13 years 10 months. All patients reported personal and extrapersonal neglect affecting their everyday activities. Neglect behaviours were also verified in the neuropsychological observations. The BIT tests correctly identified four of the seven neglect patients, as three patients showed no neglect, two had mild and two had moderate neglect. The scores for peripersonal neglect severity ranged from 0 to 3.

Conclusions: Paper-pencil tests are not on their own sensitive enough to identify neglect in the chronic phase. These tests must be complemented by computerized methods to assess general attention, adequate observations by a professional, and self-ratings by the patient and a close relative. Correspondence: *Laura J. Nurmi, Psychology, University of Tampere, Kalevantie 5, University of Tampere 33014, Finland. E-mail: laura.j.nurmi@uta.fi*

M. SHIBASAKI & T. TOSHIMA. Visual Integration Deficit in a Patient with Prosopagnosia.

Objective: Many studies have argued that in face recognition, configural processing, which deals with the spatial relation of each component and their global configuration, predominates over other types of objects. To examine the mechanisms underlying impaired visual information processing in prosopagnosia, we investigated a prosopagnosic patient's visual integration ability—a factor considered crucial for configural processing.

Participants and Methods: The participants were IM, a 71-year-old right-handed male patient who exhibited prosopagnosia without noticeable symptoms of visual object agnosia following a right-hemisphere occipitotemporal lesion, and other age-matched control participants. In Experiment 1, the participants performed three visual spatial integration tasks (overlapping figures test, hidden figures test, and Navon's hierarchical letters test) that required them to spatially integrate visual elements. In Experiment 2, they performed two visual spatiotemporal integration tasks that required them to spatiotemporally integrate visual elements that were presented successively under various stimulus onset asynchronies (SOAs), using the element presentation method (Ikeda & Uchikawa, 1978).

Results: In both experiments, IM demonstrated a marked deficit in visual object recognition. He was unable to integrate visual elements spatially and spatiotemporally as a whole, in both the spatial integration task and spatiotemporal integration task. Moreover, in contrast to the control participants, IM showed a local precedence effect in Navon's test.

Conclusions: IM has severe problems in the visual integration process that integrates local parts with more holistic properties, and this is likely to be the root cause of his prosopagnosia. Therefore, IM's face identification deficit could be categorized as "integrative prosopagnosia."

Correspondence: *Mitsuyo Shibasaki, Psychology, Meisei University, 2-1-1, Hodokubo, Hino City, Tokyo 191-8506, Japan. E-mail: mitsuyo@psy.meisei-u.ac.jp*

M. ALEGRET, M. BOADA, G. VINYES-JUNQUE, G. CUBERAS, A. ESPINOSA, P. MARTÍNEZ-LAGE, S. VALERO, I. HERNÁNDEZ, M. ROSENDE-ROCA, I. ROCA & L. TÁRRAGA. Brain perfusion correlates of visuoperceptual deficits in preclinical and mild Alzheimer's disease.

Objective: Visuoperceptual processing is impaired early in the clinical course of Alzheimer's disease (AD). The 15-Objects test (15-OT) is a visual discrimination task similar to the Poppelreuter test, but more complex. The 15-OT allows detecting visuoperceptual deficits in the preclinical and mild AD stages when classical tests such as Poppelreuter's are still unable to detect subtle deficits. The aim of the present study was to determine the cerebral areas related to the 15-OT performance in subjects with MCI, mild AD and normal aging.

Participants and Methods: Fifty-one mild AD patients, 48 subjects with MCI and 49 healthy elderly controls underwent a 99mTc-ethyl cysteinate dimer SPECT and were administered the 15-OT, out of the neurological and neuropsychological examinations for diagnosis. SPM5 analyses were used to carry out group comparisons and correlation between 15-OT performance and cerebral perfusion.

Results: The 15-OT performances were significantly different between groups. MCI scored between AD and EC. Compared to controls, the perfusion was significantly decreased in the temporoparietal regions of AD patients, and in the posterior cingulate and medial temporal of MCI. A statistically significant correlation was found between a worse performance on the 15-OT and a reduced perfusion on several brain regions, mainly precuneus and posterior cingulate.

Conclusions: Preclinical and mild AD patients differed from controls in the 15-OT visuoperceptual performance and in regional cerebral perfusion. Moreover, a worse execution on the 15-OT was found to be related to reduced rCBF in some specific parietal areas.

Correspondence: *Montse Alegret, PhD, Marques de Sentmenat, 35-37, Barcelona 08014, Spain. E-mail: malegret@funcacioace.com*

M.A. WITKOWSKA & D. BIECHOWSKA. An anosognosia prevalence of neglect and depression symptoms in patients after brain damage.

Objective: Anosognosia - self consciousness disorder in which a person seems unaware of or denies the existence of physical or psychical disability - is a common consequence of brain injury. It can be related to hemiplegia or can manifest as an unilateral inattention of usually the left side of the body. In the second case the deficit is most often connected with neglect symptoms. The neglect syndrome is a group of various neuropsychological symptoms and it is a relatively often consequence of right hemisphere injury. The common feature of these disorders is that a patient unwittingly ignore one side of body and/or the space surrounding it.

Furthermore, brain damage is a major overload for the patient, its possible complications, long-term rehabilitation and the likelihood of chronic disability has an adverse effect on the patient's well-being and increases the possibility of depression. The main purpose of this study is clinical characteristic of anosognosia symptoms and associated disorders, such as neglect and/or depression.

Participants and Methods: Neglect, anosognosia and depression were examined in 36 right-handed subjects. Selection of patients was made on the basis of the results of CT and information about the history of the patient disease. The study was preceded by personal history, and the tests were assessed in the invariable order - Beck Depression Inventory, standardized anosognosia questionnaire, the Schenkenberger line bisection test, the crossing out of the "e" letter task.

Conclusions: Neuropsychological consequences of brain injuries vary from the side and the size of the brain damage, but even the injuries of a similar extent and location produce a broad spectrum of symptoms that mostly could not be explained by a one psychological pathomechanism. Correspondence: *Marta A. Witkowska, masters, University of Gdansk, Pomorska 68, Gdansk 80-343, Poland. E-mail: psymwi@univ.gda.pl*

Other

D.H. BIECHOWSKA. Effects of Hormone Replacement Therapy on Cognition: Evidence from Executive Dysfunction.

Objective: The hippocampus has long been presumed the primary site of action of estrogens on cognition; and explicit memory is considered the cognitive function most vulnerable to menopausal loss of estrogen. We hypothesize instead that the prefrontal cortex and its neural circuitry are prime mediators of estrogen's role in cognition. We also propose that previously reported menopausal cognitive decline, presumed to be hippocampally mediated, may be secondary to executive dysfunction.

Participants and Methods: We used a cross sectional design to compare the performance of 15 menopausal women on hormone replacement therapy (HRT) and 15 menopausal women with no prior exposure to HRT on a battery of neuropsychological tests. The battery was comprised primarily of tests of memory and executive functioning. Executive functioning is mediated by the frontal lobes and encompasses working memory, directed attention, the inhibition of inappropriate responses, cognitive set switching, and behavioral monitoring.

Results: Results yielded both qualitative and quantitative evidence for disruption of cognitive processes subserved by the frontal lobes rather than the hippocampus: 1) despite intact free recall on a list-learning task (AVLT), untreated menopausal women were relatively impaired in correctly recognizing words previously learned and distinguishing them from items not on the list (discriminability), 2) untreated women also had difficulty inhibiting inappropriate responses in the form of perseverative errors, and 3) untreated menopausal women consistently performed worse on the tests of working memory.

Conclusions: The prefrontal cortex is critical for intact working memory and estrogen enhances performance on working memory tasks. In conclusion, this study provides preliminary evidence for executive dysfunction in untreated menopausal women as women with HRT outperformed women without HRT on tests requiring directed attention, inhibition of inappropriate responses, and cognitive set switching.

Correspondence: *Daria H. Biechowska, Institute of Psychology, University of Gdansk, Pomorska 68, Gdansk 80-343, Poland. E-mail: psydlb@univ.gda.pl*

E. BOLCEKOVA, J. FIALA & P. KULISTÁK. Lesion in right cerebellar hemisphere leads to greater impairment in executive and visuospatial functioning than left cerebellar lesion.

Objective: Traditionally, the cerebellum has been regarded as a structure involved in coordinating skilled movements and muscle tone. However, over the past decades, a role of cerebellum in higher cognitive functions has been considered. The aim of this study was to further investigate this field.

Participants and Methods: We investigated 11 subjects with cerebellar lesion limited to right (R, n=5) or left (L, n=6) hemisphere and 7 healthy controls (C). The extent and nature of the lesion was evaluated

using MRI. An extensive neuropsychological assessment, which included cognitive and affective functions, was performed. We also employed the International Cooperative Ataxia Rating Scale (ICARS). Possible functional relationships between cerebellar hemispheres and other brain areas was examined using SPECT.

Results: Compared to C, the R group performed significantly lower in visuospatial functioning (Rey-Osterrieth Complex Figure Test) and in executive functions tests: Stroop Color-Word Test, Trail Making Test, Frontal Assessment Battery, Wisconsin Card Sorting Test and Tower of Hanoi Test. Moreover, we found significant differences between R and L groups in Stroop Color-Word Test, Trail Making Test and Frontal Assessment Battery. We found no difference between R and L groups in motor impairment identified by ICARS.

SPECT revealed that hypoperfusion in one cerebellar hemisphere was accompanied by hypoperfusion in contralateral frontal lobe (cerebello-cerebral diaschisis).

Conclusions: We conclude that lesion in right cerebellar hemisphere is associated with significantly worse performance in several executive and visuospatial tests in comparison to healthy controls, but also in comparison to subjects with left cerebellar lesion.

Correspondence: *Eva Bolcekova, Charles University, Na Mokrinske, Prague 13004, Czech Republic. E-mail: eva.bolcekova@gmail.com*

A. ZANINOTTO, O.A. BUENO, M. PRADELLA-HALLINAN, S. TUFIK, J. RUSTED, C. STOUGH & S. POMPEIA. Performance on Visuospatial Domains are Improved after Acute Donepezil Intake.

Objective: To evaluate cognitive effects of an acute oral dose of donepezil in young, healthy volunteers, with a focus on visuospatial abilities.

Participants and Methods: This was a double-blind, placebo controlled, parallel group study of cognitive effects of acute oral donepezil (5 mg) in young, healthy, male volunteers. Subjects were tested after 90 min, to coincide with previous testing in the literature, and at 210 min, at peak-plasma concentration of the drug. The test battery included tasks that tap visuospatial processing, object identity and position recall, as well as evaluations of mood alterations.

Results: Analyses showed performance improvement after donepezil in memory for object identity, static positions, and the integration of identity with spatial location at both testing times. Improvement in some aspects of mood were also observed after donepezil, and correlated with better spatial location.

Conclusions: Positive cognitive effects can be observed in visuo (what or ventral pathway) and spatial (how/where or dorsal pathway) static domains in young, healthy volunteers after acute intake of donepezil before peak-plasma concentration is reached. Improvement of mood was related with better performance in spatial tests.

Correspondence: *Ana Luiza Zaninotto, Psicobiologia, Unifesp, Rua Bela Vista 517, Jundiaí 13207-780, Brazil. E-mail: analu@psicobio.epm.br*

C. MARUTA, R. GOUVEIA & I.P. MARTINS. Cognition in Migraine.

Objective: Migraine is one of the most common neurological disorders with a primary neurogenic pathogenesis involving part of the cerebral cortex. Migraine patients often have cognitive complaints during the attacks but there is little knowledge of their long term effect on cognition. We studied the relation between migraine diagnosis and cognitive performance in a sample of GP clinic patients (≥ 50 years of age) in a urban area.

Participants and Methods: 332 consecutive patients of six GP clinics centres in a metropolitan area were invited to participate. Informed consent was obtained and MMSE excluded cognitive impairment. Migraine diagnosis was made by the ID-Migraine (Lipton) and cognition was evaluated by a battery of memory (CVLT - 9, Digit Span, Immediate and Delayed Visual Memory and Faces from WMS - III), executive function (Symbol Search, TMT, Stroop Test, Verbal and Phonemic Fluency), Reading and Vocabulary tests, a scale of memory complaints (SMQ) and depression (GDS). Participants' age ranged between 50 and 92 years old (65.6 yrs on average), with 6.9 (+ 4.2) years of literacy, 63% female.

Results: Seventy out of 332 patients complained of frequent headaches of whom 42 fulfilled the diagnosis of migraine. These subjects were predominantly females (37) and younger than non migraineurs (61 versus 66 yrs). There were no differences concerning literacy. Migraineurs had significantly higher scores in some memory tests (proactive interference, long delay free recall and less recognition intrusions), yet they had lower scores in tests of divided attention, processing speed (Reading, Trail B) and Digit Span Forward. They also had significantly more memory complaints. Their better performance in memory could be explained by their younger age (regression analysis) but not their worse performance.

Conclusions: These results suggest that migraine may be associated with less efficient executive functions but the effect of medication cannot be excluded. More studies are necessary to understand these effects.

Correspondence: *Carolina Maruta, Laboratory of Language Research, Molecular Medicine Institute, Faculty of Medicine, Av. Professor Egas Moniz, Lisbon 1649-028, Portugal. E-mail: carolmaruta@gmail.com*

A. TAKEUCHI, C. TENGVAR & A. BARTFAL. Characteristics of behavioural responses measured by the Wessex Head Injury Matrix (WHIM) in different functional diagnoses in severe brain injury.

Objective: It is of utmost ethical and clinical importance to disclose behavioural signs for the existence and improvement of consciousness and self-awareness within the group of functional syndromes known as "low responsive state". Detailed systematic behavioural assessment based on structured observations by trained observer is the only way to observe recovery trajectories. The Wessex Head Injury Matrix (WHIM) (Shiel, 2000) was created to monitor those subtle changes. Our aim was to detect differences in activity pattern between different functional diagnoses in severe brain injury by applying the WHIM.

Participants and Methods: Five patients after severe ABI in the five different functional categories; vegetative state (VG), minimally conscious state (MCS), akinetic mutism (AM), the locked-in syndrome (LIS) and the paramedian diencephalic syndrome (PDS) were examined from December 2007 to December 2008 after obtaining informed consent from the relatives. Assessments were carried out by one examiner (AT) who was not informed about the diagnosis.

Results: The different diagnoses were associated with different levels of behaviour. Four patients showed improvements on behavioural score including very subtle changes in VS-diagnosed patient. It was difficult to distinguish between the different diagnoses due to some overlaps, e.g., transferring from VS to MCS. Repeated assessments in various situations were necessary since scoring was influenced by medical and environmental factors.

Conclusions: The WHIM was found to be useful for estimating general level of responsiveness and for following the recovery process. In order to capture the accurate behaviour, the assessment should be performed in various situations.

Correspondence: *Ai Takeuchi, Section of Liaison Psychiatry & Palliative Medicine, Graduate School of Tokyo Medical and Dental University; 6-5-90 Miyazaki Miyamae-ku, Kawasaki 216-0033, Japan. E-mail: umeklppm@tmd.ac.jp*

E. VALEVICA, D. VOITA, A. VITOLS & A. ZAKKE. Peculiarities of Autonomic Nervous System Function in Migraine Patients with Increased Stress Reactivity in Headache Free Period.

Objective: There is lack of data about autonomic nervous system (ANS) function in migraine patients with increased stress reactivity.

Participants and Methods: Migraine patients (female, mean age 29,3 \pm 4,8 years, n=22) in headache free period and age and gender matched healthy controls (n=10) were tested at physical rest, during 10 s. pre-contraction period (mental stress), isometric contraction and recovery period. Heart rate (HR) and baroreflex sensitivity (BRS) were analyzed.

Results: At rest 40 % of migraine patients (group M1) had increased HR comparing to controls (78,8 \pm 8,4 vs. 77,1 \pm 4,9 beats/min; NS). The rest of migraine patients (group M2) had significantly decreased HR comparing to control group (61,9 \pm 5,6 beats/min; P=0,002). M1 group had statistically significant tendency to decreased BRS at rest

comparing to control group ($9,5 \pm 2,3$ vs. $15,0 \pm 3,4$ ms/mmHg) and statistically significant ($P=0,004$) difference comparing to M2 group $29,7 \pm 10,1$ ms/mmHg. In 10 s. precontraction period to M2 group HR statistically significant difference were stated comparing to other analyzed groups ($70,7 \pm 6,3$ vs. $89,0 \pm 3,6$ vs. $84,2 \pm 8,8$ beats/min $P=0,005$). HR in M2 group during recovery period was significantly decreased comparing to controls and M1 group ($61,6 \pm 5,9$ vs. $76,0 \pm 6,2$ vs. $74,5 \pm 9,5$ beats/min; $P=0,018$).

Conclusions: It was concluded that M1 group had decreased parasympathetic activity. But patients of M2 group – increased parasympathetic activity. M1 group patients would be suitable for biofeedback trainings. Further investigation will be needed.

Correspondence: *Erita Valevica, LU Institute of Cardiology, Pilsonu 13, Riga LV-1002, Latvia. E-mail: kolleenster@gmail.com*

S. LEE. The Reduction of Anxiety Rate for the Stroke Patients and Caregivers.

Objective: To utilize Lee Cross-cultural Anxiety Dream Scale(2008) as a clinical measurement tool for the stroke patients and caregivers after receiving rehabilitative couple therapy interventions.

Participants and Methods: 15 male Korean aged stroke patients(mean age=72.5) and 15 female caregivers(wives)(mean age=67.2) were selected for rehabilitative couple therapy interventions. 15 male stroke patients out of 39 stroke patients were screened, by the Halstead-Reitan Neuropsychological Test battery, as not having greater impairments, and they have wives as primary caregivers at home. The male stroke patients and their wives were arranged to receive total 16 sessions of rehabilitative couple therapy during and 6 months after inpatient hospitalization. The patients were referred for rehabilitative couple therapy from major stroke rehabilitation hospitals. Pretreatment and posttreatment assessment of the Lee Cross-cultural Anxiety Dream Scale(2008) were administered to measure anxiety dream scale and to evaluate significant reduction of anxiety dream scale by having rehabilitative couple therapy interventions.

Results: Between pretreatment and posttreatment, there was significant reduction of anxiety dream scale(male: $p<0.01$ and female: $p<0.001$). The Cross-cultural Anxiety Dream Scale has been proven as an effective clinical tool to measure the subjects' level of anxiety at the season of life crisis having the strokes.

Conclusions: The research results demonstrate the efficacy of rehabilitative couple therapy as a useful therapeutic intervention in reducing the anxiety level of the stroke patients and of their spouses.

Correspondence: *Sang Bok Lee, Ph.D., Kangnam University, San 6-2, Gugal-Dong, Giheung-Gu, Yongin City 446-702, Korea, South. E-mail: brainwork28@hanmail.net*

Invited Plenary: The Nature of Music from a Neurobiological Perspective

Speaker: Isabelle Peretz

11:00 a.m.–12:00 p.m.

I. PERETZ. The Nature of Music from a Neurobiological Perspective.

The last decade of research has provided compelling evidence that the ability to engage with music is a fundamental human trait, yet the biological basis of music remains largely unknown. Recent findings indicate that a small number of individuals have severe musical problems and that these deficiencies have neuro-genetic underpinnings. Such a musical disorder is termed “congenital amusia”, an umbrella term for lifelong musical disabilities that cannot be attributed to mental retardation, deafness, lack of exposure, or brain damage after birth. Interestingly, the disorder appears music-specific. Thus, congenital amusia provides a natural experiment—a rare chance to examine the biological basis of music by tracing causal links between genes, environment, brain, and behavior.

Correspondence: *Isabelle Peretz, International Laboratory for Brain, Music and Sound Research, Psychology Department, University of Montreal, BRAMS-Pavillon 1420 Mont-Royal, Montreal, QC H2V 4P3, Canada. E-mail: isabelle.peretz@umontreal.ca*

FRIDAY AFTERNOON, JULY 31, 2009

Paper Session 4: Lateralisation and Neural Correlates of Cognition

1:30–3:00 p.m.

A. BOUMA, J.M. LUST, T. GROOTHUIS, C. VAN DE BEEK, P. COHEN-KETTENIS & R.H. GEUZE. Effects of Prenatal Testosterone Exposure on Handedness in Children.

Objective: Family studies have clearly shown that hand preference has an important genetic component. This does however not exclude a major role of environmental factors in the development and expression of handedness. Although the effects of prenatal sex hormones on cerebral lateralization are still controversial, there is good evidence that prenatal sex hormones associated with intra-uterine environment have a strong influence on the brain lateralization of the developing fetus. The present study is designed to investigate the influence of prenatal testosterone on handedness in children at the age of 6.5 years.

Participants and Methods: Prenatal testosterone levels were measured in amniotic fluid of healthy mothers between 15 and 18 weeks of gestation. All children (34 boys, 31 girls) were asked to perform the actions of an 11-item questionnaire. The direction and degree of hand preference were measured by using a laterality index, which ranged from -1 for strong left-handedness to +1 for strong right-handedness.

Results: The results revealed that prenatal testosterone was not related to the laterality index of handedness, but to the strength of hand preference (absolute hand preference scores), independent of direction, suggesting that higher prenatal testosterone exposure was related to a decrease in the strength of hand preference. Sex did not influence these results.

Conclusions: The present study suggests that prenatal testosterone modulates the strength of hand preference, but not the direction. These findings have important implications for genetic and environmental factors implied in handedness.

Correspondence: *Anke Bouma, Clinical & Developmental Psychology / Neuropsychology, Rijksuniversiteit Groningen, Grote Kruisstraat 2/1, Groningen 9712 TS, Netherlands. E-mail: j.m.bouma@rug.nl*

R. EVERTS, S. HARVEY, L. LILLYWHITE, J. WRENNALL, D. ABBOTT, L. GONZALEZ, M. KEAN, G. JACKSON & V. ANDERSON. Language Lateralisation Correlates with Verbal Memory Performance in Children with Focal Epilepsy.

Objective: Assessment of language dominance with functional magnetic resonance imaging (fMRI) and neuropsychological assessment is often used prior to neurosurgery. The present study explores whether language lateralisation and cognitive performance are systematically related in young patients with unilateral focal epilepsy.

Participants and Methods: Language fMRI and neuropsychological assessment (language, visuo-spatial perception, memory) of 40 patients

(7-18 years) with unilateral, refractory focal epilepsy in temporal and/or frontal areas of the left (n=23) or right hemisphere (n=17) were analysed. fMRI data of 18 healthy controls (7-18 years) served as a normative sample. A laterality index was computed to determine the lateralization of activation in three regions of interest (frontal, parietal, temporal).

Results: The patient group showed a significant correlation between language lateralisation and verbal memory performance over all three regions of interest. Bilateral or right-sided language lateralisation correlated with better verbal memory performance. Verbal memory performance made the largest unique contribution to language lateralisation, while handedness and side of seizures did not contribute to the variance in language lateralisation. Language lateralisation did not differ between patients with left- and right-sided epilepsy or between left- and right-handers. The correlation between language lateralisation and verbal memory performance was present in patients with left-sided, but not in patients with right-sided epilepsy.

Conclusions: This finding reflects an association between neocortical language areas and hippocampal memory regions in patients with left-sided epilepsy. Knowledge about the relationship between language lateralisation and verbal memory performance allows for a refined clinical interpretation of pre-surgical language fMRI and neuropsychological data.

Correspondence: *Regula Everts, Murdoch Childrens Research Institute, Royal Children's Hospital, Parkville, VIC 3052, Australia. E-mail: regula@everts.ch*

A. HULTÉN, H. LAAKSONEN, M. VIHILA, M. LAINE & R. SALMELIN. Neural Correlates of Word Learning and Forgetting: An MEG Study.

Objective: We set out to explore whether neural correlates of naming would predict remembering vs. forgetting of newly acquired words over a period of ten months.

Participants and Methods: Ten healthy participants learned either the name, usage or both for a set of pictures of ancient unfamiliar tools. Additional sets of unfamiliar and familiar tools served as control items. In magnetoencephalography (MEG) recordings before and after successful learning, the participants attempted to name the pictured objects. To track changes in neural activation patterns during the forgetting phase, the MEG recording was repeated one, four and eight weeks and 10 months after training.

Results: Behavioral learning rates were fairly similar across participants but there was a remarkable individual variation in forgetting: the percentage of correctly named items at 10 months after learning varied from 20 to 88%. The MEG results showed that the active brain areas remained the same in all recordings, with marked individual differences in response strength as time elapsed between the recordings. The individual change of activation strength in the left frontal and temporal cortex co-varied with the behavioral performance: a rise/fall of activation strength within one week of learning predicted a participant's successful/unsuccessful name retrieval ten months later.

Conclusions: The activation pattern that was established during the learning (Hultén, et al. 2008) remained similar throughout the follow-up recordings. Furthermore, the results suggests that long-lasting access to novel words requires efficient engagement of the left frontal and temporal areas soon after learning.

Correspondence: *Annika Hultén, PsM, Brain Research Unit, Low Temperature Laboratory, TKK, PO BOX 5100, Espoo 02015 TKK, Finland. E-mail: annika@neuro.hut.fi*

O. MEULENBROEK, R. KESSELS, M. OLDE RIKKERT, M. RIJPKEMA & G. FERNÁNDEZ. Neural Underpinnings of Autobiographical Memory Retrieval in Alzheimer's Disease.

Objective: Patients with Alzheimer's Disease (AD) seem to base their remote memories on factual knowledge (i.e. semantic memory) and less on an actual re-experience of the episode. This shift is probably re-

lated to structural decline of the hippocampi, and leads to the hypothesis that AD patients will attempt to compensate by activating e.g. the left inferior frontal gyrus (LIFG; semantic processing) and the ventromedial prefrontal cortex (vmPFC; interacts with hippocampus during consolidation).

Participants and Methods: Using fMRI, we investigated 22 healthy elderly subjects (aged 69.6±8.6, MMSE 29.0±1.1) and 21 patients with early stage probable AD (aged 72.4±7.1, MMSE 25.1±3.2) (research criteria Dubois 2007). Matched Autobiographical and Semantic (world knowledge) statements were visually presented, and subjects indicated if the statements were true. Autobiographical statements were derived from an interview; memories were scored on details.

Results: Besides similar memory length, AD-patients reported less episodic ($F(1,41)=17.70, P<.001$), and more semantic details than healthy elderly ($F(1,41)=13.15, P<.005$). During fMRI, AD-patients performed lower on Autobiographical ($F(1,41)=15.89, P<.001$) and Semantic ($F(1,41)=21.88, P<.001$) statements.

Subjects activate brain regions involved in autobiographical retrieval during fMRI (autobiographical versus semantic). Controlling the data for performance, AD-patients showed enhanced activity in LIFG, vmPFC, right precuneus and left lingual gyrus (Patients>Controls). Also, AD-patients had smaller hippocampi ($t_{40}=2.02, P<.05$). Activation of LIFG and vmPFC was significantly negatively correlated with hippocampal volume in the AD-patients only ($r=-0.40, P<.05$ and $r=-0.37, P<.05$).

Conclusions: AD-patients attempt to compensate for their hippocampal damage/ autobiographical memory impairment by relying more on the vmPFC as a linking node and by increasing semantic processing.

Correspondence: *Olga Meulenbroek, MSc, Donders Institute for Brain, Cognition and Behaviour, Postbus 9101, Nijmegen 6500 HB, Netherlands. E-mail: o.meulenbroek@donders.ru.nl*

E. DE BRUIJN, I.A. BRAZIL, D. VON RHEIN, K. VON BORRIES, E. BULTEN, J. BUITELAAR & R. VERKES. Neural Correlates of the Detection of Own and Other's Errors in Individuals with Psychopathy.

Objective: For successful goal-directed behavior it is essential for humans to continuously monitor one's actions and detect errors as fast as possible. EEG studies have identified an error-related ERP component known as the error-related negativity or ERN, originating from posterior medial frontal cortex. Recently, an ERN has also been demonstrated following the observation of other's errors, the so-called observed ERN (oERN). Individuals with psychopathy are characterized by a failure to efficiently adapt their behaviour in response to aversive events, suggesting deficits in error-monitoring processes. Crucially however, the core symptoms of psychopathy are most prominent during interactions with other people. The aim of the current study was to disentangle possible deficits in the monitoring of own and other's errors in individuals with psychopathy.

Participants and Methods: Behavioral and EEG data were obtained from 18 individuals with psychopathy and 18 healthy controls matched for age and education. All participants performed a speeded choice-reaction task and observed another person perform the same task.

Results: The two groups did not differ in ERN amplitudes following own errors, but the individuals with psychopathy did display reduced oERN amplitudes in response to other's errors.

Conclusions: In line with previous studies from our lab, individuals with psychopathy do not show disturbances in the automatic processing of own errors. Importantly, however, the current study demonstrates specific deficits in the monitoring of other's errors. The present findings are in line with the prominent disturbed interpersonal behaviour characteristic for this severe personality disorder and may thus provide us with important knowledge about the underlying cognitive and neural mechanisms.

Correspondence: *Ellen de Bruijn, PhD, Donders Centre for Cognition, Donders Institute for Brain, Cognition and Behaviour, P.O. Box 9104, Nijmegen 6500 HE, Netherlands. E-mail: e.debruijn@donders.ru.nl*

Invited Symposium: Driving and Cognition

Chair: Taina Nybo

1:30–3:00 p.m.

T. NYBO, C. LUNDBERG, W. BROUWER, V. HEIKKILÄ & A. SCHANKE. Driving and Cognition.

Symposium Description: In the near future due to the ageing population the number of individuals with age-related medical conditions affecting cognition will increase. If driving is considered as 'everyman's right' it becomes necessary to carefully weight the individual and social consequences of licence revocation against the crash risk of patients suffering from e.g. stroke, Parkinson's disease and early dementia. The assessment of cognitive and behavioural prerequisites for driving in clinical settings with appropriate (sensitive and specific) methods becomes increasingly important, including also ADHD drivers and TBI patients. The aim of this symposium is to focus on the types of cognitive functions that are needed for safe driving and can be measured in a relevant manner. The concept of compensation (eg. driving skill) should be taken into account while evaluating the effects of cognitive impairments on driving. It will also be shown how the lacking compensatory mechanisms are revealed in structured test drives in an advanced driving simulator as a part of the neuropsychological assessment. In addition, the crucial question 'who is driving' is discussed using a more holistic approach taking into account that people always express their personality behind the wheel. When evaluating driving ability the foremost but often overlooked personality aspect self-awareness (insight, metacognition) will be discussed. Finally, steps towards evidence based practice and better agreement among clinicians will be outlined. Standardized assessment procedures, collection of normative data and multicenter studies are needed in order to better meet the increasing demand of correctly identifying the safe drivers from the unsafe ones.

Correspondence: *Taina Nybo, PhD, Department of neurology, Helsinki University Hospital, Haartmanink.4, 00029 HUS, Helsinki 00290, Finland. E-mail: taina.nybo@helsinki.fi*

A. SCHANKE. Cognitive Driving Evaluations and Brain Damage: What Steps Are Needed in Order to Establish an Evidence Based Practice?

Objective: During the last 20 years, the demand to identify safe from unsafe drivers has been increasingly focused upon in the rehabilitation medicine. Patients with cerebrovascular accidents, traumatic brain injury, dementia of the Alzheimer type, multiple sclerosis, Parkinsons disease and ADHD are among groups which have been assessed for cognitive and behavioral prerequisites to hold a driver's license. However, the results of the studies conducted are often not easily compared and the generalization of the results often limited. The divergent results from studies on driving reflects experimental approaches in a least four aspects: the type of predictors used, the type of measures regarded as the criterion for fitness to drive, the sample of subjects studied and the length of the follow-up considered. These methodological issues will be presented more into detail.

The cognitive impairments are often focused in the assessment of driving after brain injury. Insight and self-criticism (metacognition) also necessary prerequisites -are often overlooked, in spite of the fact that a key factor for safe driving is whether or not a person with diseases affecting the brain can compensate for their motor and cognitive deficits by changing driving style and driving patterns. In addition, premorbid personality and premorbid driving style are important predictors for safe driving post-injury documented in recent studies. These three types of data represent the frame work for an evidence based practice. Steps towards better agreement among clinicians and researchers will be outlined such as standardized assessment-procedures, collection of normative data, and multicenter studies.

Correspondence: *Taina Nybo, PhD, Department of neurology, Helsinki University Hospital, Haartmanink.4, 00029 HUS, Helsinki 00290, Finland. E-mail: taina.nybo@helsinki.fi*

C. LUNDBERG. Older Drivers with Cognitive Impairments-Issues of Detection and Assessment.

Objective: Although older drivers in general are not over-represented in crashes, age-related medical conditions affecting cognition, particularly cognitive impairment/dementia and stroke, may impair driving capability. Paradoxically, there are conflicting results regarding crash involvement of individuals identified with dementia, while, at the same time, there is evidence of impaired driving skills among people with cognitive impairment but no dementia.

In clinical settings, there is a need to determine the most appropriate methods to evaluate patients' cognitive fitness to drive. Much previous research has aimed at the prediction of driving fitness in dementia or post-stroke, using neuropsychological tests. Coherence is often lacking between findings of different studies, due to factors such as small study groups, diversity of diagnoses, many different test methods, and questionable outcome measures. Some useful results have emerged, but the selected assessment methods often appear to lack both sensitivity and specificity, meaning that potentially unsafe drivers are missed, and safe drivers are wrongly classified as unsafe.

Clinical assessment procedures should take into account cognitive models of the driving task that include the types of cognitive functions that are needed for safe driving, and that are also measured in a relevant manner. In addition, the cognitive models should also take into account the concept of compensation. The driving skill of some patients diminishes their need for attentional control when driving and makes it possible for them to compensate for their cognitive impairments.

Correspondence: *Taina Nybo, PhD, Department of neurology, Helsinki University Hospital, Haartmanink.4, 00029 HUS, Helsinki 00290, Finland. E-mail: taina.nybo@helsinki.fi*

W.H. BROUWER, R.B. BUSSCHER & P.C. VAN WOLFFELAAR. Driving Simulator Tests as Part of the Neuropsychological Assessment of Fitness to Drive in Stroke and TBI Patients.

Objective: Stroke and Traumatic Brain Injury (TBI) cause persistent functional limitations in visual, visuo-spatial, visuo-motor functions and attention which may have consequences for fitness to drive. On-road driving performance in this population is significantly related to performance on neuropsychological tests of attention and information processing. This particularly concerns basic "operational" driving tasks like brake reaction time, visual search time and lateral position control. Within limits, patients can compensate visuo-motor impairments by strategic and tactical adaptations, e.g. reducing speed in anticipation of time-pressured complex situation, and by extensive driving experience (Brouwer, W.H. and Withaar, F.K. Fitness to drive after traumatic brain injury. *Neuropsychological Rehabilitation*, 7 (3), 1997, p. 177-193). Based on a revised mental schema model of action selection, it is argued that visuo-spatial and dysexecutive impairments often cannot be compensated adequately because the situations that should give rise to the adaptations cannot be correctly detected. Using four case-studies of chronic brain-injured patients referred because of unexplained crash involvement and/or failures in on-road tests (two right hemisphere stroke patients and two very severe TBI patients) it will be shown how the lacking compensatory mechanisms are revealed in structured test-drives in an advanced driving simulator. These driving simulator tests are part of the neuropsychological assessment of fitness to drive (12DRIVE), which also comprises syndrome and vision screening and neuropsychological tests of attention and information processing.

Correspondence: *Taina Nybo, PhD, Department of neurology, Helsinki University Hospital, Haartmanink.4, 00029 HUS, Helsinki 00290, Finland. E-mail: taina.nybo@helsinki.fi*

Symposium 4: Neurocognitive Consequences of Pediatric Risk Conditions

Chair: Marit Korkman

Discussant: H. Gerry Taylor

1:30–3:00 p.m.

M. KORKMAN & G. TAYLOR. Neurocognitive Consequences of Pediatric Risk Conditions.

Symposium Description: While most diseases or somatic conditions in childhood pose no threat to neurocognitive development there are some conditions that may harm the developing nervous system. Premature birth belongs to the latter category through various respiratory, vascular, circulatory and other mechanisms. Improved survival of prematurely born children has also led to an increase in the number of follow-up studies. The focus has shifted from early, general developmental outcome to more specific questions or longer follow-up. The presentations of this symposium will include studies on pre-reading skills in 5-year-old children (Petriina Munck et al.), comprehensive neuropsychological test profiles at 11 years of age (Leena Karvonen et al.), and neurocognitive and educational performance and adjustment at 18 years of age (Ann-Charlotte Smedler et al.).

Pediatric conditions that may cause severe neurocognitive impairment also include severe conditions of the heart, with consequent circulatory disturbance. Riina Puosi et al. have assessed young children with hypoplastic left heart syndrome or univentricular heart. Anu Uschakoff et al. will present a follow-up study on children who have undergone heart transplantation. The children were assessed with a very comprehensive set of tests.

Correspondence: Marit Korkman, PhD, Psychology, University of Helsinki, PB 9, Helsinki 00014, Finland. E-mail: marit.korkman@helsinki.fi

P. MUNCK, P. NIEMI, A. VÄLIAHO, L. LEHTONEN, H. LAPINLEIMU & L. HAATAJA. Pre-reading Skills at the Age of 5 years - Comparison of Prematurely and Full-term Born Children.

Objective: Reading skills start to develop well before entering the school. Difficulties in pre-reading skills are strongly correlated with difficulties in learning to read. It is important to find the children at risk for reading difficulties to offer them sufficient support. Prematurely born children are at increased risk for various learning difficulties. The aim of the present study was to assess the pre-reading skills of these children, and compare these skills with full-term born control group.

Participants and Methods: Participants were 105 prematurely born, very-low-birth-weight (<1500g) children born in Turku University Hospital in 2001-2001, and 180 healthy controls born in the same hospital. Psychological assessment at the age of 5 years (+0-2 months) included WPPSI-R phonological processing (NEPSY), speeded naming (NEPSY-II), letter knowledge and reading of words and sentences. Comprehension of instructions (NEPSY-II) was used to measure the receptive language skills. In prematurely born children, also neonatal brain imaging data from MRI and serial ultrasound were available.

Results: Data collection is still in progress. Preliminary results show that pre-reading skills of prematurely born children were within the normal variation. However, there were differences between the groups. Prematurely born children with major brain pathology performed poorer than children with less severe findings.

Conclusions: Prematurely born children are considered to be at increased risk for academic problems. However, in our preliminary findings, these children had relatively good pre-reading skills at the age of 5 years.

Correspondence: Marit Korkman, PhD, Psychology, University of Helsinki, PB 9, Helsinki 00014, Finland. E-mail: marit.korkman@helsinki.fi

L. KARVONEN, V. FELLMAN, V. TOMMISKA, A. LANO & M. KORKMAN. Longitudinal Study of Neurocognitive Development of Children Born with Extremely Low Birth Weight.

Objective: Children with extremely low birth weight (ELBW) are at risk for neurocognitive impairments. The aim of the present study was to analyze longitudinally the neurocognitive development of a group of ELBW children from early childhood to middle school years.

Participants and Methods: Participants were 23 ELBW children aged 11 years, and 46 control children. The ELBW children were volunteers from a national ELBW study. The assessment included an abbreviated form of the WISC-III and 17 subtests from the NEPSY-II. The control group was derived from the Finnish NEPSY-II standardization study. All ELBW children had been assessed at 5 years of age with WPPSI and NEPSY. Fourteen children had also been tested with the Bayley Scales of Infant Development 2nd Edition (BSID-II) at the age of 2 years.

Results: At 11 years of age the ELBW group performed significantly below the control group in all NEPSY II domains. The test scores were significantly poorer than the corresponding results at 5 years of age in all domains except the Visuo-Motor domains (Sensorimotor and Visuospatial domains collapsed).

The 11-year WISC III test scores correlated significantly with the corresponding 5-year WPPSI scores but not with the BSID-II score.

Conclusions: The results indicate that ELBW children continue to be at risk for neurocognitive impairments at 11 years of age. Neuropsychological performance seems to decrease from 5 years of age to 11 years of age. Prediction in early childhood of later neurocognitive development is uncertain.

Correspondence: Marit Korkman, PhD, Psychology, University of Helsinki, PB 9, Helsinki 00014, Finland. E-mail: marit.korkman@helsinki.fi

A. SMEDLER, B. BÖHM, A. LUNDEQVIST & P. RISHOLM MOTHANDER. Born Preterm: Socio-emotional Adjustment in Relation to Neuropsychological Functioning at Age 18.

Objective: The Stockholm Neonatal Project is a prospective longitudinal study of children born prematurely in 1988-93, with very low birth weight (<1500 g, VLBW). Currently, all children with VLBW (n=182) and matched controls born at term (n=125), who participated in the previous follow-up at age 5 1/2 years, are invited to a psychological assessment at age 18.

Participants and Methods: The assessment involves neuropsychological tests as well as self-report measures of health and adjustment, interpersonal relations, school performance, interests and quality of life. As a complement, parents are asked to complete a rating scale of their child's health, adjustment and educational record, as well as self-report measures of their own well-being and possible parental stress.

Results: Half-way through the data collection, preliminary neuropsychological results suggest that at age 18, the preterm group tends to score >1 SD below the controls on tests of visuo-spatial ability, executive functions, and speed, whereas no systematic group differences have been observed in the verbal domain. According to self-reports from SDQ and YSR/CBCL, the preterm group has a higher incidence of peer problems and lower self-rated competence than controls, a picture that is supported by the parental reports. Qualitative data indicate that the preterm group may be less socially active and more home-bound. When controlling for overall cognitive functioning, most group differences in socio-emotional adjustment disappear, although parents of prematurely born adolescents still tend to report more concerns.

Conclusions: Our findings suggest that socio-emotional adjustment may be closely linked to long-term neuropsychological outcome in adolescents with a history of premature birth.

Correspondence: Marit Korkman, PhD, Psychology, University of Helsinki, PB 9, Helsinki 00014, Finland. E-mail: marit.korkman@helsinki.fi

R. PUOSI, A. SARAJUURI, T. LÖNNQVIST, L. MILDH, I. MATTILA & E. JOKINEN. Cognitive Development and Behavioral Outcome of Children with Univentricular Heart.

Objective: Recent advances in the treatment of children with univentricular heart have significantly increased their survival rates. The children with hypoplastic left heart syndrome (HLHS) and other forms of univentricular heart (UVH) are, however, at risk of having varying cognitive and behavioral deficiencies. The aim of this study was to assess the cognitive level, the language development and the behavior of children with univentricular heart at the age of 30 months.

Participants and Methods: Participants were 36 children with univentricular heart, 22 with HLHS, 14 with other UVH, and 41 healthy control subjects at a median age of 30 months.

The Bayley Scales for Infant Development was administered to assess the cognitive level and behavior. The MacArthur Communicative Development Inventories was used to gather data of the vocabulary and maximum length of sentences.

Results: Distributions of age and gender were similar for the groups of children with univentricular heart and the control group. Significant differences were found between the HLHS group and the control group with respect to mental development. Children with HLHS had a lower mean mental development index, smaller vocabulary and produced shorter sentences than the children in the control group. Two children with HLHS (10%) had mental development index below 50 indicating significantly delayed performance. No statistically significant differences were found between the children with UVH and the control group.

Conclusions: Neurodevelopmental deficits are prevalent especially among children with HLHS. Results suggest that early developmental screening and interventions are needed for these children.

Correspondence: *Marit Korkman, PhD, Psychology, University of Helsinki, PB 9, Helsinki 00014, Finland. E-mail: marit.korkman@helsinki.fi*

A. USCHAKOFF, E. QVIST & M. KORKMAN. Generalized Neurocognitive Effects of Childhood Chronic Heart Disease with Consequent Transplantation.

Objective: The present study was performed to determine the effects of childhood chronic heart disease and consequent transplantation on neurocognitive development.

Participants and Methods: All children in Finland aged 6-16 years who had received heart transplantation at least 5 months prior to assessment, participated in the study. These 19 children (11 girls and 8 boys) were assessed on average 5.6 years postoperatively (SD = 3.5; range 0.4-11.1 years). Mean age at the time of assessment was 12.0 years (SD = 3.1; range 6.4-16.4 years). Standardized tests of intelligence (WISC-III), attention, language functions, visuospatial precision, memory and learning, visuospatial processing, and social perception (NEPSY-II) were administered. Heart transplanted children were compared with a control group (n = 17) with comparable gender, age range, and maternal educational level for their performance in NEPSY-II.

Results: Heart transplanted children showed a poorer performance than expected by their age on Verbal (p = .026, One-Sample t-Test), Performance (p = .001), and Full-Scale Intelligence Quotients (p = .002) of the WISC-III. Five children scored in the range of mild mental retardation. The heart transplanted children also had significantly lower scores than the control group on the subtests Comprehension of Instructions (p = .028, Independent Samples t-Test), Word List Interference (p = .008), Memory for Designs (p = .020), Visuospatial Precision (p = .048), Design Copying (p = .006), and Affect Recognition (p = .037) of the NEPSY-II.

Conclusions: The heart transplanted children exhibit an overall cognitive level slightly below the average range and deficits particularly in visuospatial functioning.

Correspondence: *Marit Korkman, PhD, Psychology, University of Helsinki, PB 9, Helsinki 00014, Finland. E-mail: marit.korkman@helsinki.fi*

**Symposium 5:
Social Cognition: Investigation of Clinical Profiles**

Chair: Paul Eslinger

1:30-3:00 p.m.

P.J. ESLINGER, M.V. MILDERS, J.J. SPIKMAN, D. TRANEL & P.J. ESLINGER. Social Cognition: Investigation of Clinical Profiles.

Symposium Description: Social cognition is a vital component of overall social adaptation throughout development, maturation, and aging. Clinical and basic studies from neuropsychology and neuroscience have increasingly identified not only specific types of social cognitive deficits associated with neurologic and neuropsychiatric disease but also important constructs, processes and neural structures mediating social functioning. This symposium is organized to present a multidisciplinary overview of social cognition clinical profiles in primary affective disorders, traumatic brain injury, ventromedial prefrontal lesions, and frontotemporal dementia. Each presenter will focus not only on a specific clinical sample, but also the state of current conceptual models of social cognition, measurement approaches, analytical techniques, and potential application of findings to clinical settings. Analyses will include novel tasks of social cognition and social emotions that may be more sensitive to social deficits than most standardized neurocognitive testing. The role of emotion, empathy, social signals, and executive functions will be considered as well. Several of the findings will be related to available brain imaging data, including lesion analyses and functional activations in identifying a common neural substrate for social cognition, and a common approach to assessment, interpretation, and potential application of findings.

Correspondence: *Paul J. Eslinger, PhD, Neurology, Penn State University, Hershey Medical Center EC037, PO Box 850, Hershey, PA 17033. E-mail: peslinger@psu.edu*

M.V. MILDERS. Social Cognition in Affective Disorders.

Objective: Abnormalities in social cognition in affective disorders have been linked to poor social functioning and brain abnormalities. Certain brain abnormalities in affective disorders remain stable across states, whereas other brain abnormalities and social functioning appear state-dependent. Therefore, if there were a link between social cognition and social functioning or state-dependent brain abnormalities, one would expect social cognition performance also to vary with symptom severity. This study examined the association between social cognition and symptom severity in affective disorder a longitudinal design.

Participants and Methods: Patients with unipolar (n=19) and bipolar (n=12) affective disorder were assessed 3 times during a 6-month period on two social cognition tasks: facial expression recognition and expression matching. At each assessment symptom severity was assessed with the Beck Depression Inventory, Hamilton Depression Scale or Bech-Rafaelson Mania Scale. Patients' performance was compared to that of matched healthy controls (n=25).

Results: The matching task revealed no group differences. In the recognition task the unipolar group showed higher accuracy and greater response bias than controls for sad only. The bipolar group was more accurate than controls at recognising disgust and fear. In both groups these patterns remained stable over the 6-month period, although symptoms severity decreased significantly in the unipolar group. At each assessment symptom severity was unrelated to emotion recognition.

Conclusions: In both patient groups abnormalities in social cognition remained stable over time, suggesting that social cognition in affective disorders may be related to state independent brain abnormalities and be unrelated to social functioning.

Correspondence: *Paul J. Eslinger, PhD, Neurology, Penn State University, Hershey Medical Center EC037, PO Box 850, Hershey, PA 17033. E-mail: peslinger@psu.edu*

J.M. SPIKMAN, W.S. VEENSTRA, M.V. MILDERS & J. VAN DER NAALT. Deficits in Social Cognition Related to Location of Frontal Lesions in TBI Patients.

Objective: Severe TBI often results in damage in prefrontal areas, either due to focal contusions or to diffuse axonal injury (DAI). Some of these patients show impairments in social, interpersonal behaviour, like insensitivity to social cues and disregard and lack of empathy for others. Such deficits in social cognition are associated with lesions in ventromedial and orbitofrontal areas. Although these deficits are known to have negative consequences, assessment is difficult because well-normed, standardized neuropsychological tests are lacking. However, there are some tests available which tap elements of social cognition, for instance emotion perception, theory of mind (ToM) and empathy. In this study we examined whether TBI patients were impaired on these tests and whether test performance could be related to specific prefrontal lesion locations.

Participants and Methods: 24 chronic TBI patients were selected by a neurologist because of their record of personality/behavioural changes. They underwent a neuropsychological assessment with tests for social cognition. A matched group of 26 healthy controls was tested on the same measures. Afterwards, neuroimaging data were provided with respect to whether and where the patients had frontal lesions.

Results: T-tests showed that patients performed worse than the healthy controls on all social cognition measures. Of the patients, 18 (75%) had frontal abnormalities on MRI. In this subgroup, 9 had orbitofrontal lesions, 5 had dorso/ventromedial lesions and 4 had abnormalities in both areas.

Conclusions: No significant correlations were found between the social cognition tests and the presence of orbitofrontal lesions. However, emotion perception was related to lesions in the dorsomedial cortex.

Correspondence: *Paul J. Eslinger, PhD, Neurology, Penn State University, Hershey Medical Center EC037, PO Box 850, Hershey, PA 17033. E-mail: peslinger@psu.edu*

P.J. ESLINGER & M. GROSSMAN. Social Cognition in FTD: Converging Cognitive, Executive and Emotional Deficits.

Objective: Social cognition and behavior are influenced by multiple variables including motivation, interpersonal sensitivity and perspective-taking, social knowledge, and executive functions. We investigated these variables in frontotemporal dementia (FTD) using standardized and experimental techniques and examined the neural substrate for social cognition with voxel-based morphometry.

Participants and Methods: Twenty-six patients were diagnosed according to published criteria for FTD and classified by consensus as prominent social-executive impairments (SOC-EXEC), progressive non-fluent aphasia (PNFA) or semantic dementia (SD), and compared to 16 age-matched controls. Tasks of social judgment, theory of mind, and cognitive flexibility were administered and behavioral rating scales for empathy, apathy and depression were completed by patients and caregivers.

Results: FTD patients presenting with prominent social and executive impairments (SOC-EXEC) were significantly impaired in social judgment, theory of mind, cognitive flexibility and in caregiver ratings of empathy (including social perspective-taking and interpersonal sensitivity) and apathy (including cognitive and behavioral aspects) even though self-ratings were normal. FTD PNFA and SD samples were less abnormal on social cognition tasks and in caregiver and self-ratings. In the SOC-EXEC sample, empathy and apathy were not related to depression but were correlated with social cognition and executive function measures. Their voxel-based morphometry analysis revealed distinctive patterns of frontal-temporal atrophy that correlated significantly with social judgment, empathy, and apathy.

Conclusions: Findings suggest that FTD SOC-EXEC patients show a multivariate breakdown in social cognition as well as supportive interpersonal, executive and emotional-motivational resources that contribute to social adaptation. Assessment and models of social cognition need to consider multiple interacting variables that might require different intervention approaches.

Correspondence: *Paul J. Eslinger, PhD, Neurology, Penn State University, Hershey Medical Center EC037, PO Box 850, Hershey, PA 17033. E-mail: peslinger@psu.edu*

**Poster Session 4:
Pediatric, Developmental, Language, Memory,
Assessment**

3:00–4:00 p.m.

**Assessment/Psychometrics/Methods
(Adult)**

J. ABRISQUETA-GOMEZ, V.G. SANTIAGO, A. DIRCKSEN, E.B. PIOVEZAN, M.R. FERREIRA, E.V. SOUZA, C. S.C.PONCE, F. OSTROSKY-SOLIS, P. H.F. BERTOLUCCI, L.J. VAZ & O. F.A. BUENO. Transcultural Study Cognitive Profile Of Brazilian Seniors.

Objective: Cultural differences are manifested not only in the beliefs and values of people, can also influence the cognitive functioning of individuals. Being Brazil a very heterogeneous country, with separate regional characteristics, it is necessary to study the cognitive profile of elderly population.

Participants and Methods: From a total of 387 subjects, a sample of 253 healthy elderly was taken, which was divided into 5 groups from different states of Brazil, G1 = São Paulo, G2 = Maranhão, G3 = Recife, G4 = Belo Horizonte, G5 = Curitiba. All groups were matched according to age and educational level of its participants.

All were assessed with a brief neuropsychological test battery NEUROPSI, exploring different cognitive functions such as, memory, attention, language, executive functions and motor concept, among others.

Results: The statistical analysis (ANOVA), showed significant differences ($p < 0.05$) in total scores of the different states. The groups G2 = 83.7 and G3 = 93.4, showed a reduced performance in comparison with the groups G1 = 100.6; G4 = 98.5 and G5 = 102.7. Also, we observed differences between groups G2 and G3, and being G2 who got the lower score of all groups.

Conclusions: The group of elders, who showed lower scores, lived in the northeast of the country. These results were consistent with other Brazilian researches. The explanation leads us to assume that due to differences in the quality of the education system at that time was quite heterogeneous characteristics in addition to regional specificities. These results are preliminary, further studies need to be conducted.

Correspondence: *Jacqueline Abrisqueta-Gomez, PhD, Centro Paulista de Neuropsicologia, AFIP, R. Embau 54, Sao Paulo SP, Brazil. E-mail: jacky_ag@hotmail.com*

M. BUNNAGE & H. DAWSON. NART, WTAR and VCI From The WAIS-III: Do They Measure the Same Thing?

Objective: The National Adult Reading Test (NART) and Wechsler Test of Adult Reading (WTAR) are often used as measures of premorbid intellectual ability. The Verbal Comprehension Index from the Wechsler Adult Intelligence Scale-III (VCI) is generally considered a measure of contemporaneous verbal intelligence. Recent factor analytic research suggests they may all measure the same latent trait, crystallised intelligence. This study aimed to determine whether, in a clinical sample, it is reasonable to interpret the NART, WTAR and VCI as measuring different things.

Participants and Methods: Psychometric data from a heterogeneous clinical sample of 93 adult patients were analysed.

Results: Scores on the NART, WTAR and VCI were all highly correlated with one another (NART:WTAR $r = .77$; NART:VCI $r = .66$; WTAR:VCI $r = .76$). All three measures were contrasted with the number of years of formal education completed by participants. The mean differences between NART, WTAR and VCI scores and the number of years of education completed were not significant across measures

($p=0.08$). All three measures were contrasted with current performance on the Processing Speed Index from the Wechsler Adult Intelligence Scale-III (PSI). On average NART, WTAR and VCI scores were higher than PSI scores. The mean differences between the NART, WTAR and VCI scores and performance on PSI were not significant across measures ($p=0.2$).

Conclusions: These results suggest performance on the NART, WTAR and VCI may all be a reflection of the same underlying trait; presumably crystallised intelligence. There were no systematic differences between performance on these measures and number of years of education (a proxy reflection of likely premorbid intelligence) or PSI (current measure sensitive to the effects of brain injury). These results suggest the NART, WTAR and VCI may all be equally good indicators of likely premorbid intelligence and/or all equally affected by brain injury.

Correspondence: *Martin Bunnage, BSc(Hons) M.Psych(Neuro) PhD, Neuropsychology, North Bristol NHS Trust, Head Injury Therapy Unit, Frenchay Hospital, Bristol BS16 1LE, United Kingdom. E-mail: mbunnage@npsych.co.uk*

R. CHALER-BAULÉS. Neuropsychological dysfunction pattern in patients with stroke in the left posterior cerebral artery.

Objective: The 60% of patients with cerebral vascular accidents in the territory of the posterior cerebral artery (PCA) show both significant neuropsychological dysfunction and alterations of the classic visual field. When the accident involves the vascular territory of the left PCA, the alterations we found occur as verbal memory deficits, alexia without agraphia, color perception disorders and aphasic disorders, among others.

In order to assess these specific deficits, we have developed a protocol of Neuropsychological assessment, made up of different subtests of standardized scales for Spanish population.

Participants and Methods: With this protocol, we have evaluated, during two years, a total of 12 patients in the "Hospital Universitario de Bellvitge". These patients were affected by stroke in the territory of the left PCA, matched with the subjects on age, gender, laterality and level of schooling.

With this protocol, we have evaluated, during two years, a total of 12 patients in the "Hospital Universitario de Bellvitge". These patients were affected by stroke in the territory of the left PCA, matched with the subjects on age, gender, laterality and level of schooling.

Results: The sample of patients showed significantly lower scores than the control group in series of words learning, text processing memory, name and color perception, reading and writing.

Conclusions: Beyond the disruption of the visual field, the study showed significant deficits in the memory processes, concretely in the consolidation and evocation of memory. Patients showed some degree of anosognosia in relation to the alteration of the processes of color perception, reading and writing. In contrast, we did not find this pattern in relation to memory processes, where patients reported subjective difficulties when retaining the verbal information that has to be evoked.

Correspondence: *Roger Chaler-Baulés, 33, Mental Health, Hospital Martí Julià, c/ Jose Millan Gonzalez, 6, Barcelona 08024, Spain. E-mail: rogerchaler@gmail.com*

C. MATE-KOLE, J. CONWAY, K. CATAYONG, N.A. SACKKEY & R. WOOD. Validation of the Revised Quick Cognitive Screening Test.

Objective: As the elderly population steadily increases, complaints of memory loss and decline in cognitive functions are becoming more common. Screening for cognitive changes will help primary care physicians to be more aware of the possibility of declining cognition in patients and in developing appropriate dementia care and a proactive approach for the care of patients and families.

The present study examined the psychometric properties of the revised version of the Quick Cognitive Screening Test (RQCST).

Participants and Methods: Participants: Three hundred seventy-seven participants were recruited comprising healthy controls, individuals with

dementia including Alzheimer's disease and vascular dementia, individuals with psychiatric illness, and other neurological conditions. Main Outcome Measure: In an effort to examine the reliability and validity of the RQCST, participants were administered the revised QCST with a number of standardized measures.

Results: Results: The results revealed that the RQCST discriminated between healthy controls and the neuropsychiatric participants. Additionally, the RQCST significantly correlated with other standardized measures confirming the RQCST's reliability and validity as a screening instrument for individuals with cognitive deficits.

Conclusions: Conclusion: The RQCST provides the clinician with a short, yet reliable screening instrument in detecting cognitive deficits in individuals with dementia and other neurological conditions.

Correspondence: *C Charles Mate-Kole, PhD, Psychology, Central Connecticut/University of Ghana, 1615 Stanley Street, New Britain, CT Connecticut. E-mail: matekolec@ccsu.edu*

T. EDGINTON, C. LOVEDAY, J. IDDON, J. PICKARD & R. MORGAN. Cognitive and Psychological Sequelae of Hydrocephalus and Spina Bifida: Triangulation of Patient and Carer Perceptions with Neuropsychological Data to Inform Clinical Intervention.

Objective: Despite significant advances in treating and improving the prognosis of individuals with hydrocephalus and spina bifida, many individuals continue to experience specific cognitive difficulties including memory, language, attention and executive function deficits that can negatively impact on everyday functioning (Iddon et al, 1996; 2001:03:04). This study aimed to assess patient and caregiver perceptions of the specific difficulties they experience and correlate this data with neuropsychological performance in order to tailor specific cognitive strategies based on their neuropsychological profile and enhanced self-awareness.

Participants and Methods: 60 patients and their caregivers completed a comprehensive questionnaire designed to assess specific difficulties and needs based on known cognitive and emotional sequelae. Responses were correlated with measures of memory and executive functioning. In addition responses for a subgroup of 30 patients were also correlated with their performance on a detailed neuropsychological battery designed to capture more subtle cognitive and language deficits.

Results: Results confirm specific areas of discrepancy and concordance between patients and their caregivers in relation to their actual cognitive performance on a range of neuropsychological tasks. The implications of these findings for cognitive strategy interventions and facilitating increased understanding and awareness will be discussed.

Conclusions: The triangulation of subjective patient and caregiver perceptions with neuropsychological data has provided an in depth insight into the discrepancies between patient and their caregiver reports with their actual cognitive performance. This technique and the dissemination of these materials and methods can be used to inform best practice guidelines and provide measurable outcomes for cognitive performance discrepancy, meta-awareness, strategy implementation and evaluation. Correspondence: *Trudi Edginton, University of Westminster, Regent Street, London W1B 2UW, United Kingdom. E-mail: edgintt@staff.westminster.ac.uk*

M. ENNOK. Preliminary Estonian Normative Data for the Trail Making Test.

Objective: It is desirable that interpretation of test results should be based on locally appropriate norms. The aim of this study is to provide contemporary Estonian norms for the Trail Making Test, also analyzing the effects of demographic variables to test scores.

Participants and Methods: Preliminary data from an ongoing normative study of neuropsychological tests is presented. Current sample includes 127 healthy subjects (73 women, 54 men) aged from 19 to 83

with mean education of 13.61 years. Subjects over 50 years of age were screened with MMSE and only those with a score of 27 or higher were included in the study. The Trail Making Test parts A and B were used with standard instructions and scoring as presented in Spreen & Strauss (1998).

Results: The age and obtained education level had a significant effect on test scores. A sex effect was observed with men performing better in both parts of the test. There was no effect of age, education and sex on the ratio score (B/A).

Conclusions: In agreement with other normative studies the scores of Trail Making Test were influenced by age and education. However, this was not the case with the ratio score, the cognitive complexity included in the part B is uniform across ages and education levels. The observed effect of sex is possibly due to the fact that the groups were of unequal size and the distribution of men and women between ages were uneven. Preliminary normative tables for test scores are presented.

Correspondence: *Margus Ennok, MSc, Department of Neurology and Neurosurgery, University of Tartu, L. Puusepa 2, Tartu 51014, Estonia. E-mail: margus.ennok@ut.ee*

C.L. IVERSON, B.L. BROOKS, K.E. FERGUSON & A.H. YOUNG. Development of a New Neurocognitive Screening Battery for Depression.

Objective: Subjectively-experienced problems with concentration, memory, and problem solving are cardinal diagnostic features of major depressive disorder. To date, neurocognitive test batteries have not been systematically evaluated for use in depression, they are mostly idiosyncratic, and they are not co-normed. The purpose of this study is to develop a new time- and cost-effective neurocognitive screening battery for use in clinical practice and research with patients suffering from depression.

Participants and Methods: Participants were 1,269 healthy adults between 18 and 79 years old (mean age=55.1, SD=17.8) selected from the Neuropsychological Assessment Battery (NAB; Stern & White, 2003) normative sample. The full NAB requires 3-3.5 hours of testing. The new screening battery requires approximately 1 hour of testing. It includes co-normed measures of attention, speed of processing, expressive language, learning, memory, and executive functioning that were selected based on a review of the depression literature.

Results: Sixteen individual test scores are derived from this screening battery. The base rates of low scores, stratified by intelligence, are presented for different cutoff scores. For those with average intelligence, it is common to have 1-3 scores below 1SD from the mean, but uncommon to have six or more low scores. For those with high average intelligence, it is common to have 0-2 scores below 1SD, but uncommon to have four or more low scores.

Conclusions: This one-hour battery, which includes data on the base rates of low scores, is designed for evaluating cognition in patients with depression. A case series of patients with depression will be presented.

Correspondence: *Grant L. Iverson, Ph.D., Psychiatry, University of British Columbia, 2255 Wesbrook Mall, Vancouver, BC V6T 2A1, Canada. E-mail: giverson@interchange.ubc.ca*

K.A. KAPLOUN, J.R. URLACHER & C.A. ABEARE. Verbal Fluency as an Embedded Measure of Effort.

Objective: The purpose of the current study was to investigate whether verbal fluency (FAS) can be used as an embedded measure of effort in an academic setting. Crowe (1998) suggested that verbal fluency performance changes as a function of time in that as time passes examinees begin to exhaust their word pool and successful word retrieval becomes increasingly more effortful. Thus, it was predicted that the FAS (total raw score) and the score for the last 15 second time block on the FAS would be significantly positively correlated with validated measures of effort and with an Effort and Motivation Questionnaire (EMQ).

Participants and Methods: One hundred and 20 undergraduate students (67 female, 53 male) completed the Rey-15 + Recognition; the Test of Memory Malingering (TOMM); the Malingering Detection Test (MDT); the Word Memory Test (WMT); and the Reliable Digit Span (RDS). The EMQ consisted of 2 subscales: Motivation for taking part in the study, and the amount of effort participants felt they had exerted.

Results: Overall, the FAS was significantly positively correlated with the RDS ($R = .24, p < .01$) and Motivation score ($R = .22, p < .01$). A standard multiple regression with FAS as the outcome variable and the RDS and Motivation scores as the predictor variables revealed that 12% of the variance in FAS scores was predicted by this model [$F(2, 115) = 7.97, p < .01$]. The last 15 second time block on the FAS was also significantly positively correlated with the RDS ($R = .17, p < .05$).

Conclusions: The present study provides preliminary evidence that the FAS may be used as an embedded measure of effort. As tests of effort concurrently assess other cognitive domains (e.g., memory or attention), perhaps the FAS (total score and the last time block total) taps into effort in a unique way, assessing effort within the domains of language and executive functioning. Future research will include coached, clinical and litigation samples to further investigate the utility of the FAS as an embedded measure of effort.

Correspondence: *Kristen A. Kaploun, M.A., University of Windsor, 401 Sunset Avenue, Windsor, ON N9B 3P4, Canada. E-mail: hodgesk@uwindsor.ca*

L. KRAMSKA & M. PREISS. Adaptation of the NART in Czech speakers – first experiences.

Objective: Word reading test represents one of the possibilities of pre-morbid intellect evaluation. Another options include regression equations based on demographic variables, Wechsler dictionary (or information-based) scatter, Index of deterioration, Best-performance method and evaluation of the type and quality of education and their results.

Participants and Methods: The proposal of the Czech version of the Word reading test is discussed in a view of previously published works as well as linguistic possibilities of the Czech language. The goal of this study is creation of Czech version of the NART. Second goal is validation in relation to detailed examination of patients after subarachnoidal haemorrhage ($n=62$) and normal volunteers ($n=237$) and their general level of education.

Results: The test is considered successful in case of high correlation with the education and intellect of healthy subjects, as seen in its anglo-saxon version. The item analysis was undertaken on 100 words. We selected 50 acceptable words for Czech adaptation of reading test. We found that reading ability highly correlates with general education ($r=0.49$). In experimental group word-reading ability highly correlates with Verbal IQ ($r=0.75$) and Information ($r=0.67$) and Vocabulary ($r=0.71$) subtests. Reliability measured by Cronbach's Alpha is 0.95.

Conclusions: Czech version of the NART (developed by Kramska) could be important diagnostic tool for assessment of pre-morbid intellect in Czech Republic. This pilot study could be good solution for future scientific research.

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Correspondence: *Lenka Kramska, Neurosurgery, Regional Hospital Liberec, Husova 10, Liberec 46063, Czech Republic. E-mail: lenka.kramska@seznam.cz*

E. LOJEK, J. STANCZAK, A. WOJCIK & B. MARCOPULOS. Are nonverbal neuropsychological tests culturally determined? The case of the Polish adaptation of the RFFT.

Objective: Nonverbal psychological measures are usually seen as culturally independent, however the results of our study on the Polish adaptation of the Ruff Figural Fluency Test (RFFT) have led to different observations.

Participants and Methods: Normative studies were conducted on 475 men and women aged 16-79, taking into consideration such factors as gender, education, and place of residence. Clinical studies were also performed on groups of patients (n=260) with left-, right-, or bilateral hemispheric brain lesions, Parkinson's disease, Huntington's disease, progressive obstructive lung disease, dementia and depression.

Results: The results supported the utility of the RFFT as a measure of executive functions. The validity and reliability indices of the Polish version of the test were similar to those reported by Ruff (1996). However, the sample Polish test performance differed notably from American samples performance, suggesting that the performance even on non-verbal neuropsychological tests, such as the RFFT, may be culturally determined.

Conclusions: Hence, it would be extremely risky to adopt norms and cut-off points for pathology developed for foreign populations in domestic clinical practice.

Correspondence: *Emilia Lojek, Ph.D., Department of Psychology, The University of Warsaw, Stawki 5/7, Warsaw 00-183, Poland. E-mail: emilia@psych.uw.edu.pl*

J. MORCADO, C. MARUTA, M. GUERREIRO & I.P. MARTINS. Cut-Off Scores in MMSE: A Moving Target?

Objective: Cognitive tests are known to be influenced by language, culture and education. In addition there may be an impact of "epoch" in cognition that is not so well understood. In children, there is a secular improvement of general cognitive ability, measured by IQ tests. If we assume this is a long lasting process, then its effect should be persist into late adult life.

Participants and Methods: To test this hypothesis we compared the performance of two independent samples of healthy adults (>50 years of age), autonomous in daily living activities, evaluated 20 years apart using the MMSE.

Results: Study population included 135 participants in 1988 and 411 in 2008. In both epochs MMSE scored variance was related primary to literacy but also to age (linear regression analysis). Mean MMSE values were higher in 2008 than 1988. This difference remained significant, when populations were matched by literacy groups (0-2 yrs, 3-6 yrs and >6 yrs of education), on multiple t tests ($p < 0.00$ for 0-2 yrs; $p = 0.007$ for 3-6 yrs and $p = 0.02$ for >6 yrs). Operational cut off scores, between normal and pathological values, calculated as $-1.5sd$ below mean, were also higher in 2008, for all literacy groups (0-2 yrs: 15 versus 22; 3-6 yrs: 23 vs 25; >6 yrs: 26 vs 27 in 1988 compared to 2008, respectively).

Conclusions: The present study suggests that there is a secular improvement in cognitive function in adult and elderly individuals, in an interval of 20 years. The operational cut-off values may also changes with time, which may have clinical impact in the diagnosis of disorder like mild cognitive impairment or dementia.

Correspondence: *Carolina Maruta, Laboratory of Language Research, Molecular Medicine Institute, Faculty of Medicine, Av. Professor Egas Moniz, Lisbon 1649-028, Portugal. E-mail: carolmaruta@gmail.com*

P. RZEZAK, S.A. BOLOGNANI, D. LANDUCCI, D. DRUMOND, A. RODRIGUES, F. MONTEIRO, T. RIVERO, M.C. MIRANDA & O.F. BUENO. Sustained attention in brain injury patients: performance on Conners' CPT.

Objective: Attention impairments are common complaints of adults with brain injury. It is important to understand which aspects of attention are impaired, and identify patterns of deficits associated with different etiologies. Conners' CPT is a test with well-recognized and reliable measurements, often used to obtain quantitative information regarding individual ability to sustain attention over time, as well as measures based on signal detection theory. This study investigated the performance of brain injured patients on Conners' CPT.

Participants and Methods: Thirty-seven patients were sorted in groups by injury etiology: 18 with traumatic brain injury (TBI), 12 with hemorrhagic stroke (H-CVA) and 7 with ischemic stroke (I-CVA). Conners' CPT indices were evaluated using t student test to compare CPT t-scores between groups and normative data.

Results: In comparison to normative data all groups showed poorer performance on measures of reaction time; TBI and H-CVA showed higher scores on omission; both CVA groups showed poorer performance on measures that assess subject's ability to adjust to changing interstimulus intervals (Hit RT-ISI); TBI group showed higher scores on response style, and H-CVA on perseverations. TBI differ of H-CVA only in perseverations, but differ of I-CVA on perseverations and Hit RT-ISI measures. Hemorrhagic and ischemic CVA patients differ on Hit RT-ISI measures.

Conclusions: Brain injured patients showed impairment in almost all measures compared to normative data, and TBI and CVA patients showed specific patterns of deficits. This study points out the relevance of using Conners' CPT to identify patterns of attentional deficits on different brain injury etiologies.

Correspondence: *Patricia Rzezak, Doctor, Centro Paulista de Neuropsicologia - AFIP, R. Embau, 54, São Paulo 04039-060, Brazil. E-mail: przezak@uol.com.br*

M. SEMKOVSKA & D.M. MCLOUGHLIN. Long-term neuropsychological effects of electroconvulsive therapy in depression: Systematic review and meta-analysis.

Objective: Although electroconvulsive therapy (ECT) is the most effective treatment for severe depression, related neuropsychological dysfunctions still limit its use. Short-term cognitive impairments caused by ECT are well established. Conversely, extent and nature of long-term neuropsychological effects following ECT, while widely investigated, are still controversial. The current meta-analysis aimed to quantify ECT-induced long-term cognitive dysfunctions and specify their configuration.

Participants and Methods: Electronic data bases and relevant reviews were searched up to January 2009. Eligible studies had within-subjects design involving depressed patients receiving ECT and assessed with standardised neuropsychological tests. Delay between end of ECT and post-treatment cognitive assessment had to be of 14 or more days. The main outcome was change in performance on testing after ECT relative to pre-treatment scores. The influence of age, number of treatments and electrode placement (bilateral versus unilateral) as potential moderators was explored.

Results: Twenty four studies including 615 patients were meta-analysed. Nine (43%) of the 21 identified neuropsychological variables showed non significant mean effect size (ES). The remaining variables showed positive mean ES ranging from 0.26 (95% CI 0.05 to 0.46) to 0.73 (95% CI 0.42 to 1.04). ES were generally homogeneous. None of the studied moderator variables contributed significantly to eventual heterogeneity.

Conclusions: After two weeks following the end of ECT, there is no quantitative evidence of persistent neuropsychological impairment in patients with depression. Auditory attention, constructive abilities, semantic memory and intellectual pre-treatment levels of functioning are recovered. In addition, processing speed, working memory, anterograde memory, set-switching abilities and mental flexibility improved beyond initial levels.

Correspondence: *Maria Semkorska, PH.D., Dept. of Psychiatry TCD, St. Patrick's Hospital, P.O. Box 136, James's Street, Dublin Dublin 8, Ireland. E-mail: semkovsm@tcd.ie*

E. WINGBERMÜHLE, J.I. EGGER, M. WILTINK & R.P. KESSELS. Neuropsychological Interpretation of the WAIS-III: Does Intelligence Overlap with Executive Function?

Objective: The ability to act purposefully is a key element of Wechsler's definition of intelligence. Conceptually, this may be related to ex-

ecutive function (EF), notably goal oriented planning, organization and control. Previous factor analyses in healthy adolescents and young adults (age under 25) using the Spanish WAIS and WISC-III in combination with neuropsychological EF tests (Ardila et al., 1998, 2000) suggest that the Wechsler subtests do not correlate with EF measures. However, no studies exist comparing the WAIS-III with EF tasks, or using clinical participants older than 25.

Participants and Methods: Neuropsychological assessment was performed in 206 individuals (aged 16-65; 180 psychiatric patients and 26 healthy controls). The Dutch version of the WAIS-III was included, as well as the Behavioural Assessment of the Dysexecutive Syndrome, the Wisconsin Card Sorting Test, the Tower of London and the Stroop Color Word Test. Factors were determined using principal components analysis with varimax rotation, followed by parallel analysis (PA).

Results: Three factors with eigenvalues over 1 were extracted. After PA, two factors accounting for 51.2 % of the variance were retained. All non-verbal WAIS-III subtests and EF measures loaded on the same factor. Specifically, measures of abstraction and concept formation appear to have the highest correlation with EF measures.

Conclusions: Our findings suggest considerable overlap between the WAIS-III non-verbal subtests and neuropsychological measures of planning, concept shifting, and interference. However, this overlap may be due to general intelligence rather than specific Wechsler subtests being exclusive measures of EF.

Correspondence: *Ellen Wingbermuehle, MSc, Clinical research, Vincent van Gogh Institute for Psychiatry, Stationsweg 46, Venray 5500 AA, Netherlands. E-mail: pwingbermuehle@ggznu.nl*

Assessment/Psychometrics/Methods (Child)

N.S. ARGOLLO-VIEIRA, O. BUENO, B. SHAYER, A. CAPOVILLA, K. GODINHO, K. ABREU, P. DURÁN, A. ASSIS, F. VARGENS, T. SILVA, J. GUIMARÃES & R. LEVINDO. Cross-cultural Adaptation of "NEPSY: Developmental Neuropsychological Assessment": Brazilian Pilot Study.

Objective: The objectives of this study were to describe the performance of a sample of Brazilian children submitted to a translated and adapted version of the Central Part of NEPSY and compare them to the American version.

Participants and Methods: Methods: The subtests of the Central Part of NEPSY were translated by back-translation and adapted with the participation of a team of specialists; 98 children between 3-12 years of age from both public and private schools in Salvador-BA were submitted to this version. The statistical analysis was accomplished with weighted and raw scores from the subtests, through non-parametric tests, and Spearman correlation.

Results: Results: The female gender presented better scores in the following subtests: Visual-motor Precision, Naming Parts of the Body and Statue. The best performances occurred in the Dominions Executive Attention/Function, Sensor-motor, and Memory and Learning. The Brazilian sample remained within the average variation with a standard deviation ($100 + 15$), the lowest score being found in Sensor-Motor Dominion ($88.05 + 14.89$) and the highest in Visual-spatial Dominion ($102.25 + 19.39$). We observed statistically significant differences in the age group 3-4 years and between it and the other age groups.

Conclusions: Conclusions: NEPSY adapted and translated version proved to be adequate, being capable of discerning the performance of children in different age, social-economic groups, and according to the parents school level. The results of this sample show that this Central Part of NEPSY is equivalent to the American version, and can be used in the experimental study for a Brazilian standardization.

Correspondence: *Nayara S. Argollo-Vieira, PhD, Neuroscience, Federal University of Bahia, Rua Padre Feijó, 240, Canela, Salvador 40110-170, Brazil. E-mail: nayaraargollo@uol.com.br*

N.S. ARGOLLO-VIEIRA, O. BUENO, B. SHAYER, K. GODINHO, K. ABREU, P. DURÁN, F. VARGENS, S. REIS, F. DIAS, C. SOUZA & I. MOURA. Cross-cultural Adaptation of "NEPSY: Developmental Neuropsychological Assessment": Criterion Validation with WISC-III.

Objective: The goal of this study was to describe the performance of the Central Part of NEPSY, translated and adapted, with the WISC-III test.

Participants and Methods: Sixty children, between 6-12 years of age, from both public and private schools in Salvador-Bahia-BR, were selected randomly to undergo both battery of tests: WISC-III and NEPSY. For statistical analysis, we compared weighted scores of NEPSY dominions and subtests, with WISC-III total, execution and verbal intelligence coefficients, factorial groups and subtests, through Pearson correlation, with qualitative and quantitative interpretation.

Results: Average age of the sample $9.02 + 1.94$ years; 27 (45%) male and 30 (50%) from public schools. The Dominions Executive Attention/Function, Language, Visual-spatial Processing, and Memory and Learning were moderately or strongly correlated to IQ and factorial group scores. We observed weak correlations only between: Tower and Arithmetic; Touching with Finger Tips and: Information, Cubes and Searching Symbols; Visual-motor Precision and: Cubes and Numbers; Copying Drawings and: Information and Assembling objects. The sensor-motor Dominion presented the highest number of weak and very weak correlations with WISC-III subtests. The highest number of moderate correlations occurred between NEPSY Language and Memory and Learning Dominion with WISC-III subtests.

Conclusions: NEPSY adapted and translated version presented statistically significant correlations with all WISC-III tests, while there was no very strong correlation, therefore, both battery of tests are interchangeable. Moderate correlations between the following Dominions: Executive Attention/Function, Language, Visual-spatial Processing, and Memory and Learning with WISC-III subtests support the criterion validity, and the low correlations of Sensor-motor Function subtests with WISC-III subtests, which are not sensor-motor evaluation tests, support the validity of the construction.

Correspondence: *Nayara S. Argollo-Vieira, PhD, Neuroscience, Federal University of Bahia, Rua Padre Feijó, 240, Canela, Salvador 40110-170, Brazil. E-mail: nayaraargollo@uol.com.br*

A.E. BARTH, T. TOLAR, P.T. CIRINO, C.A. DENTON, S. VAUGHN, D. FRANCIS & J.M. FLETCHER. The Overlap of Different Methods of Identifying Students with Learning Disabilities.

Objective: This paper addresses the validity of alternative models for the identification of students with learning disabilities. We consider four widely used models of LD identification: (a) aptitude-achievement discrepancy, (b) low achievement, (c) intra-individual differences, and (d) response to instruction.

Participants and Methods: The current study will report on 1400 6th-8th grade students from seven middle schools located in the Southwestern United States. The sample includes 840 struggling readers and 460 adequately developing readers. Struggling readers were defined as students who failed a minimal competency, state accountability reading test and adequately developing readers were defined as students who passed the state accountability reading test. Students were assessed in the following domains, IQ, decoding, spelling, math, reading fluency, language comprehension, and reading comprehension. A series of 2 X 2 measures of association will be computed to address the agreement among the different methods of LD identification. Sensitivity, specificity, positive predictive power, negative predictive power, kappa, overall classification accuracy, and area under the curve will be evaluated and compared.

Results: Results of previous studies suggest that different methods tend to identify different students as having a learning disability, although agreement for identifying typically developing students is much higher.

Conclusions: Approaches of LD identification must use multiple criteria and avoid formulaic decision making.

Correspondence: *Amy E. Barth, Ph.D., Texas Institute of Measurement Evaluation and Statistics, University of Houston, Location: 2151 West Holcombe Blvd., 222 Texas Medical Center Annex, Houston, TX 77204. E-mail: aebarth@uh.edu*

M.C. MIRANDA, L.F. COELHO-SCARAMUZZA & O.A. BUENO. Comparative Study between North American and Brazilian children in the Computerized and Manual Versions of the Wisconsin Card Sorting Test.

Objective: The WCST has shown to be useful in detecting frontal-lobe dysfunctions in patients with ADHD, schizophrenic patients, Parkinson's disease. The computerized version of the WCST is based on the same normative data developed previously for the standard (manual) 128-card version. However, the equivalence of the measures of both versions has not yet been investigated.

The present study investigated the performance of a sample of Brazilian children aged 6-10 years, using the computerized version of the WCST. The results were compared to those of Brazilian and American children which used the manual version.

Participants and Methods: The Brazilian sample in the present study was composed of 400 children. The comparison between the data obtained in this study and that from the sample of North American and Brazilian children from the standardization study with the manual version was carried out by age-group using t student test.

Results: Results showed significant differences of North American children (manual version) in almost all measures in the age groups, where the Brazilian children presented a poorer performance. The comparison between the Brazilian (manual and computerized version) samples showed differences only in some measures; however, children of the present study obtained higher scores than those which used the manual version.

Conclusions: The differences between computerized and manual versions in both Brazilian samples indicate that the norms provided for the manual version should not be used for the computerized version. The comparison between American and Brazilian samples indicated socio-cultural factors as well as that regional normative data must be provided for computerized WCST adaptations.

Correspondence: *Mônica C. Miranda, Psychobiology Department, UNIFESP, R. Embau, 54, São Paulo 04039060, Brazil. E-mail: mirandambr@yahoo.com.br*

Autism Spectrum Disorders

J.G. FINE, M. SEMRUD-CLIKEMAN, J. BLEDSOE, D. ZHU & A. PHAM. Social perception in children with Asperger's, NVLD and controls: an fMRI study.

Objective: Two groups of children having difficulty with social interaction are Asperger's Disorder (AS) and Nonverbal Learning Disability (NVLD). This study used video vignettes of social interaction to illicit brain activity to positive and negative social conditions in typically developing children, children with AS and children with NVLD. It was hypothesized that typically developing children would activate more in the right hemisphere compared to children with AS and NVLD while the AS/NVLD groups would activate more in the left.

Participants and Methods: Twenty-seven right-handed children (9 control, 9 AS, 9 NVLD) 9-16 years. MRI with GE 3T Excite MR. Block design with video vignettes 17.5s of positive or negative videos ranging from 2 to 4 scenes per block. Four runs of 12 blocks each.

Results: Whole brain analysis indicated that in response to positive videos, controls activated more than AS in the right frontal area while children with NVLD activated more in the left temporal area compared to controls. The NVLD group activated their right temporal region more than children with AS in response to positive videos. To negative videos, there were no differences between AS and NVLD, but controls activated more than AS in the cuneus bilaterally while the NVLD group activated more than controls in the left temporal but less than controls in the association gyri.

Conclusions: Controls activated more right hemisphere and emotion-related regions compared to AS and NVLD while NVLD engaged left language areas more. AS and NVLD appeared to activate more similarly to one another than to controls.

Correspondence: *Jodene G. Fine, Ph.D., Educational Psychology, Michigan State University, 440 Erickson Hall, East Lansing, MI 48824. E-mail: finej@msu.edu*

M. SEMRUD-CLIKEMAN, J.G. FINE, J. BLEDSOE, D. ZHU & L. VROMAN. Face Perception in Children with Asperger's Syndrome, NVLD, and Controls using fMRI.

Objective: This study hypothesized that there would be group differences in regions for children with Asperger Syndrome (AS) and non-verbal learning disability (NVLD) compared to typically developing children when viewing happy and sad faces using fMRI. It was hypothesized that children with AS or NVLD would rely on language regions of the brain to decipher faces rather than on nonverbal processing regions in the right hemisphere. It was hypothesized that there would be less activation in the fusiform face gyrus for the clinical groups and more in the left temporal regions compared to the control group when viewing happy and sad faces.

Participants and Methods: Participants: 27 right-handed children (9 control, 9 AS, 9 NVLD) 9-16 years. All participants were strongly right-handed. Each subject participated in an MRI scan with stimuli blocks with either 7 happy or 7 sad photos with a single photo duration lasting 2.5 seconds with 4 runs of 12 blocks each. Alpha was set at $p < .005$.

Results: There were no significant differences between the AS and NVLD groups for the happy and sad photos. Both the AS and NVLD groups showed less activation in cerebellar regions for happy photos. No difference was found for the AS and Control groups for the sad photos. The NVLD group showed significantly more activation in the left temporal and frontal regions, and fusiform gyrus compared to the Controls.

Conclusions: These findings may indicate the children with NVLD and AS may differ in activation patterns for understanding facial expressions particularly for sad faces. In addition, it appears that children with NVLD recruit more neural systems to interpret sad photos.

Correspondence: *Margaret Semrud-Clikeman, Ph.D., Psychology, Michigan State University, 321 A West Fee Hall, E. Lansing, MI 48824. E-mail: semrudcl@msu.edu*

R. CARLSSON & B. PERSSON. Autism and Schizophrenia - Overlap and Differential Aspects.

Objective: Persons with Autism spectrum disorder (ASD) and Schizophrenia psychosis spectrum disorder (Sch) has in common deficits in social functioning, recognition and understanding of affects and theory of mind. The negative symptoms of schizophrenia correspond to the lack of mimicry, prosody and eye contact, as well as disorganized thought and talk often seen in ASD. The lack of Central Coherence also appears to be a common trait. Other common traits are deficient impulse control, attention, executive functions, perception, working memory and a tendency to understand and think concretely. Deficits in the regulation of sleep, eating, attention, thought, mood and social interaction, also appear to be common in both groups. Differential traits are the positive symptoms of hallucinations and delusions, or rather the quality of them. A childhood anamnesis must be taken in order to differ between those persons with Sch that lack positive symptoms and those of ASD, since the latter are present from birth or childhood while Sch usually debut in adolescence or later. Aspects on differential diagnosis between ASD and Sch regarding results on neuropsychological tests and anamnesis will be discussed, and illustrated by three typical cases. A proposal of differential clinical examination will be presented.

Correspondence: *Roger Carlsson, MSci, Kronoberg County Hospital, Psychiatric clinic, Box 1223, Vaxjo 351 12, Sweden. E-mail: roger.jv.carlsson@telia.com*

D. DEWEY & S.G. CRAWFORD. Developmental Trajectories of Adaptive Behaviors in Children with Autism Spectrum Disorders.

Objective: To examine the developmental trajectories of adaptive behaviors (communication, daily living skills, socialization and motor skills) in children with autism spectrum disorders (ASD) compared to children with developmental delays (DD) and typically developing children.

Participants and Methods: Participants were 39 children with ASD (average=10 yrs, SD=3.1), 18 with DD (average=10.3 yrs, SD=3.7), and 23 typically developing children (average=6.7 yrs, SD=3.1). Parents completed the Vineland Adaptive Behavior Scales at the child's initial assessment and again approximately two years later.

Results: Analyses of change in standard scores over time showed delayed onset of daily living skills, socialization skills and motor skills for children with ASD compared to typically developing children. Children with DD displayed delayed onset of motor skills compared to typically developing children. Children with ASD and children with DD displayed delayed rates of development in communication and daily living skills compared to typically developing children. The developmental trajectories for socialization and motor skills were similar for all three groups. Few differences were noted between children with ASD and children with DD; however, the rate of development of daily living skills in children with ASD was superior to that of children with DD.

Conclusions: Children with ASD displayed lower levels of adaptive functioning compared to typically developing children. In terms of the development of adaptive behaviors, considerable variability was noted among children with ASD with communication and daily living skills showing delayed rates of development, and socialization and motor skills showing rates of development similar to typically developing children. Correspondence: *Deborah Dewey, PhD, Paediatrics, University of Calgary, Behavioural Research Unit, Alberta Children's Hospital, 2888 Shaganappi Trail NW, Calgary, AB T3B 6A8, Canada. E-mail: deborah.dewey@albertahealthservices.ca*

Learning Disabilities/Academic Skills/Developmental Risk Factors

D. DEWEY, S.G. CRAWFORD, C. HILL, J. ALDERSON & D. LARKIN. Can a Parent Report Measure of Activities of Daily Living, Play Preferences and Movement Differentiate Children with Developmental Coordination Disorder from Typically Developing Children?

Objective: To determine if a parent-report questionnaire on activities of daily living, play preferences and movement (PADL-Q) differentiates between children with developmental coordination disorder (DCD) and normal comparison (NC) children

Participants and Methods: Twenty-six children from Canada (13 DCD and 13 NC) and 32 children from Australia (16 DCD and 16 NC) participated. Children ranged in age from 5.50 to 12.74 years (DCD, M = 8.83 yrs, SD=1.99; NC, M = 8.61 yrs, SD=1.80). The PADL-Q, a 61 item questionnaire was used to assess parents' perceptions of their children's performance of activities of daily living, play preferences and movement. Parents rated each item on a scale from 1 (not at all like my child) to 5 (a lot like my child).

Results: Children with DCD obtained significantly lower overall scores than NC children on the PADL-Q, $F(1,52) = 42.05, p < .001$ and on the subscales that assessed activities of daily living $F(1, 52)=39.61, p < .001$, play preferences, $F(1,54)=6.95, p=.01$, and movement, $F(1, 54)=39.36, p < .001$. Group by gender interactions were significant for the overall PADL-Q and for activities of daily living, play preferences and movement subscales. On each of these measures, girls with DCD scored significantly lower than boys with DCD, whereas girls in the NC group scored significantly higher than NC boys.

Conclusions: One of the DSM-IV criteria for a diagnosis of DCD is that the motor problems of the child significantly interfere with activities of daily living. Our findings suggest that the PADL-Q shows promise as a measure that could be used to identify difficulties in activities of daily living in children with DCD. Further research examining the validity and reliability of this questionnaire is needed.

Correspondence: *Deborah Dewey, PhD, Paediatrics, University of Calgary, Behavioural Research Unit, Alberta Children's Hospital, 2888 Shaganappi Trail NW, Calgary, AB T3B 6A8, Canada. E-mail: deborah.dewey@albertahealthservices.ca*

T. BARBOSA, C. CRUZ-RODRIGUES, C.M. TOLEDO-PIZA, T.B. SOARES, J.P. GARCIA, E.M. PINHEIRO, G.A. ZANINI, M. MUSZKAT, M.C. MIRANDA, A.P. NAVAS & O.A. BUENO. Development of Cognitive Domains in Dyslexic Children.

Objective: The present study compared reading, writing and cognitive abilities among dyslexic children, classified as "better skilled" or "poorly skilled", according to scores in accuracy tests and reading comprehension tasks.

Participants and Methods: Two groups were analyzed: Group BSG (better skilled), composed of 10 dyslexics (mean age: 12 years \pm 1,4) with scores \geq 80% on a reading comprehension task and reading errors below the 25th percentile. Group PSG (poor skilled), composed of 10 dyslexics (mean age: 10 \pm 1,4), with scores \leq 60% on reading comprehension tasks and reading errors above the 75th percentile. All children were matched individually to controls for age, sex and type of school (state or private). The assessment included oral language tasks, reading and writing abilities and cognitive performance (IQ, attention, memory, etc.)

Results: BSG and controls showed no significant differences in semantic and syntactic abilities, reading comprehension, STM and episodic and semantic memory. Differences were found in phonological awareness tasks, word reading, reading speed, attention skills and verbal sub-scales of the WISC-III. The PSG performed worse than controls in all mentioned abilities, except for oral comprehension and episodic memory tasks.

Conclusions: The PSG showed impairment in abilities related to several cognitive domains. The BSG showed better development of the mentioned abilities, suggesting the importance of maturational and environmental influences. These corroborate literature findings that demonstrate that poorer reading performance is observed in individuals with greater cognitive impairments. Nevertheless, it is interesting to notice that even when reading accuracy improves, a slower reading speed persists (Shaywitz, 2008).

Correspondence: *Thais Barbosa, Psicobiologia, UNIFESP, Rua Madre Cabrini, 406 - apto 10, São Paulo 04020-001, Brazil. E-mail: barbosa_thais@hotmail.com*

M. LAASONEN, P. TANI, S. LEPPÄMÄKI, A. ERKKILÄ & L. HOKKANEN. Project *DyAdd*: Adult Dyslexia and Attention Deficit Disorder in Finland.

Objective: Project *DyAdd* compares adults with dyslexia, ADHD, dyslexia together with ADHD, and healthy controls. The aim is to define shared and differentiating characteristics of the conditions at different levels of analysis.

Participants and Methods: Participants were 119 adults (18-55 years) in the groups of controls (n=40), those diagnosed with dyslexia (n=40), ADHD (n=30), or their comorbid combination (n=9). The groups did not differ in their age, $F(2,107) = 2.53, n.s.$, gender, $\chi^2(2) = 1.16, n.s.$, educational level, $\chi^2(4) = 6.48, n.s.$, or handedness, $\chi^2(4) = 1.85, n.s.$ Methods included various neuropsychological, psychophysical, and biological methods.

Results: Current neuropsychological results suggest that:

1) WAIS-III does not differentiate between adult dyslexia and ADHD but these clinical groups share a difficulty in processing speed, $F(3,115) = 7.45, p < 0.001$, partial $\eta^2 = .16$; post hoc: clinical groups compared to the controls $p < 0.01$.

2) Adult ADHD is not related to large or significant difficulties in phonological processing or achievement.

Current biological results on fatty acids suggest that:

1) A higher ratio of n-6/n-3 PUFAs is characteristic to males with dyslexia or ADHD, dyslexia: $F(1,103) = 4.85, p < .050$, partial $\eta^2 = .045$; ADHD: $F(1,47) = 5.87, p < .050$, partial $\eta^2 = .111$.

2) The relations between fatty acids and cognition are more prevalent in the dyslexia group than in other groups.

Conclusions: Future work of the project *DyAdd* will concentrate on group comparisons in questionnaires, visuospatial, constructive, and motor functions together with various aspects of learning and memory, executive functions and attention, and temporal processing.

Project homepage: <http://www.helsinki.fi/psykologia/projects/dyadd/>

Correspondence: *Marja Laasonen, PhD, Department of Psychology, University of Helsinki, POB 9 (Siltavuorenpenger 20 C), Helsinki 00014, Finland. E-mail: Marja.Laasonen@helsinki.fi*

G. MIJALKOVIC-STOIJILJKOVIC & D. VUCINIC. Specific Learning Disability: Cognitive Profiles and Differential Diagnostic Strategies.

Objective: The present study was designed to investigate whether specific learning disabilities are related to basic similarities and important differences in cognitive profiles of school children and to identify dominant differential-diagnostic strategies.

Participants and Methods: Categories of specific learning disabilities (by definition of IDEA) were defined by performances on neuropsychological battery for measuring level of intellectual functioning, memory, attention, executive functions, visuo-spatial and visuo-constructive ability, and language skills including achievement in automatization of word identification, automatization of arithmetic, and in listening comprehension. From a sample of 22 students from 8-15 years during secondary education in Serbia we expect to select 3 group of problems, depending on:

1. area of dominant disability ;
2. severity of disability;
3. multiplicity of compromised skills.

Results: The findings indicate that performance profiles are mainly similar in slower processing speed, executive function of information integration and attention tenacity. Diversity of profiles is based on modality of academic skills (reading, writing, maths, comprehension, learning strategy), subtypes inside described disabilities, depending on dominant perceptual channel, and interdependence of cognitive, academic and behavioral functioning. Different forms and levels of difficulties and achievements includes different patterns of orthographic-phonological or auditory-visual mapping of learning processes.

Conclusions: The idea that specific learning disabilities are associated with a combination of deficits in specific areas request multilevel diagnostic process and flexible intervention planning.

Correspondence: *Dragana Vucinic, Child Neurology, Clinic of Neurology and Psychiatry for Children and Youth, Glamocka 2, Belgrade +38111, Serbia. E-mail: dragana.vucinic.npk@gmail.com*

J. NUKARI, E. SERVICE, J. KORKEAMÄKI & S. HAAPASALO. Dyslexia Among Adults in a Transparent Orthography – Neuropsychological Profile and Everyday Consequences.

Objective: The study is part of the Learning to Learn –project that develops services for adults with learning disabilities. The aim of the study was to investigate how adult dyslexia in a transparent language can be best detected in a clinical neuropsychological examination and to find out what kind of difficulties dyslexic adults report in everyday life.

Participants and Methods: The participants were 75 adults (mean age 35) who had taken part in the project 2006–2008. They were looking for services to help them with their learning disabilities and consented to participate. All participants went through a neuropsychological examination including a battery of dyslexia tests. Before the examination they were also given questionnaires concerning problems in areas such as reading, writing, remembering etc.

Results: Out of the 75 participants, 53% fulfilled the set criteria for dyslexia. Dyslexia was most typically detected in reading speed rather than reading or writing errors. Also 80% had problems in verbal short term memory. Among the self-reported difficulties, most problems were in foreign languages (over 80%). Reported difficulties in memory and calculation were slightly more substantial than in reading and writing. Over 50% experienced some problems at work or in their studies.

Conclusions: As evident in the neuropsychological profile, as well as self-reports, dyslexia continues to have an influence in adulthood in many different areas of functioning. For adult dyslexic readers of a transparent language, especially learning foreign languages rather than reading was a major source of difficulties in both working life and studies.

Correspondence: *Johanna Nukari, Rehabilitation Foundation, Pakaritievantie 4-5, Helsinki 00411, Finland. E-mail: johanna.nukari@helsinki.fi*

K. PELTOMAA, A. AUER, H. SUOMINEN & H. LYYTINEN. Early Recognition and Preventive Intervention for First-Graders at Risk for Reading Failure.

Objective: The objective of the study is to develop an early intervening system for school-age children who are at risk for reading failure.

Participants and Methods: The study is carried out among first-graders (n=415) in the city of Järvenpää 2008-2010. The screening assessments take place in the beginning, in the middle, and at the end of the first grade by using ARMI – The screening material of literacy skills for the first grade. The children at risk for reading difficulties are assessed by tasks from WISC-III, NEPSY-II, RAN and ARMI. The children at-risk play the "Literate" computer game designed to strengthen the knowledge of letter-sound connections. The children whose literacy skills are far behind (> -1 sd) their classmates in check-up points will be provided by individually tailored instruction.

Results: All first-graders in the city of Järvenpää were invited to participate, and 95 % (n=396) of them agreed. The children with poor letter knowledge and phonological awareness (n=83) were provided by individual assessments. 78 (19,7 %) children took part, and 57 of them played the "Literate"-game. Most players reached their classmates, but ten (2,5 %/396) of these children were still very poor (> -3 sd), in word reading assessment in January.

Conclusions: Preliminary results show that screening of letter naming and phonological awareness skills of first-graders is worth the effort. It seems that most children at risk for reading failure did benefit from the use of the "Literate"-game. The neuropsychological characteristics of those who didn't will be discussed.

Correspondence: *Kaisa Peltomaa, Rehabilitation Center Nekku, Sibeliuksenkatu 15 B, Järvenpää 04400, Finland. E-mail: kaisa.peltomaa@gmail.com*

M. PELTOPURO, V. NÄRHI, J. KAARTINEN & T. AHONEN. Systematic Literature Review of Borderline Intellectual Functioning.

Objective: People with borderline intellectual functioning (BIF) are overrepresented in many social services: e.g. special education, vocational, mental health and social security. Despite clear problems in many sectors of life, theoretical knowledge of BIF is scattered. Aims: To systematically review of the literature related to BIF. The focus is on neuropsychological and academic deficits of BIF, and how these problems compare to those related to specific learning disabilities and mental retardation. Developmental risk and preventive factors are also addressed.

Participants and Methods: 20 BIF related terms were used in the search of four databases (PsycInfo, Medline, ISI, ERIC). Totally 4108 hits were obtained. Group studies which reported results relevant to study questions on subjects whose IQ was from 70 to 85 were included.

Results: Fewer than 40 studies fulfilled the inclusion criteria, showing that BIF is understudied subject. Also quality of studies was mainly rather low. Preliminary analysis indicates that academic problems are severe.

Conclusions: BIF is rather neglected subject in research. Especially neuropsychological studies are few, medical and educational approaches being somewhat more established in the literature of BIF. Differences in academic performance between BIF, specific learning disabilities and mental retardation are seen. The results will be discussed in the light of the directions for future research.

Correspondence: *Minna Peltopuro, Nilso Mäki Institute, University of Jyväskylä, PL 35, Jyväskylän yliopisto 40014, Finland. E-mail: minna@peltopuro.fi*

C.C. RODRIGUES, L. CASTRO, G. MOREIRA, S. TUFIK & O. BUENO. Sleep Disorders (SD) in Children with and without Learning Disabilities (LD).

Objective: In Brazil, 30 to 40% of elementary school children present some academic difficulty, of which 3 to 5% is LD. Some reports show that children having learning disabilities of no specific cause, complaint of SD in 44% of cases, turning the evaluation of sleep important

for a differential diagnosis. Moreover, children with Obstructive Sleep Apnea (OSA) may present cognitive impairment, slowness in learning, behavioral problems, attention deficit, and hyperactivity, which may recover after treatment. Objective: To investigate the incidence of sleep pattern alterations in children with and without LD.

Participants and Methods: 58 children were evaluated and separated in 2 groups. G1: 31 children (21 boys), mean age 10.32 (1.85), primarily diagnosed as exhibiting learning disability, and G2 (control): 27 children (14 boys), mean age 10.25 (1.78), with no LD. Two consecutive full-night polysomnography (Alice/Respironics) were carried out in the Sleep Institute.

Results: Data from the second night of sleep was evaluated. Groups did not differ in sleep stages (t-test) and SD diagnoses (Chi-square), and presented sleep disorders (63.8%), such as snoring (53.4%), sleep architecture alteration (3.4%), periodic limb movements (1.7%), and epileptic activity (8.6%).

Conclusions: In the present study some cases evidenced potential treatable factors, especially for snoring and epileptic activity, emphasizing the importance of evaluating sleep pattern among scholar-age children, exhibiting or not LD, so as to prevent or minimize academic impairment and behavior and cognitive alterations. Further research is required to correlate polysomnography findings to cognitive alterations for this population. Correspondence: *Camila C. Rodrigues, Master, Psychobiology, UNIFESP/ EPM, Rua Embaú, 54, São Paulo 04039060, Brazil. E-mail: camilacruzrodrigues@hotmail.com*

C.M. TOLEDO-PIZA, E.C. MACEDO, T. BARBOSA, C.C. RODRIGUES, E.M. PINHEIRO, G.A. ZANINI & O.A. BUENO. Comparison of Brazilian Children with Dyslexia and Learning Difficulties in Single Word Reading and Spelling Tasks.

Objective: The analysis of undergoing cognitive processes in single word reading and spelling tests, can help us distinguish different profiles of learning difficulties. The present study aims to compare the performance of children with dyslexia and learning difficulties in single word reading and spelling tasks.

Participants and Methods: Participants were: twelve dyslexics (mean age = 11.77 years \pm 1.66) and 12 children with learning difficulties (LD) (mean age = 12.09 years \pm 1.85), paired by age, sex and type of school (public or private). All were tested for IQ, obtaining overall scores above 80. The reading task, composed of 191 Portuguese words and pseudowords, was presented on a computer screen one-by-one, to be read out-loud. In the spelling test, 45 words and pseudowords, were dictated out-loud for the child to write down the answer. The psycholinguistic variables controlled in reading were: regularity (regular, irregular, rule), frequency (high and low) and lexicality (real words and pseudowords). On the spelling test, only the last two were controlled.

Results: Results showed higher total scores in the LD reading group ($M=164.17 \pm 12.25$), when compared to those with dyslexia ($M=132.5 \pm 42.28$). Data demonstrated that dyslexics had lower scores in the reading of pseudowords, low frequency and irregular words, as well as in all regularity items. In spelling test, differences were observed in the total number of correct answers, in pseudowords and high frequency words. Interestingly, both groups performed weakly in the spelling of low frequency words.

Conclusions: Overall findings suggest that comparative studies of reading and spelling performance can also assist in the differential diagnosis of learning disabilities.

Correspondence: *Carolina M. Toledo-Piza, masters, Psychobiology, UNIFESP, R. Napoleao de Barros, 925, To andar, vila clementino, Sao Paulo 01302-907, Brazil. E-mail: carolatp@terra.com.br*

.M. FAGERLUND, M. KORKMAN, I. AUTTI-RÄMÖ, S.N. MATTSON & E. HOYME. Risk and Protective Factors for Mental and Behavioral Well-being in Fetal Alcohol Spectrum Disorders.

Objective: To examine the risk and protective factors associated with the mental and behavioral well-being of children and adolescents following prenatal alcohol exposure.

Participants and Methods: A total of 73 children and adolescents were assessed for internalizing, externalizing, and total behavior problems using the Child Behavior Checklist. Linear regression models were used to determine the effects of diagnostic and environmental risk and protective factors on behavior, while controlling for age, sex and IQ.

Results: Length of time spent in residential care was the most pervasive risk factor associated with internalizing, externalizing and total mental and behavioral problems. A low dysmorphology score was related to more internalizing and total problems.

Conclusions: The results underscore the need to consider the postnatal environmental circumstances of children with fetal alcohol spectrum disorders in predicting outcome. Consistent with an attachment model of development, presence of close and persistent relationships may be of particular importance for improved outcomes in children with FASD. More attention should be focused on children with fetal alcohol spectrum disorders with lower dysmorphology scores and their special risk profile.

Correspondence: *Åse M. Fagerlund, M.A., Psychology, Abo Akademi, Björnstrandgränd 6B, Helsinki 00890, Finland. E-mail: asefagerlund@gmail.com*

A. KOLK. Cognitive Development of Children with Unilateral Non-Progressive Brain Lesion.

Objective: The aim of the study was to discover the relationship between unilateral early-onset nonprogressive brain lesion and cognitive development in children.

Participants and Methods: The neuropsychological examination was performed using the NEPSY test battery for 44 children with perinatal stroke including 12 with epilepsy, 10 other children with newly diagnosed epilepsy and 14 healthy controls matched for sex, age and socioeconomic status, aged from 4 to 9 years.

Results: We found the worst cognitive outcome in hemiparetic children with epilepsy. They showed diffuse impairment in many cognitive functions especially in boys. The children with left hemisphere lesion associated with left-sided epileptic discharges in the EEG demonstrated significant delay in language and in memory skills. In some instances language dysfunction was also associated with a lesion in the right hemisphere. The right hemisphere lesion detected with MRI/CT or/and EEG was associated mainly with attention and spatial dysfunction.

Conclusions: A different pattern of cognitive decline results from left versus right-hemisphere damage, but frequently the cognitive impairment of focal brain-damaged children tends to be diffuse. Children associated with epilepsy have severe and children with newly diagnosed partial epilepsy moderate cognitive deficit. Early evaluation of the structure of cognitive dysfunction in children with focal brain lesion is extremely important for appropriate intervention

Correspondence: *Anneli Kolk, PhD, Neurology, Children's Clinic Tartu University Hospital, Lunini 6, Tartu EE 51015, Estonia. E-mail: anneli.kolk@kliinikum.ee*

Language and Speech Functions/Aphasia

N. ABREU. Right-Brain Damage Affects Semantic but not Orthographic Word Fluency.

Objective: Word fluency is a function that can be affected by right-brain hemisphere lesion (RBD). Studies reported specific differences in the word fluency with specific semantic criteria while others showed decrements also for orthographic criteria. The aim of this study was to evaluate the orthographic and semantic verbal fluency with RBD subjects.

Participants and Methods: RBD (n:14, age: 59.7 \pm 10.0; years of study: 5.5 \pm 2.6) with an unique cerebral vascular accident and control group were assessed. All of them were right handers portuguese-speaking (>90% on EHI). The subjects were asked to answer to 6 semantic and 6 orthographic word fluency tests and an attention task.

Results: RBDs showed decrements in semantic (11.5, sd.1.4; controls: 14.4, sd. 1.7) but not in orthographic (9.1, sd. 1.6; controls: 10.7 sd. 1.9) criterion considering number of acceptable words. In an attention task, RBDs had a lower significant performance.

Conclusions: This study extend and corroborates the hypothesis that RBD affects only semantic word fluency, but not orthographic. Attention deficits seems to contribute to word fluency decrement.

Correspondence: *Neander Abreu, Ph.D., Centro de Ciências da Saúde, Universidade Federal do Recôncavo da Bahia, Rua Rubem Berta, 339/602, Ed. Praia de Guarujá Pituba, Salvador 41810-045, Brazil. E-mail: neandersa@hotmail.com*

M. BALCONI & S. AMENTA. Pragmatic and semantic information interplay in ironic meaning computation: evidence from “pragmatic-semantic” P600 effect.

Objective: It is generally assumed that, in order to derive the meaning of complex communicative phenomena, such as irony, contextual and common knowledge should enter the comprehension process (Hagoort et al., 2004). Recently, semantic-P600 ERP effect has been associated to figurative language comprehension, in general, and irony in particular (Kutas et al., 2006; Regel, 2006), suggesting that pragmatic interpretation of ironic sentences requires specific inferential processes in order to derive contextual-compatible meanings.

Participants and Methods: In our study, we used ERPs to compare familiar ironic and literal sentences processing in order to assess if ironic and literal meaning comprehension could involve similar or different processes and whether peculiar components of ironic processing could be identified. Fifteen subjects read 100 short stories ending either literally or ironically.

Results: Morphological ERP analyses showed a similar pattern of activation for irony and literality in the initial phases of comprehension, and a positive deflection, for both conditions, at mean latencies of 600ms, with an increased amplitude in anterior areas.

The ANOVA performed found no difference relative to this positive component throughout the conditions, while confirming its increase in anterior areas.

Conclusions: Our data showed that familiar irony processing seem not to differ qualitatively from non-ironic comprehension since, for both conditions, late processes of contextual and pragmatic information implementation in sentence meaning seem to be involved (Bornkessel-Schlesewsky, 2008). Furthermore, the increase of this “semantic-pragmatic” P600 in anterior areas suggests frontal lobes have a major role in taking into account background knowledge and speakers’ communicative intents in meaning co-construction.

Correspondence: *Michela Balconi, Ph.D., Psychology, Catholic University of Milan, L.go Gemelli, 1, Milan 20123, Italy. E-mail: michela.balconi@unicatt.it*

A. BOSE, K. DURDA, S. KIRAN & L. BUCHANAN. Verbal fluency in aphasia: word frequency and semantic similarity.

Objective: The category fluency test in which participants are required to produce exemplars from specified semantic category (e.g., animals) is widely used in aphasia assessment. Successful performance depends on the ability to initiate a systematic search and retrieval sequence within semantic memory. The frequency distributions and semantic relations among items generated by aphasic individuals are data that could be uniquely informative but such data have yet to be reported. This study aimed to fill this gap by analyzing the frequency characteristics of the items as well as the semantic relationship between sequential responses. The semantic relationship between two consecutive items were defined in terms of semantic similarity and quantified by a measure of similarity provided by a computational model of semantic space (Durda & Buchanan, 2008).

Participants and Methods: We collected animal fluency data for one minute from 23 people with post-stroke aphasia and 20 normal control speakers. For the analysis, the one minute interval was divided into four 15 second intervals. The mean word frequency and semantic similarity for the items in each interval were analyzed and compared between the groups.

Results: The pattern for word frequency between the two groups was similar: words with higher frequencies were produced earlier than words with lower frequency. However, the aphasics produced a gradual decrease in semantic similarity across the time intervals but the controls did not.

Conclusions: The decrease could be explained in terms of a more effortful search through a sparser semantic network or by assuming increased noise within a semantic network that otherwise retains the same number of pre-morbid representations. We discuss both possibilities in the context of other previously published evidence.

Durda, K., & Buchanan, L. (2008). WINDSORS: Windsor improved norms of distance and similarity of representations of semantics. *Behavior Research Methods*, 40(3), 705-712.

Correspondence: *Arpita Bose, Ph.D., Psychology, University of Windsor, 401 Sunset Ave, Windsor, ON N9A5G8, Canada. E-mail: bosea@uwindsor.ca*

W. GRAUEL, L. CUPPLES & C. LAW. Production of Passives in Fluent Aphasia: Effects of Thematic Structure of the Verb.

Objective: Production of passives has been found to be difficult for individuals with fluent aphasia, typically evident by thematic role-reversals, which are assumed to result from an underlying lexical semantic deficit. Passivisation has traditionally been assessed with verbs whose canonical structure is that of an active (e.g., agent-theme verbs, such as ‘climb’). Different types of verbs (e.g., theme-experiencer verbs, such as ‘frighten’) have, however, been found to be more commonly produced in the passive voice by non-brain-damaged (NBD) individuals. This study investigated whether people with fluent aphasia would also find it easier to produce grammatical passives with theme-experiencer verbs than with agent-theme verbs.

Participants and Methods: Preliminary data were collected from P1 (anomia) and P2 (Wernicke’s) as well as forty-five NBD individuals. Production of passives was assessed by means of a highly constrained sentence anagram task as well as a picture description task comprising two conditions with different levels of constraint.

Results: In the highly constrained context (anagram task), all participants produced passives with both types of verb. By contrast, in the moderately constrained picture description context P1 and NBD participants produced grammatical passives with both verb types, while P2’s passives were restricted to theme-experiencer verbs. In the least constrained context passives were readily produced only with theme-experiencer verbs, both by NBD speakers and the two individuals with aphasia.

Conclusions: Results suggest that difficulty producing passives in fluent aphasia may not result purely from a lexical semantic deficit but is influenced by the thematic structure of the verb, resulting in a higher likelihood for grammatical passives to be produced with theme-experiencer verbs than with agent-theme verbs.

Correspondence: *Wiebke Grauel, Macquarie University, University Ave, Sydney, NSW 2109, Australia. E-mail: wiebke.grauel@ling.mq.edu.au*

S.L. HAUGER, T. ENDESTAD, A. SOLBAKK & P. DUE-TØNNESEN. Bilateral Representation of Language in Crossed Aphasia: A Case Report.

Objective: Crossed aphasia is a phenomenon in which injury to the right cerebral hemisphere (usually non-language dominant) in a right-handed person leads to aphasia. Most studies estimate the prevalence of crossed aphasia to around 3%.

Participants and Methods: We report a case study of a 30 year old right-handed man who exhibited an aphasic syndrome after sustaining a haemorrhagic infarct of the right temporal lobe. Post-injury, the patient underwent neuropsychological testing and brain activation patterns were studied using functional magnetic resonance imaging (fMRI) during finger tapping, covert reading and word generation (phonological fluency).

Results: The structural MRI scans 5 months after the haemorrhage and the subsequent surgery showed residual damage in the right inferior temporal gyrus extending medially and involving the fusiform gyrus. Initial

neuropsychological assessment showed severe aphasia affecting both receptive and expressive language functions. fMRI studies five months post-injury showed that the patient had left hemisphere motor cortex activation when tapping with his right index finger, and a reversed activation pattern when tapping with his left index finger. The sentence reading task elicited extensive extrastriate bilateral activation. In the lesioned hemisphere there was an additional rim of activation around the same area activated by the covert word production task. The silent word production task produced bilateral activation in the left somatomotor areas as well as in the right motor, pre-motor areas and the inferior frontal region. Linguistic testing at this point revealed mild word finding difficulties only.

Conclusions: The fMRI findings indicate bilateral organization of the neural networks subserving word generation, and may explain the patient's rapid recovery of aphasia within a 5 month period.

Correspondence: *Solveig L. Hauger, cand. psychol., Klinikk for hjerne-skade, Sunnaas sykehus HF, Furulua 44, Bekkestua 1356, Norway. E-mail: solveig.hauger@gmail.com*

M. HIGASHIKAWA, K. HADANO & T. HATTA. Different types of scanning disturbances from the mental lexicon observed in Japanese semantic jargon aphasics.

Objective: The aims of this study were first to analysis the speech content characteristics in three Japanese semantic jargon aphasics who showed different types of word scanning disturbance and second to examine breakdown mechanisms of their semantic system in mental lexicon.

Participants and Methods: Three semantic jargon aphasics were examined. Case1; Age 61, female, subarachnoid hemorrhage. Case2; Age 49, male, intracerebral hemorrhage. Case3; Age 59, male, cerebral infarction. Their speech characteristics were summarized and the disabilities in the selection of items in the mental lexicon were analyzed. The analysis of speech had been performed by the method of Hadano (1991) by taking the speech in the naming task, separating it into phrases and categorizing the content word in each phrase into 7 groups (neologism, paraphasia, empty phrases, etc.)

Results: Each speech was characterized by abundant iterative patterns of semantic variations in many semantic categories (Case 1), an iterative pattern of semantic variations in only a particular category (Case 2), and stereotypic repetitions of a particular lexical item without variations (Case 3). These three cases might indicate that the range of scanning in the lexicon might shrink in this order.

Conclusions: All cases had a tendency of breakdown in their automatic scanning system of semantic system. These different types of breakdown characteristics suggest first that the range of scanning in the mental lexicon became shrinking and second that the semantic system in our mental lexicon organized as a hierarchical system. The semantic system in human mental lexicon could be disorganized depending on different levels. Correspondence: *Mari Higashikawa, Ph.D., Teikyo Heisei University, 2-51-4, Higashi-ikebukuro, Toshimawa-ku, Tokyo 170-8445, Japan. E-mail: himawari@xj.biglobe.ne.jp*

S. KISELEV & Y. LAPSHINA. Investigation of visuospatial abilities in Russian-speaking children with weakness in understanding grammatical structures.

Objective: The goal of this research was to examine the hypothesis that children with weakness in comprehension of grammatical structures (GW-children) have also a weakness in visuospatial abilities.

Participants and Methods: 25 children aged between 7 and 8 years were included in the experimental group with weakness in comprehension of grammatical structures, and 25 children were included in the control group.

Children from both groups were assessed with visuospatial tasks from Luria's child neuropsychological assessment battery and with the Rey-Osterieth Complex Figure test.

Results: One-way ANOVAs by group revealed significant differences between the groups for scores in the two visuospatial tasks (Constructional Praxis and Head Task) and for number of spatial errors

in the Rey-Osterieth Complex Figure test. However, there were no differences in number of omission errors and needless details. The two groups differed also significantly in their use of coping strategies. The majority of the GW-children used immature analytic strategy. In contrast, the majority of children from control group used holistic strategy.

Conclusions: Thus in view of the obtained results it can be assumed that children with weakness in comprehension of grammatical structures have also weakness in visuospatial abilities.

Correspondence: *Sergey Kiselev, Ph.D., Psychology, Ural State University, Lenina ave, 51, Ekaterinburg 620083, Russia. E-mail: eskisa@rambler.ru*

M. LILJESTRÖM, A. HULTÉN, L. PARKKONEN & R. SALMELIN. Comparing MEG and fMRI Views to Naming Actions and Objects.

Objective: Category-specific impairments in aphasic patients have suggested that verbs and nouns are processed in dissociable cerebral networks. Here, we report both MEG and fMRI results in healthy subjects when they named verbs and nouns from images that depicted an action or an object. Due to the different nature of the signals, MEG and fMRI might be sensitive to different components of the overall neural activity. To be able to compare the results we used exactly the same experimental design and the same subjects for both imaging modalities.

Participants and Methods: Eleven healthy subjects were asked to silently name both verbs and nouns from images that illustrate an event, and nouns from images depicting only an object. The MEG data were modeled both by equivalent current dipoles and by distributed minimum norm estimates. The fMRI data were subjected to random-effect contrast analysis.

Results: Naming actions or objects from pictures depicting an action evoked stronger activation than naming objects from object-only images in the frontal, inferior parietal and posterior temporal areas in fMRI. Lower activation to object-only images in the left frontal and parietal cortex was also the main finding in MEG. Naming verbs or nouns from action pictures were not differentiated in cortical activation.

Conclusions: fMRI and MEG data showed fairly good convergence, with both overall activation patterns and task effects localizing to comparable cortical regions. Both fMRI and MEG results indicate that the image category had a stronger influence than the naming category on activation within the picture naming network.

Correspondence: *Mia Liljeström, M.Sc (Tech), Brain Research Unit, Low Temperature Laboratory, Helsinki University of Technology, PO BOX 5100, Espoo 02015, Finland. E-mail: mli@neuro.hut.fi*

C. NAGAI, T. INUI & M. IWATA. Grammatical Development in a Case of Acquired Childhood Aphasia with Onset at Age 6.

Objective: It has recently been suggested that the prognosis of acquired childhood aphasia depends on the age at onset and is often similar to certain types of aphasia in adulthood. The purpose of this study was to determine what components of grammatical function would be affected by cerebral infarction at age 6.

Participants and Methods: A 6-year-old, right-handed girl suffered cerebral infarction in the left central area extending from the putamen and supramarginal gyrus caused by left internal carotid artery stenosis. Although her speech disturbance recovered shortly after acute treatment, sentence comprehension disabilities remained. She subsequently participated in this study at age 38. Her general intelligence and verbal function were investigated by standard neuropsychological tests. Moreover, we administered the Japanese test for Comprehension of Syntax and Semantics (J.COSS), which includes 20 grammatical components, and compared the results with those of healthy developing children.

Results: Spontaneous speech was fluent with preserved naming, reading, writing and word recognition, while repetition and syntactic comprehension were poor. J.COSS revealed a distinct impairment with regard to grammatical components: complex sentence structures

(center-embedded, predicate modification); comparatives; case particles; conjunctive particles; and plurals. In contrast, comprehension of active, passive and left-branched sentences was intact, as was that of other components. The mean grammatical age for all components, as estimated from data for healthy developing children obtained using J.COSS (Nakagawa, 2005), was 5.8 years.

Conclusions: The results suggest that the impaired grammatical function in this patient is largely confined to the components expected to be acquired after age 6, and is apparently correlated with age at onset and lesion site.

Correspondence: *Chiyoiko Nagai, ERATO, JST, S9-3 Kitashirakawa Oiwake-cho, Sakyo-ku, Kyoto, Kyoto 606-8224, Japan. E-mail: nagai@jeap.org*

R. STROBILIUS, F. MONTEIRO, S.P. BOLOGNANI & O.A. BUENO. Interrelations between Semantic and Phonological Domains in Conduction Aphasia(CA).

Objective: Our aim is to use a case study of a patient with CA to evaluate how semantic and phonological domains are related in processing verbal information. We will compare our data with specialized literature.

Participants and Methods: HR, male, 34 years-old, suffered a brain injury, with frontal-parietal lesions. He was submitted to neuropsychological and language evaluation, with CA diagnoses and a curious predominance of semantic paraphasias (SP), like Howard & Franklin 1988 deep dysphasia case.

In order to investigate the nature of his deficit, he was submitted to the tests: Word Repetition (WR); Sentence Repetition (SR); Pseudoword Repetition (PwR); and Recognition by Visual Confrontation (RVC).

Results: We found SP in all tests. For the WR, he got 107/168. He made 61 errors: 47 SP; 7 omissions; 4 phonemic paraphasias; and 3 phonological paraphasias. He got worse scores in abstract words: 9/21 versus 98/147 to concrete words. For the SR, he elaborated theme-related sentences. For the PwR, HR got 5/40, the 35 errors were: 10 SP; 10 phonological paraphasias, 13 no related with the target; and 2 omissions. For the RVC, he got 45/56, and did 11 errors: 9 SP and 2 phonological paraphasias.

Conclusions: The observed occurrence of SP, even for non-verbal answers (RVC test), as well as the worse performance in pseudowords and in abstract words, cannot be explained by the literature models assuming that the deficit in CA is only in output phonological buffer. Our findings are coherent with the models that emphasized multiple levels of representation in short-term memory (phonological and semantic).

Correspondence: *Renata Strobilius, Psychobiology, Universidade Federal de São Paulo, Rua Embau, 54, São Paulo 04039-060, Brazil. E-mail: rstrobilius@hotmail.com*

Memory Functions

R.H. AKILA, V. KALAKOSKI, M. VUORI, H. AHVENINEN & M.A. SAINIO. Cognitive Functioning in Mild Burnout.

Objective: Neuropsychologists are increasingly involved in work ability evaluations of persons suffering from burnout who work in cognitively demanding occupations. Our preliminary study examined the cognitive performance of experts and managers with different degrees of burnout. Studies on this topic are scarce.

Participants and Methods: Seventeen people from a large information technology service company participated in the study. The Maslach Burnout Inventory - General Survey total score (MBI-GS) was used to determine the severity of burnout symptoms. The average MBI-GS was 1.7 (range 0.27 - 3.8). Cognitive assessment included WAIS-III Matrix Reasoning, subtests of WAIS-III Working Memory and Processing Speed Indices, WMS-III word list learning, PASAT, Stroop, and experimental tasks measuring the speed of visual search, the efficacy of encoding, and working memory capacity (WMC). The WMC tasks were dual-task conditions, requiring simultaneous verbal or visuospatial learning and information processing.

Results: Age, gender and education level had no significant relationship to burnout ratings. Mental arithmetic and delayed recall of the word list were the only neuropsychological variables that associated with MBI-GS ratings. The speed of visual search was not related to burnout, but more severe burnout was related to slower memory encoding. More severe burnout was also associated with significantly lower performance in both WMC tasks.

Conclusions: Fairly mild burnout was related to lower performance when continuous attention-switching and remembering of order information was required; an alarming result in a nonclinical sample. Whether the suggested relationship reflects the cause or the consequence of subjective job stress remains, however, unsolved.

Correspondence: *Ritva H. Akila, PsL, Brain and Work Research Centre, Finnish Institute of Occupational Health, Topeliuksenkatu 41 a A, Helsinki FI-00250, Finland. E-mail: ritva.akila@ttl.fi*

F. ANDELMAN, D. HOOFIEN, I. GOLDBERG & M. NEUFELD. A Case of Bilateral Hippocampal Lesion and a Selective Impairment of the Ability for Mental Time Travel.

Objective: The capacity for Mental Time Travel (MTT) allows individuals to mentally project themselves backwards and forwards in their subjective time (Tulving 1985; 2005). Recent studies suggest that the neural substrate of MTT may involve either mesial temporal (Viskontas et al 2006) or pre-frontal and parietal lobes (Addis et al 2007). We present a case of an amnesic patient with a selective bilateral hippocampal lesion and severe retrospective and prospective memory deficits.

Participants and Methods: Clinical case study

Results: The patient's neuropsychological profile was characterized by a high-average general level of cognitive functioning, retrograde amnesia with a three years time gradient, severe difficulties in learning and retention of new material and topographical disorientation. In addition, she experienced significant difficulties to envision and plan her personal future. Her procedural learning and memory were spared. On the "Memory and Temporal Experience Questionnaire" (Klein et al 2002), the patient adequately answered known future and known past questions and had difficulties answering the questions pertaining to her personal past as well as to her personal future. One year later she still suffered from severe amnesia, difficulties in topographical orientation and could not plan or imagine her immediate and distant future. She did not return to gainful employment and did not function independently.

Conclusions: This case presents clinical support for the concept of MTT with its retrospective and prospective memory components and underscores the role of the hippocampus as a critical neural substrate of the MTT ability, which can be selectively impaired as a result of focal brain damage.

Correspondence: *Fani Andelman, PhD, Souraski Medical Center, Weizman 6, Tel-Aviv 64239, Israel. E-mail: fani@hermes.tau.ac.il*

J. ANDERSON, M. SALING, J. ROSENFELD & G. FABINYI. Successful Forgetting of Irrelevant Information in Individuals with Frontal Lobe Tumours.

Objective: Research with university students has demonstrated that successful forgetting of irrelevant information is essential for normal memory function; it has been suggested that inhibitory mechanisms underpin this process. Recent functional neuroimaging research on 'normal' individuals has indicated that successful forgetting of irrelevant information is particularly reliant on the frontal lobes. This study aims to investigate whether individuals with discrete frontal lobe lesions demonstrate impairment in their ability to forget irrelevant information, compared with individuals with discrete temporal lobe lesions and a normal control group. It also aims to identify whether inhibition plays a role in successful forgetting in these individuals.

Participants and Methods: Twenty individuals with frontal lobe tumours were assessed with a range of clinical and experimental cognitive tools to examine ability to forget irrelevant information, anterograde memory function and inhibitory abilities. Performance was compared to 20 individuals with temporal lobe lesions and 20 normal control participants.

Results: The results will be presented.

Conclusions: The role of inhibition in successful forgetting will be discussed.
Correspondence: *Jacqueline Anderson, MPsych, PhD, The University of Melbourne, Psychology Dept, Melbourne, VIC 3010, Australia. E-mail: jfande@unimelb.edu.au*

M. BALAGUE, J. MARIN, A. SALVADO, S. FERNANDEZ, E. MORAL, J. OLIVELLA & C. ARASANZ. Right parahippocampal gyrus lesion and memory impairment: a case report.

Objective: Hippocampus is a basic structure for declarative memory and is related with combining multiple sources' information and with processing specific information by specific areas. Our study shows specific memory deficit in a patient with right parahippocampal gyrus lesion.

Participants and Methods: A 73 years-old male, right handed, primary education with dysarthria and left inferior facial palsy, no cognitive deficit referred.

MRI: Chronic hypoxic lesions in subcortical and periventricular regions involving parietal and frontal lobes. Acute ischemic lesion located in corona radiata and posterior part of the lenticular nucleus. Focal lesion of bad defined contours, affecting right parahippocampal gyrus, suggesting neoplastic etiology.

Neuropsychological exam: Wechsler Memory Scale III, additional test of Draws I-II, auditory span, verbal fluency (semantic/phonemic), TMT A/B.

Results: Visual delayed memory was the lowest index. "Family Pictures II" showed sever impairment, with lower results than Faces II and Draws II (Pe=2, Pe=11, Pe=8), and with poor results in location and people's activity than in names.

Deficit in Inverse digit span, TMT B, and phonemic fluency, doesn't affect memory (IMQ=90), could be better explained by frontal lesions and lenticular nucleus/corona radiata lesions. Low results in Draw I (Pe=6) doesn't show memory impairment (Draws II Pe=8), could be better explained by parietal lesions.

Conclusions: Low results in "Family Pictures" (location/activity) suggest the role of hippocampus in combining multiple sources' information. The specific deficit in "Family Pictures" as visual-spatial memory task and not in faces and draws suggests the specific role of right parahippocampal gyrus in processing spatial memory and information of high association areas.

Correspondence: *Marta Balague, Psychology and Neuropsychology, Neuropsychology, Hospital 2 Maig, C/2 de Maig, 301, Barcelona 08025, Spain. E-mail: mbalaguees@yahoo.es*

R.P. KESSELS, M. REMMERSWAAL & B.A. WILSON. Clinical Assessment of Nondeclarative Learning in Dementia: the Implicit Memory Test.

Objective: There is abundant evidence that amnesic patients demonstrate implicit learning. In Alzheimer patients, implicit learning effects have been shown on stem-completion paradigms and perceptual priming tasks. However, to date no neuropsychological tests exist that can be used to assess implicit memory function in clinical practice. In the present study we investigate the newly developed Implicit Memory Test (IMT) in Alzheimer patients and nondemented controls.

Participants and Methods: 28 moderate to severe Alzheimer patients (MMSE between 5 and 12) and 21 controls (MMSE>25) were recruited. Verbal and nonverbal explicit memory function was assessed using WMS-R Paired-Associate Learning and the Visual Association Test. The IMT consist of a verbal and nonverbal subtest: in the Stem Completion Test, printed words were presented that must be read aloud, followed by a test with only word stems presented that had to be completed. In the Fragmented Pictures Test, a set of line drawing sequences (from fragmented to the complete picture) was presented that had to be named. Both subtests consist of three trials and a delayed test.

Results: Significant group differences were found on all tests. Alzheimer patients were at floor levels on the explicit memory tests, with no improvement after subsequent trials. On the IMT subtests, the Alzheimer group showed significant learning effects after consecutive trials, albeit to a lesser extent than the controls.

Conclusions: Clear learning effects were found on the IMT tasks in the Alzheimer group. Whereas it may be argued that this merely reflects explicit cued-recall, the severe explicit memory deficits suggest that the IMT indeed taps implicit processing.

Correspondence: *Roy P. Kessels, PhD, Donders Centre for Cognition, Radboud University Nijmegen, Montessorilaan 3, Nijmegen 6525 HR, Netherlands. E-mail: r.kessels@donders.ru.nl*

C. MARUTA, M. GUERREIRO & I.P. MARTINS. Memory Complaints and Visual Memory.

Objective: Memory complaints are frequent in the elderly but often are not associated with objective measures of learning and memory. Yet most studies dedicated to this matter have evaluated verbal memory and there have been few reports on the role played by visual memory performance. The aim of the present report is, therefore, to study the relation of immediate and delayed visual memory and memory complaints in a sample of an adult healthy population.

Participants and Methods: A sample of 334 healthy subjects, without brain lesion and independent on daily living activities, undertook the Immediate and Delayed Visual Reproduction subtests from WMS - III (VR I and VR II), as part of a larger study on Aging and Cognition. Participants' age ranged between 50 and 92 years old (65.6 yrs on average), with 6.9 (+ 4.2) years of literacy, 63% female.

Results: We found an effect of age, sex and literacy in the performance of both subtests as well as cognitive complaints ($p < .05$). Most participants (59%) had subjective memory complaints ($SMQ > 5$). The SMQ score did not correlate with age, literacy or any objective measure of verbal memory (assessed by CVLT - 9; $p > .05$). However, there was a mild negative correlation between SMQ and immediate ($r = -.193$; $p < .01$) and delayed visual memory ($r = -.203$; $p < .01$) that persisted when it was corrected for literacy ($r = -.188$ and $r = -.198$; $p < .01$, respectively). SMQ scores were moderately correlated with depressive symptoms (GDS; $r = .493$; $p < .01$).

Conclusions: Visual memory may be a more sensitive measure of memory complaints compared to verbal memory possibly because of its lack of semantic cues. The results suggest that Visual Reproduction subtests can be used in neuropsychological screening of subjects with memory complaints. Its role in the differential diagnosis between normal complaints and MCI must be evaluated.

Correspondence: *Carolina Maruta, Laboratory of Language Research, Molecular Medicine Institute, Faculty of Medicine, Av. Professor Egas Moniz, Lisbon 1649-028, Portugal. E-mail: carolmaruta@gmail.com*

P. SPAAN & J.C. RAAIJMAKERS. Priming Effects from Young-Old to Very Old Age on a Word-Stem Completion Task: Minimizing Explicit Contamination.

Objective: We investigated repetition priming within the normal aging spectrum from young-old to very old age using a newly developed Word-Stem Completion (WSC) task. We evaluated the influence on priming of age and other relevant participant-related characteristics. We additionally examined whether priming effects validly reflected implicit memory performance and were not obscured by the use of explicit memory strategies.

Participants and Methods: 170 cognitively healthy elderly persons of 55-94 years old ($M = 71.8$ years, $SD = 10.1$; $MMSE: M = 28.7$, $SD = 1.2$) were administered an extensive computerized neuropsychological test battery. This battery included a WSC task that was constructed by taking factors into account that were known to complicate the measurement of significant and valid priming effects. Accordingly, the possibilities of floor effects and explicit contamination were minimized.

Results: We found no effects on priming of age, gender, education, intelligence, cognitive status, subjective memory complaints, or depressive symptoms. Participants that subsequent to task administration reported to be aware of the connection between the WSC task and its study task obtained higher priming scores. However, analysis of stem-completion times showed that explicit contamination during the task was unlikely. We found no interaction effect between awareness and age on priming.

Conclusions: The results suggest that WSC priming is age-invariant up to very old age. Participants with low-average intelligence or depression (related to explicit memory decline) do not show impaired priming. This task with increased validity might contribute to the differentiation between normal aging and Alzheimer's Disease by improving specificity of assessment.

Correspondence: *Pauline Spaan, PhD, Psychonomics / Clinical Neuropsychology, University of Amsterdam, Roetersstraat 15, Amsterdam 1015 WB, Netherlands. E-mail: P.E.J.Spaan@uva.nl*

A. TREESE, M. JOHANSSON & M. LINDGREN. Electrophysiological correlates of the control of emotional memories.

Objective: The emotional salience of faces has previously been shown to induce memory distortions in recognition memory tasks. This event-related potential (ERP) study used repeated runs of a continuous recognition task with emotional and neutral faces to investigate emotion-induced memory distortions in healthy participants and to elucidate control functions employed to handle such distortions.

Participants and Methods: Participants (N = 30) were in a first run presented with a series of items. Some pictures were repeated as targets and participants had to indicate recurrences. In subsequent runs, the same series of pictures were presented again with identical task instructions, but target status was changed. While the first run assesses learning and recognition of new items, the subsequent runs measure the ability to differentiate between relevant (repetition within run; targets) and irrelevant (repetition across runs; distracters) memory representations.

Results: Participants made more false alarms to irrelevant distracters in the subsequent runs. The overall pattern of findings suggests that although emotion did not modulate the amount of errors, it modulated the extent to which recollection was employed to maximise performance. For neutral and positive faces, only targets were associated with parietal memory effects, presumably reflecting recollection, whereas this was the case also for negative distracters.

Conclusions: The results suggest that recollection was strategically used to correctly reject negative distracters ('recall-to-reject'). This finding is consistent with the view that negative valence facilitates recollection, which was used to differentiate relevant from irrelevant memory representations. Correspondence: *Anne-Cecile Treese, Diplom-Psychologe, Department of Psychology, Lund University, Box 213, Lund 21100, Sweden. E-mail: Anne-Cecile.Treese@psychology.lu.se*

G.T. WALDHAUSER, M. JOHANSSON & M. LINDGREN. Recognition Memory Impairment after Intentional Suppression and the Interference of Conflicting Information: An ERP Study.

Objective: This study tested the hypothesis that intentional suppression attenuates the activation strength of unwanted memories, as reflected in later impaired recognition memory performance. By employing the event-related potential (ERP) technique, we investigated the effects of suppression on the relative involvement of familiarity, recollection and post-retrieval processes in correct recognition.

Participants and Methods: In a think/no-think experiment, twenty healthy participants were cued to either suppress or retrieve previously learned words, 18 or 0 times. Subsequently, memory for all items was assessed by means of an old/new recognition test. To investigate the processes underlying successful recognition memory performance, ERPs to correctly classified old and new items were compared.

Results: In contrast to the zero-repetition condition, memory performance for repeatedly suppressed no-think items was significantly reduced. This was indicated by impaired subsequent old/new discrimination, as well as prolonged response times in correct recognition. Early frontal ERP old/new effects, reflecting familiarity, were present for all correctly recognized items. Old/new effects at parietal electrode sites, related to recollection, were of comparable magnitude in all conditions, but later onset in the zero-repetition condition. In a late time window from 800-1200 ms, zero-repetition items were associated with a right frontal ERP maximum, while ERPs to no-think words showed a widespread distribution.

Conclusions: The results indicate that intentional suppression diminishes ensuing item recognition, but not the relative contributions of familiarity and recollection to correct recognition memory. Instead, the late ERP pattern possibly suggests that remembering no-think items comprises the additional retrieval of conflicting information, resulting from previous attempts to suppress.

Correspondence: *Gerd T. Waldhauser, M.S., Department of Psychology, Lund University, Box 213, Lund 22100, Sweden. E-mail: gerd.waldhauser@psychology.lu.se*

M. YAMADA, Y. OHGASHI, Y. YOSHIDA, M. MATSUI, Y. HONZAWA, A. IKEDA, K. ISHIZU & H. FUKUYAMA. Functional Retrograde Amnesia: The Blockage of Emotional Memory Retrieval.

Objective: Amnesia can occur usually after incurring brain lesions. There are some cases, however, that present pure retrograde amnesia without clear neurological origins, known as "functional retrograde amnesia (FRA)". Although several neuropsychological assumptions for this condition have been put forward, they are still controversial. Considering that the autobiographical memory is strongly colored by emotional information (Fink et al., 1996), the present study investigated how emotional memory retrieval might be affected in patients with FRA.

Participants and Methods: Two patients presented entire autobiographical memory deficits after minor head injuries, and one recovered from FRA after 3 months and the other after 4 months. MRI examination showed larger left inferior horn of lateral ventricle in both patients. Emotional memory retrieval was examined before and after recovery from FRA, and results were compared to those of 24 healthy subjects. After the incidental learning of emotional pictures (negative, positive, neutral), recognition of each picture was examined using the Remember/Know/New paradigm. After completing this test phase, valence and arousal were rated for each picture.

Results: Both patients showed normal memory recognition for neutral pictures. However, they recognized significantly lower number of negative pictures before recovery compared to neutral ones, compared to healthy subjects, and compared to after recovery. Valence and arousal ratings for negative pictures were not impaired in these patients.

Conclusions: Results from this study demonstrated that FRA was associated with impaired memory retrieval, which was only evident for emotional materials. This result was similar to recent work examining psychosocial stress and memory retrieval. The present study suggests that FRA might be attributable to the blockage of emotional memory retrieval, which could be explained by the possible influence of psychological stress and brain mechanisms.

Correspondence: *Makiko Yamada, Ph.D., Neuropsychiatry, Kyoto University, 54 Kawarachou Shogoin, Sakyo-ku, Kyoto 606-8507, Japan. E-mail: yamada@kuhp.kyoto-u.ac.jp*

M. YANO, S. UMEDA & M. MIMURA. Preserved Priming but Insensitivity to Perceptual Fluency on Recognition Judgments in Alzheimer's Disease.

Objective: Previous research on Alzheimer's disease (AD) has not yielded a consensus regarding the preservation of automatic memory processes, while there is a consensus that conscious recollection processes are impaired in AD. The aim of the present study is to examine whether perceptually automatic processes in explicit memory judgments and implicit memory processes are preserved in AD.

Participants and Methods: To examine automatic processes, we used perceptual specificity effects (PSEs) on the performance of verbal memory tasks. In the explicit memory task (Experiment 1), 16 individuals with mild AD and 22 elderly adults without dementia (controls) performed continuous recognition judgments in which some words were repeated in a same or different font. Participants were asked to indicate the repeated words regardless of the font. In the

implicit memory task (Experiment 2), 15 individuals with mild AD and 22 controls performed word-fragment completion. The word-fragment completion test consisted of 15 new words and the 30 words that were presented in the study phase. Half of the studied words were presented in the same font, while the remaining half were presented in the other font.

Results: In recognition judgments, controls but not individuals with AD demonstrated PSEs; in controls, words presented in a same font were more accurately recognized than words presented in a different font were. In contrast, neither group showed PSEs on word-fragment completion, and their priming magnitudes were comparable.

Conclusions: The present study used PSEs to reveal that perceptually automatic processes in explicit memory judgments and perceptual implicit memory are different processes. It is only the process of the former that is impaired in AD. Individuals with AD failed to show PSEs in recognition judgments, suggesting that they are insensitive to processing fluency in recognition judgments. Such insensitivity appears to result in impaired recognition performance in individuals with AD.

Correspondence: *Madoka Yano, Chukyo University, 101-2 Yagoto-honmachi, Showa-ku, Nagoya-shi 466-8666, Japan. E-mail: yanoma@lets.chukyo-u.ac.jp*

Pediatric Neuropsychology

T. HOPYAN & M. DENNIS. Children With Cerebellar Tumors Cannot Judge the Emotional Valence of Music With Conflicting Emotion in Lyrics.

Objective: Recent views of the cerebellum suggest a role in cognitive-affective regulation, which may be measured by Stroop-type tasks that require attending to conflicting information. By generating a conflict between the emotional valence in music and the emotional valence of words, we studied cognitive-affective regulation in children with acquired cerebellar disorders.

Participants and Methods: Participants were 74 children (7-16 years), 37 treated for cerebellar tumors, and 37 matched controls. The children listened to musical excerpts that elicit happy or sad evaluations. In Congruent trials, emotional valence in the music matched that in the words. In Incongruent trials, emotional valence in the music mismatched the valence in the words. In the Music Stroop task, the children decided valence of the music (happy or sad) and in the Lyric Stroop task, they decided the valence of the lyric.

Results: Repeated-Measures ANOVA for reaction time (RT) on the Music Stroop task showed a significant Condition (Congruent vs. Incongruent) x Group (cerebellar tumor vs. controls) interaction ($F(2, 71) = 4.5, p < .01$), and a significant Group effect for RT on the Lyric Stroop task ($F(2, 71) = 15.1, p < .01$). For accuracy, cerebellar tumor groups differed significantly from controls on incongruent condition of the Music Stroop task ($F(2, 71) = 15.0, p < .001$), but not in the Lyric Stroop task.

Conclusions: Children with cerebellar tumors are impaired in judging emotional valence of music when there is conflict between emotion in music and words, suggesting an impairment of cognitive-affective regulation. Music is a child-friendly tool that can be utilized to investigate cognitive-affective processes in clinical populations.

Correspondence: *Talar Hopyan, Ph.D., Otolaryngology, Cochlear Implant Program, Hospital for Sick Children, University of Toronto, 555 University Avenue, Toronto, ON M5G 1X8, Canada. E-mail: t.hopyan@utoronto.ca*

M. LEVAV, J. AHONNISKA-ASSA, N. LEVIN, G. BEN BASHAT, O. MUSSEL, S. FRANK & T. PERETZ. The Child Behavior Checklist (CBCL): Comparison between Children with Cerebral Palsy (CP), Posterior Fossa Tumors (PF) and Epilepsy.

Objective: Earlier studies on children affected with neurological disorders reported the presence of emotional problems, e.g., isolation and anxiety. However, there is limited research comparing the spe-

cific behavioral profiles of different clinical groups, and almost none specifying the main areas of emotional difficulties. The objective of the study was to evaluate whether there are significant differences among children with CP, PF and epilepsy on behavioral and emotional functions.

Participants and Methods: We compared the CBCL parental report from the three clinical groups: CP $n = 40$, age range 5-13; PF $n = 20$, age range 5-18; and epilepsy $n = 113$, age range 5-19.

Results: Group comparisons between the internalizing and externalizing factors were not significant. Anova-analysis were performed controlled by age. The results showed statistically significant differences among the three diagnostic groups in five areas: anxiety, withdrawal, somatic complaints, social problems and attention.

Conclusions: Based on parental report, different neurological disorders seem to affect children's behavior differently. Conceivably, parent's perceptions may also be influenced by, e.g. severity of the disorder, age of onset, school environment, family support and scope of interventions.

Correspondence: *Jaana Ahonniska-Assa, PhD, Shafrir Children's Hospital, Sheba Medical Center, Tel HaShomer 52621, Israel. E-mail: assa@netvision.net.il*

J. AHONNISKA-ASSA, M. LEVAV, S. FRANK, T. PERETZ, N. LEVIN & A. BREZNER. Meeting the Challenges in the Cognitive Assessment of Children with Cerebral Palsy (CP).

Objective: Children with cerebral palsy (CP) suffer from cognitive difficulties in addition to motor handicaps, communication disorders and sensory impairments. All of these problems present a remarkable challenge for their neuropsychological assessment. The objective of this study was to develop assessment protocols according to the level of children's level of general impairment.

Participants and Methods: Forty six children with CP (aged 5-14) were assessed. Assessment procedures were devised for three levels of deficits in motor, sensory and communication areas. Children who were clinically diagnosed with mild deficits were assessed with a variety of neuropsychological tools, except for tasks requiring motor dexterity. Those with moderate deficits were assessed with tasks requiring simple motor or verbal response only. The assessment of children with severe deficits included behavior observations and a structured interview evaluating daily living skills administered to the caregivers.

Results: The three tiers of assessment procedures differed remarkably, and will be presented, together with the three group profiles. The cognitive profiles in all three tiers illustrate the relative strength of verbal and communication abilities over visual abilities among children with CP.

Conclusions: Even children with severe motor, sensory and/or communication impairments can be assessed with standardized tests. CP children in the whole spectrum of motor and communication difficulties have better verbal than non-verbal skills. Combining cognitive assessments with evaluation of daily living skills allows focusing on what the child can do and helps planning the rehabilitation.

Correspondence: *Jaana Ahonniska-Assa, PhD, Shafrir Children's Hospital, Sheba Medical Center, Tel HaShomer 52621, Israel. E-mail: assa@netvision.net.il*

T. SHANY-UR, M. LEVAV, J. LANDA, J. AHONNISKA-ASSA, S. FRANK & A. BREZNER. Neuropsychological assessment of children with craniopharyngiomas.

Objective: Craniopharyngiomas, histologically benign tumors of the sella and suprasellar region, often extend to adjacent cortical and vascular structures, thus leading to pituitary, hypothalamic and optic malfunctions. Their location causes frequent endocrine, visual and cognitive deficits, which may be further affected by surgical resection, with or without radiation therapy. Research studies of these children indicate normal intelligence, alongside deficits in executive functions, memory,

processing speed, quality of life, together with emotional, behavioral and social problems. The objective of this study was to present a comprehensive assessment of young patients with a history of craniopharyngioma, emphasizing on executive functioning, emotional, and social-behavioral domains.

Participants and Methods: We present results of comprehensive neuropsychological assessment of four patients (ages 12-18; 3 males) with a history of craniopharyngioma, all assessed at least one year post surgery.

Results: All patients had average verbal IQ but low to low average performance IQ. Supporting previous findings, impaired areas (group average $z \leq -1.3$) included: verbal and visual memory, motor coordination, processing speed as well as selective attention. Contrary to previous findings, children in our group performed at mean level on the Wisconsin Card Sorting Test. However, the parents described impairments in executive function in everyday life: initiation, planning, working memory and shifting. Significant difficulties were reported and observed in the social and emotional functioning (anxiety and depression).

Conclusions: The above profile may be associated with brain pathology and the effects of surgery on the frontal-sub cortical pathways.

Correspondence: *Jaana Ahoniska-Assa, PhD, Shafrat Children's Hospital, Sheba Medical Center, Tel HaShomer 52621, Israel. E-mail: assa@netvision.net.il*

J.A. MACDONALD, M.H. BEAUCHAMP, J.A. CRIGAN & P.J. ANDERSON. The Development and Measurement of Inhibition in Early School-Aged Children.

Objective: When children begin school they are expected to inhibit irrelevant or inappropriate automatic responses in order to concentrate on learning and to interact successfully. However, research into the development of inhibitory control in the early school years has been constrained by a lack of age-appropriate and sensitive measures.

The aim of this study was to examine the typical developmental trajectory of inhibition and effects of gender in children during the first three years of school; and to assess the validity and sensitivity of three age-appropriate measures of inhibition (pictorial Stroop-like tasks).

Participants and Methods: Error rates and response latencies were measured in 80 typically developing children, aged 5 to 8 years, using one computerized Stroop-like task (Boy-Girl Stroop; McInerney, 2005) and two hardcopy pictorial Stroop-like tasks (Expressive attention test, Cognitive Assessment System; Naglieri & Das, 1997, and Fruit Stroop; Archibald & Kerns, 1999).

Results: Age-related improvement was recorded up to the age of 7 years. In particular, error rates declined significantly as the children grew older. Age-related trends were also evident in the speed with which children could inhibit a prepotent response and produce an alternative response. There were no consistent differences between genders. Performance on the three tasks correlated significantly, ($r = -.35, .44, -.64, p < .001$).

Conclusions: The linear development of inhibition in 5- to 7-year-olds is positioned logically between the reported maturation of inhibition in the pre-school years and later childhood. Well-designed pictorial Stroop-like tasks provide a valuable resource for assessing inhibitory control in young school children.

Correspondence: *Miriam H. Beauchamp, PhD, Child Neuropsychology, Murdoch Children's Research Institute, Dept. of Psychology, 1st floor SEB, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: miriam.beauchamp@mcri.edu.au*

J.A. CRIGAN, M.H. BEAUCHAMP, J. MACDONALD & P.J. ANDERSON. The Development of Sustained Attention in Early School-Aged Children.

Objective: Attention is implicated in many areas of psychological functioning, and is vital for academic success. Despite this, little is known about children's ability to sustain attention and particularly how it may change in the first years of schooling. A lack of standardised, age-appropriate measures may have contributed to the lag of research in this area. This study examined gender and age differences in two tasks purported to measure sustained attention.

Participants and Methods: Eighty children (aged 5 – 8) completed auditory and visual continuous performance tasks – the Auditory Attention subtest from NEPSY II and the visual condition of a novel computerised task, The Farm Animals Game.

Results: Performance generally improved with age, with older children more likely to complete the tasks without missing a target ($p = .04$), and with faster reaction times ($p < .01$). Across the duration of the task, responses slowed and younger children showed more decrement, suggesting sustained attention development in the 5 – 8 age range. Although not significant ($p = .06$), boys showed less decrement over the task, which may indicate a better ability to sustain attention. Interestingly, the rate of false alarm errors did not change with age ($p = .45$).

Conclusions: These results suggest that the ability to sustain attention develops during the early school years. The findings have implications for the diagnosis and intervention of attentional problems in young children and children's readiness for school. The Farm Animals Game is a new, easily-administered tool which is sensitive to age differences in sustained attention of young children.

Correspondence: *Miriam H. Beauchamp, PhD, Child Neuropsychology, Murdoch Children's Research Institute, Dept. of Psychology, 1st floor SEB, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: miriam.beauchamp@mcri.edu.au*

Y. BIRAN-GOL, G. MALINGER, T. LERMAN-SAGIE, H. COHEN, M. DAVIDOVICH, D. LEV & A. SCHWEIGER. Developmental Outcome of Isolated Fetal Macrocephaly.

Objective: Macrocephaly is defined as a head circumference greater than 2 standard deviations. The counseling regarding the prognosis of macrocephaly diagnosed in-utero is difficult due to lack of available studies. The neuropsychological outcome of children with macrocephaly is not clear due to contradictory results in the literature. This study was designed to evaluate the neurodevelopmental outcome of prenatally diagnosed isolated macrocephaly. The working hypothesis was that macrocephaly in-utero will result in neurodevelopmental deficits.

Participants and Methods: We evaluated the performance of 17 children, aged 2-7 years, diagnosed in utero as macrocephalic and compared them to 17 normocephalic children, utilizing a standardized neuropsychological battery, which included attribution to cognitive, emotional and behavioral domains.

Results: All the children in the study group had a head circumference between 2-3 SD. No significant differences were found between the groups on the cognitive, language and motor domains. The study group scored significantly lower than the control on three parameters reflecting executive functioning, behavior and social-emotional development. Children with familial macrocephaly showed significantly better executive functioning compared to children with non-familial macrocephaly. Multiple linear regression analysis found paternal head circumference as the only significant variable in positively predicting the cognitive functioning of the child.

Conclusions: Our results indicate that prenatally diagnosed macrocephaly is NOT a risk factor for abnormal long-term neuropsychological development. Paternal macrocephaly was found to be most important in positively predicting cognitive performance of the child. These findings facilitate a better understanding of the developmental outcome of prenatally diagnosed macrocephaly, broadening the ability to provide accurate information, concerning the implications of such diagnosis.

Correspondence: *Yael Biran-Gol, M.A, psychology, Academic College of Tel Aviv, 14th Brandes st., Tel Aviv 62001, Israel. E-mail: yaelbirang@gmail.com*

N. FARKAS, C. HOFFMANN, L. BEN-SIRA, D. LEV, A. SCHWEIGER, D. KIDRON, T. LERMAN-SAGIE & G. MALINGER. Does Normal Brain Imaging Predict Normal Neurodevelopmental Outcome in Fetuses with Proven Cytomegalovirus Infection?

Objective: Cytomegalovirus (CMV) infection is the most common viral cause of congenital infection. Imaging studies from prenatal di-

agnosed children are scant. This study was designed to test the neuropsychological outcome of children with congenital CMV infection and normal consecutive fetal neurosonographic examinations. It was also designed to determine whether Magnetic Resonance Imaging (MRI) provides additional information in these cases. The hypotheses were that fetal neurosonography has a high predictive value of a good outcome and that MRI adds valuable information regarding the prognosis.

Participants and Methods: We retrospectively reviewed laboratory and imaging findings of children with congenital CMV infection. Twenty one children with a positive PCR in amniotic fluid and virus isolation in urine in the first week of life, but without fetal neurosonographic findings, were included; cases with abnormal MRI findings were also included. These children and 21 matched controls were assessed, utilizing a number of standardized cognitive, behavioral and emotional instruments.

Results: Children with congenital CMV infection and normal fetal brain US did not differ from the control group in terms of cognitive, language, motor, emotional-behavioral and executive functioning. No differences were found between congenitally infected children who had a normal fetal brain MRI examination and children with abnormal fetal brain MRI examination.

Conclusions: Normal neurosonographic examinations during pregnancy, predict a normal neuropsychological outcome in fetuses with congenital CMV infection. Abnormal white matter signal on MRI did not correlate with outcome. These findings improve prenatal management of pregnant women with intrauterine CMV infection, providing additional information regarding the prognosis of these children.

Correspondence: *Natalie Farkas, MA, The Academic Collage of Tel-Aviv-Yafo, rabenu yeruham, 2, Tel-Aviv-Yafo 64044, Israel. E-mail: natalie2009@gmail.com*

A. MARYNIAK, A. ONDRUCH, T. KROPIWNICKI, S. BARSZCZ & M. ROSZKOWSKI. Psychopathologic symptoms in children after surgery for craniopharyngioma.

Objective: Craniopharyngioma is a benign neoplasm of suprasellar area, deriving from Rathke's cells of front pituitary lobe cells. This tumour constitutes 6-9% of all brain neoplasms in children. Many children operated on for craniopharyngioma continue to present with symptoms resulting from damage of important CNS structures. Postoperational complications are both of edocrinological and neuropsychological nature.

Participants and Methods: 27 children (9 boys and 18 girls), aged 2-15 years at the time of surgery, operated on for craniopharyngioma were examined. The follow-up varied from 1 to 5 years. Detailed clinical interviews with parents were conducted. Cognitive functions were examined (WISC-R, CFT). Psychopathological symptoms were evaluated with the Child Behaviour Checklist (CBCL) consisting of eight scales: Withdrawn/Depressed, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Rule-Breaking Behaviour and Aggressive Behaviour.

Results: Intellectual functioning of the majority (82%) of patients fell within the average or above-average range. No child was diagnosed as mentally retarded. 70% of examined children had deficit in visual memory. The CBCL results show significantly more frequent disorders in all the analyzed areas compared to a healthy population ($p \leq 0,0004$). Social problems, anxiety and depression symptoms were mostly escalated. Obesity was diagnosed in 71%. 45% suffered from pathological insatiable hunger, resulting in aggression and stealing. One third of the patients present adynamic frontal lobe syndrome. Deficit on control was observed too.

Conclusions: Our results revealed a frequent prevalence of psychopathologic symptoms affecting everyday activity of children operated on for craniopharyngioma.

Correspondence: *Agnieszka Maryniak, Children's Memorial Health Institute, Al.Dzieci Polskich 20, Warsaw 01-179, Poland. E-mail: a.maryniak@chello.pl*

A. MARYNIAK, M. GINALSKA-MALINOWSKA & A. ONDRUCH. Cognitive Functions in Girls at Risk for Congenital Adrenal Hyperplasia Treated Prenatally with Dexamethasone.

Objective: Congenital adrenal hyperplasia (CAH) comprises a group of disorders resulting from defective synthesis of adrenal corticosteroids. Without these hormones, body produces more androgen. Female children with CAH might be born with ambiguous genitalia. Virilization due to CAH can be prevented by prenatal dexamethasone (DEX). This treatment has to start at 6-7 week of gestation – has to be given “blindly”, until the diagnosis of an affected female can be ascertained. Several questions are long-term consequences of exposure to DEX, especially to cognitive development.

Participants and Methods: Patients: 33 girls (aged 6,7-23, mean and median 13,9) from 20 families at risk for CAH: 16 CAH-affected untreated, 9 CAH-affected treated, 8 CAH-unaffected treated.

Methods: WISC-R or WAIS-R, Auditory Verbal Learning Test (AVLT), DCS-Visual Learning-Memory Test, hand-preference tests, detailed interview with parents and patients about preferred activities.

Results: CAH-affected untreated girls presented typical masculine interests: combat sport, motorbikes, DIY, fishing. These are activities that were no interest to their treated sisters. Higher scores in most tasks are obtained by CAH-affected treated patients, but due to small number of groups, in some tasks the differences were no statistically significant (from $p < 0,03$ to $p = 0,11$). Only in tasks involving working memory (Arithmetic, Digit Span and AVLT) there were no differences between analyzed groups ($p > 0,65$). In patients with CAH, regardless of DEX treatment, left-handedness was more frequent ($p = 0,06$).

Conclusions: CAH-affected untreated girls have the features suggesting brain masculinisation. DEX administered prenatally may favourably influence development of girls with CAH, but unfavourably development of the unaffected patients. Prenatal DEX treatment may influence the impairment of working memory. The results show importance of hormonal balance during prenatal period to cognitive development. Correspondence: *Agnieszka Maryniak, Children's Memorial Health Institute, Al.Dzieci Polskich 20, Warsaw 01-179, Poland. E-mail: a.maryniak@chello.pl*

M. MUSZKAT, C.B. MELLO, R.G. NOGUEIRA, A. JACKOWSKI, F.L. VARGENS, B.A. SANTANNA, S.C. FELDBERG, D. PINHEIRO & O.A. BUENO. Morphometric and Neuropsychological Study in Two Pediatric Patients with Callosal Dysgenesis and Cingulate Gyrus Absence.

Objective: The functional role of the corpus callosum (CC) and cingulate gyrus (CG) on the modulation of neurocognitive and behavioural functions in children is an important matter for developmental studies. We investigated structural magnetic resonance image, neuropsychological and behavioural data in two children with malformations in these brain structures.

Participants and Methods: Case 1: 11 year old male, 5th grade. Case 2: 14 year old male, 8th grade. Neuroimaging data was obtained through a MRI protocol for volumetric imaging with morphometric and morphologic analysis using voximetry. The corpus callosum was outlined at the midsagittal slice and semi-automatically segmented into seven sections using Witelson's protocol. Neuropsychological battery included: WISC-III, Rey Complex Figure, Continuous Performance Test, WCST, Corsi Blocks, Digit Span, Verbal Fluency. A z-score allowed comparing patients' performance to controls matched by age. Behavioural assessment included CBCL and Autism Scales.

Results: Case 1: presence of the genu of CC, thin lamina rostralis segment, CG absence and thin anterior commissure (AC); intellectual disability, visuo-constructive and executive function impairment were observed, but attentional skills were preserved; impairments in symbolic, verbal and nonverbal communication skills (including eye contact) suggested Autistic Spectrum Disorder. Case 2: Absence of the CC with voluminous AC; average intellectual level, normal neuropsychological performance; apathy and lack of social motivation.

Conclusions: In spite of the absence of the CC, the case 2 presented a better cognitive development than the Case 1. We interpreted this result as a compensatory role of the voluminous AC. Behavioural dysfunctions may be related to the CG malformation seen in both patients.

Correspondence: *Mauro Muszkat, PhD, Psychobiology, UNIFESP, Rua Embau, 54, Sao Paulo 04039060, Brazil. E-mail: maumuszkat@uol.com.br*

L. RÖNNQVIST, A. JOHANSSON & E. DOMELLÖF. Upper Limb Functions in Children with Cerebral Palsy (CP): Kinematic Investigations and Timing Intervention.

Objective: Kinematic investigations of upper limb functions in children with CP are few, especially those focusing on training effects. To increase our understanding of how different arm and hand functions are organized and related to levels of impairment, spatiotemporal characteristics were investigated. Additionally, how different kinematic parameters might be affected by timing and rhythmicity training was examined.

Participants and Methods: Eleven children with hemiplegic CP and eleven age matched "control" children participated in investigations of bi- and uni-manual, goal-directed arm and hand movements. In addition five children/adolescents with diverse severity of CP took part in a 4-week intervention program utilizing the interactive Metronome©, and test-retest design. All movements of interest were examined through 3D optoelectronic recordings.

Results: It was found that the children with hemiplegic CP significantly differed from the controls on the majority of the kinematic parameters investigated. This was especially true for the affected-, but also for non-affected side, and more pronounced in distal- than proximal movement components. Although the preliminary analysis of the timing training seems to bring beneficial effects of upper limb functions by means of the kinematic properties, such relations to individual level of impairments need further consideration.

Conclusions: Investigations of kinematics provide important information of spatiotemporal organization of upper limb functions in children with different levels of CP impairments. The outcomes reveal the importance of not treating these children as homogeneous groups, both by means of their individual arm/hand functions and regarding effects of timing training in relation to levels of impairments.

Correspondence: *Louise Rönnqvist, Department of Psychology, Umeå University, Umeå University, Umeå 901 87, Sweden. E-mail: louise.ronnqvist@psy.umu.se*

S. SHAVEL-JESSOP, S.E. AYLETT, L. JAZBINSEK & P.M. RANKIN. Neuropsychological Predictions of Skill Development and Problem Behaviours in Young Adults with Complex Epilepsy and Intellectual Disability.

Objective: A retrospective review of case notes of 70 adolescents and young adults in a residential centre for people with complex epilepsy was conducted to establish cognitive factors that may contribute to daily living skills in terms of skill development and problem behaviours.

Participants and Methods: The population, age 16-21 years (Mean=19.02, SD=1.56) had a range of intellectual ability (FSIQ=30-83, Mean=56.20, SD=13.09). Routine clinical data collection included: ratings of executive function (EF), age at onset of epilepsy, duration of epilepsy, number of current anti-epileptic medications, number of psychiatric medications, history of status epilepticus, history of neurosurgery, degree of motor impairment, and extent of neuropathology as identified on MRI.

Results: Results suggest that skill development was predicted to various degrees by FSIQ (13%), degree of motor impairment (11%), and executive metacognition (10%). Problematic behaviours were again predicted by degree of motor impairment (24%), and also by executive behavioural regulation (12-20%), and extent of neuropathology on MRI (7%), but not by IQ. All other medical variables investigated were found to be unrelated to skill development or problematic behaviour.

Conclusions: These findings suggest that motor impairment limits both skill development and increases problematic behaviour in young people with epilepsy. In addition, IQ is important for skill development, but behavioural regulation EF is particularly relevant to the development of problematic behaviours. These results are discussed in terms of appropriate support and management for young people with complex epilepsy.

Correspondence: *Sara Shavel-Jessop, Developmental Cognitive Neuroscience Unit, University College London Institute of Child Health, and Great Ormond Street Hospital for Children NHS Trust, 30 Guilford Street, London WC1N 1EH, United Kingdom. E-mail: s.shavel-jessop@ucl.ac.uk*

R.E. SUMPTER, L. DORRIS, R. MCWILLIAM & R. CARACHI. Adjustment and Quality of Life after Childhood Hydrocephalus and Meningitis.

Objective: Childhood meningitis and hydrocephalus, which may cause early brain injury, are associated with significant rates of behavioural problems. However, there exists only limited research on quality of life and the relationship between psychosocial outcome and service provision. The current study aims to describe psychosocial adjustment and quality of life in childhood meningitis and hydrocephalus, and to relate findings to service need.

Participants and Methods: Parents and teachers of school-aged children were recruited: a consecutive sample of meningitis or meningococcaemia survivors admitted to the Royal Hospital for Sick Children, between January 1991 and January 2007; and children with hydrocephalus identified via a national database held by the Scottish Spina Bifida Association. Postal questionnaire methodology examined parent and teacher report of behaviour on the Strengths and Difficulties Questionnaire, and parent report of quality of life on the Paediatric Quality of Life Inventory.

Results: 31% of parents (meningitis n=111; meningococcaemia n=49; hydrocephalus n=79) and 69% of teachers (n=70; n=27; n=47) returned questionnaires. The meningococcaemia group did not differ from published norms. Parents of meningitis survivors reported behavioural problems in 34% and teachers in 21%. In the hydrocephalus group, parents reported behavioural difficulties in 55% and teachers in 34%. Quality of life was reduced for both diagnoses in comparison to published norms.

Conclusions: This study demonstrates moderate to high rates of behavioural difficulties, and lowered quality of life, in these conditions. Those with self-reported service needs had poorer psychosocial outcome. Findings highlight the need to recognise the impact of early brain injury on later adjustment and quality of life.

Correspondence: *Ruth E. Sumpter, MA(hons), DClinPsy, NHS Glasgow & Clyde, Fraser of Allander Neurosciences Unit, Royal Hospital for Sick Children, Yorkhill, Glasgow G3 3SJ, United Kingdom. E-mail: R.Sumpter@clinmed.gla.ac.uk*

R. CANT, I. WRIGHT & U. KALU. The validity of premorbid IQ estimates in childhood traumatic brain injury (TBI).

Objective: We aim to assess the validity of a range of methods of estimating pre-morbid functioning in children following TBI

Methods of estimating pre-injury functioning are well established tools in the practice of adult neuropsychologists. However, paediatric neuropsychologists face considerable challenges when attempting to estimate pre-morbid intellectual functioning. Available methods of estimating premorbid functioning include 'hold' methods and demographic methods or, typically, a combination of these.

The validation of any premorbid estimation method is crucially dependent upon the availability of pre-injury tests. Such test data is rarely available and therefore most published methods rely on less robust forms of validation (see Schoenberg et al, 2007; Vanderploeg et al, 1998; Yeates and Taylor, 1997)

Participants and Methods: In the UK assessment of intellectual ability is increasingly undertaken as a routine on entry to secondary school at 11 years. Available test scores are known to correlate strongly with the WISC intelligence tests (Wright, Strand, & Wonders, 2004). We present data from 37 children who had suffered traumatic brain injury and for whom pre-morbid cognitive test data was available. Measures include pre-injury CAT-III IQ scores, and post injury word reading (WIAT and Schonell), WISC-IV subtests and CAT-III data.

Results: Our findings indicate that traditional estimates of premorbid IQ indicate greater changes in perceptual reasoning relative to verbal IQ. However, the patterns of change in actual pre- and post- injury performance scores indicates a different pattern with larger evident changes in verbal ability. Furthermore, the relative change in verbal and non-verbal abilities appears sensitive to age at injury.

Conclusions: These results are discussed in terms of biases in methods used to estimate premorbid ability and consequent implications for commonly reported patterns of assumed change following childhood TBI. Correspondence: *Ingram Wright, Frenchay Hospital, Frenchay Park Road, Bristol BS16 1LE, United Kingdom. E-mail: ingram.wright@bristol.ac.uk*

K. VAN BRAECKEL, P. BUTCHER, R. GEUZE, A. BOS & A. BOUMA. A Pathogenic Model for Impaired Elementary Visuomotor Processes in Very Preterm Children.

Objective: Follow-up studies of preterm born children without serious neurological complications have consistently found deficits in visuomotor and visuospatial skills. These deficits have been hypothesized to reflect impaired dorsal stream functioning. However, they may also reflect impaired cerebellar functioning. A detailed analysis of pointing movements provides information on the extent to which processes associated with dorsal and/or cerebellar functions are impaired.

Participants and Methods: We carried out a quasi-longitudinal study (14-month interval) in which kinematic characteristics of pointing movements in 53 7- to 11-year-old preterm born children without Cerebral Palsy and an age-matched full-term group were analyzed.

Results: Multi-level analysis showed less efficient – slower without gain in accuracy - movement programming and on-line control in the preterm born group.

Conclusions: These results provide converging evidence for dorsal visual stream involvement in visuomotor deficits in preterm born children, but do not rule out impaired cerebellar functioning. A pathogenic mechanism of impaired dorsal visual stream development resulting from periventricular white matter injury, and impaired cerebellar development secondary to dorsal visual stream impairment in preterm born children without serious neurological complications will be proposed.

Correspondence: *Koen Van Braeckel, PhD, Neonatology, Beatrix Children's Clinic, Postbus 30.001, Huispostcode CA51, Groningen 9700 RB, Netherlands. E-mail: k.van.braeckel@bkk.umcg.nl*

A.E. CASTANEDA, A. TUULIO-HENRIKSSON, T. VÄISTÖ, E. ARONEN, M. MARTTUNEN & K. KOLHO. Cognitive Functioning Among Adolescents with Inflammatory Bowel Disease.

Objective: Patients with chronic illnesses may experience deficits in cognitive functioning. However, cognitive functioning among adolescents with inflammatory bowel disease (IBD) has not been investigated. The main aim of the present study was to examine cognitive functioning among adolescent patients with IBD in comparison to peers with juvenile idiopathic arthritis (JIA) and to normative data.

Participants and Methods: We studied adolescents with IBD (n=24) and JIA (n=20), aged 16 years on average. Verbal and visual short-term memory were measured with the WMS-R Digit Span and Visual Span, verbal learning and memory with the California Verbal Learning Test, attention and executive functioning with the Trail Making Test and the Stroop Color-Word Test, psychomotor speed with the WAIS-R Digit Symbol, visual reasoning with the WAIS-III Picture Arrangement, and verbal intelligence with the WAIS-R Vocabulary. Gender and depressive symptoms, assessed with the Beck Depression Inventory, were controlled for.

Results: In comparison to normative data, the IBD group scored lower in the Digit Span Backward and Visual Span Forward, and the JIA group scored lower in the Digit Span Backward and Visual Span Forward and Backward. The study groups did not differ from normative data in Digit Symbol, Picture Arrangement or Vocabulary. No differences occurred between the study groups in the neuropsychological test performance.

Conclusions: The findings indicate that when compared to normative data, adolescents with IBD or JIA may have deficits in verbal working memory and visual attention. However, adolescents with IBD may not have any major cognitive deficits when compared to peers with JIA.

Correspondence: *Anu E Castaneda, National Institute for Health and Welfare, Department of Mental Health and Substance Abuse Services, Mannerheimintie 166, 00300 Helsinki, Finland & University of Helsinki, Department of Psychology. E-mail: anu.castaneda@thl.fi*

R. HANNONEN, J. KOMULAINEN, R. RIIKONEN & T. AHONEN. Academic and Verbal Skills in Children with Early Onset Type 1 Diabetes.

Objective: In children with type 1 diabetes, neurocognitive development is normal in most cases. However, early onset of diabetes and episodes of severe hypoglycemia can increase the risk of diffuse deficits. So far, the studies have focused on intelligence, memory and non-verbal skills. Verbal skills, reading, spelling and mathematics have been less studied, although minor learning deficits seem to be more common in children with diabetes than in healthy children. This study aims to assess academic and verbal skills in children with early onset diabetes.

Participants and Methods: The study included 63 children with type 1 diabetes onset before the age of five years and 92 control children without diabetes. The children were 9 to 10 years of age and in the 3rd grade at school. They were assessed with the tasks of reading, spelling and mathematics, auditory discrimination, verbal short term memory and rapid serial naming.

Results: Children with early onset diabetes performed significantly poorer than the control children in spelling accuracy, auditory discrimination and mathematics.

Conclusions: Children with early onset diabetes are prone to minor learning deficits in the first years of school. Parents, pediatricians and teachers need to recognize the risk for learning deficits in some subgroups of children with diabetes. Multiprofessional collaboration is needed to develop services for this growing group of children.

Correspondence: *Riitta Hannonen, Lic. Psych. Kymenlaakso Central Hospital, Department of Child Neurology, Kotkantie 41, Kotka, SF-48210, Finland. E-mail: riitta.hannonen@kolumbus.fi*

**Symposium 8:
Cognitive Profile in Multiple Sclerosis**

Chair: Päivi Hämäläinen,

4:00–5:30 p.m.

P.I. HÄMÄLÄINEN. Cognitive Profile in Multiple Sclerosis.

Symposium Description: Cognitive problems are a common manifestation of multiple sclerosis (MS). Information processing slowness, attentional deficits and problems with memory and executive functions has been reported most frequently. The widespread nature of MS-related cognitive impairments calls for comprehensive neuropsychological assessment although brief screening methods are also needed.

Cognitive fatigue defined as deterioration of sustained cognitive activity has been recently observed as a characteristic of cognitive impairment in MS. Objective cognitive fatigue and overall subjective feelings of fatigue do not go hand by hand. Whether the same holds true for the relationship between objective and subjective cognitive fatigue has not been evaluated. Heat seems to temporarily worsen symptoms of MS. Whether heat induces cognitive problems or cognitive fatigue is still unclear. Research shows that cognitive performances are associated with more widespread activation of certain brain areas in MS. Cognitive fatigue, instead, could be related to specific changes in the spreading activation, whether a sign of compensatory mechanisms or an inefficiency of neural transport. Anticholinesterasics has been shown to have mild positive effects on cognitive performances in MS. The mechanisms of positive effects have not, however, been evaluated.

The present symposium presents the characteristics of the Paced Auditory Serial Addition Test (PASAT) as a measure of information processing, attention and cognitive fatigue. Moreover, results on the relationship between objective and subjective cognitive fatigue as well as the effects of heat on cognitive performances are reported. Finally, neural mechanisms of cognitive fatigue and the role of anticholinesterases in the treatment of cognitive problems in MS are considered.

Correspondence: Päivi I. Hämäläinen, PhD, Docent, Masku Neurological Rehabilitation Centre, Seppäläntie 90, PO Box 15, Masku 21251, Finland. E-mail: paivi.hamalainen@ms-liitto.fi

E. ROSTI-OTAJÄRVI, P. HÄMÄLÄINEN, K. KOIVISTO & L. HOKKANEN. The Paced Auditory Serial Addition Test Performance among Patients with Multiple Sclerosis.

Objective: Cognitive impairment in multiple sclerosis (MS) is common but difficult to detect without a neuropsychological examination. Valid and reliable methods are needed in clinical practice and research. The Paced Auditory Serial Addition Test (PASAT) is widely used in MS patients' neuropsychological evaluation, and also acts as the sole cognitive measure in an assessment tool for MS clinical trials, the Multiple Sclerosis Functional Composite (MSFC). To determine the validity and reliability of the PASAT in measuring cognitive performance in MS patients.

Participants and Methods: Forty-five relapsing-remitting MS patients and 43 healthy controls underwent comprehensive neuropsychological assessments, including the PASAT, twice in a one-year follow-up, and additionally a sample of 10 patients and controls were evaluated with the PASAT in serial assessments five times in one month.

Results: The PASAT was moderately accurate in detecting MS-associated cognitive impairment, and 69% of patients were correctly classified as cognitively impaired or unimpaired when comprehensive neuropsychological assessment was used as a "gold standard". Self-reported nervousness and poor arithmetical skills seemed to explain misclassifications. MS-related fatigue was objectively demonstrated as fading performance towards the end of the test. Despite the observed practice effect, the reliability of the PASAT was excellent, and it was sensitive to the cognitive decline in a subgroup of patients observed during the follow-up.

Conclusions: The PASAT can be recommended for use in the neuropsychological assessment of MS patients. The test is fairly sensitive, but less specific; consequently, the reasons for low scores have to be carefully identified before interpreting them as clinically significant.

Correspondence: Päivi I. Hämäläinen, PhD, Docent, Masku Neurological Rehabilitation Centre, Seppäläntie 90, PO Box 15, Masku 21251, Finland. E-mail: paivi.hamalainen@ms-liitto.fi

S. LIUHA, J. KAARTINEN, P. HÄMÄLÄINEN, R. HÄNNINEN, J. SUHONEN & T. AHONEN. Patterns of Fatigue in Cognitively Intact patients with MS.

Objective: Cognitive fatigue is a frequent symptom of multiple sclerosis (MS). The relationship between objective signs of cognitive fatigue, like the deterioration of sustained cognitive performance, and subjective feelings of fatigue is, however, unclear. The purpose of this study was to evaluate the patterns of cognitive fatigue and the relationship between objective cognitive and subjective feelings of fatigue.

Participants and Methods: 18 MS patients and 18 age and education matched healthy controls were evaluated with three tests of sustained attention: the PASAT, the RVP from the CANTAB -test battery and the CPT test. Before the testing and after each test the participants rated their feeling of fatigue with VAS-F scale.

Results: In the PASAT, the two groups did not differ from each other. In the RVP, the reaction times of the controls increased on the second half of the test compared to the first half. In the CPT the MS group performed less well than the control group; their reaction times were longer

and they made more mistakes. Moreover, the accuracy of the patients deteriorated towards the end of the test. Both the patients and the controls rated themselves as more fatigued after the testing than in the beginning but no difference in the degree of fatigue was observed between the groups.

Conclusions: In the present study, signs of cognitive fatigue as well as subjective feelings of fatigue were observed not only in the patients but also in the healthy controls. The relationship between subjective feelings of fatigue and objective cognitive fatigue still remain controversial.

Correspondence: Päivi I. Hämäläinen, PhD, Docent, Masku Neurological Rehabilitation Centre, Seppäläntie 90, PO Box 15, Masku 21251, Finland. E-mail: paivi.hamalainen@ms-liitto.fi

A. IKONEN, P. HÄMÄLÄINEN & J. RUUTIAINEN. The Effects of Heat on Cognitive Performance in Patients with Multiple Sclerosis.

Objective: Heat sensitivity is known to be common among people with multiple sclerosis (MS). Muscular strength, visual acuity and fatigue may deteriorate temporarily during heat stress. However, the effects of heat on cognitive performance in MS patients have not been evaluated. The objective of the present study was to assess the effects of heat on cognitive performance in MS.

Participants and Methods: 13 patients with definite MS and 15 age and education matched healthy controls performed the Paced Auditory Serial Addition test (PASAT) and The Visual Vigilance Test before, during and one hour after the heat exposure (sauna). Core body temperature and vision were monitored during the assessments. Subjective fatigue, mood state and physical functioning were also assessed.

Results: The overall performance of MS patients was lower than that of the controls, both in the PASAT and in the Visual Vigilance test. Compared to the baseline and the performance of the controls, MS patients' performance deteriorated temporarily in the PASAT during heat exposure. After one hour delay the performance was near the baseline level. In the Visual Vigilance Test MS patients tended to make more errors during heat exposure than during baseline or one hour after the exposure.

Conclusions: The present results suggest that the cognitive performance of MS patients may temporarily deteriorate during heat exposure. After a short delay the performance seems to recover to the baseline level. Correspondence: Päivi I. Hämäläinen, PhD, Docent, Masku Neurological Rehabilitation Centre, Seppäläntie 90, PO Box 15, Masku 21251, Finland. E-mail: paivi.hamalainen@ms-liitto.fi

S. HUOLMAN, P. HÄMÄLÄINEN, V. VOROBYEV, J. RUUTIAINEN, M. KANKANPÄÄ, R. PARKKOLA, T. LAINE & H. HÄMÄLÄINEN. Rivastigmine May Have an Effect on Cognitive Fatigue and Related Brain Activation in Multiple Sclerosis.

Objective: Cognitive fatigue is defined as performance deterioration during a test of sustained attention or sustained cognitive effort and has been reported in multiple sclerosis (MS). The neural mechanisms of cognitive fatigue have remained unclear. The purpose of this study was to evaluate the neural correlates of cognitive fatigue using functional magnetic resonance imaging (fMRI) and study the possible effects of a single dose rivastigmine on sustained cognitive activity and associated brain activation.

Participants and Methods: 16 MS patients with subjective fatigue and/or objective signs of cognitive fatigue and 16 age and education matched healthy controls participated in the study. Modified version of Paced Visual Serial Addition Test (PVSAT) was used both as a screening test and as a task during the fMRI-scans. After the first scanning period, MS patients and healthy controls were randomly divided into four groups receiving either rivastigmine or placebo. The scanning was repeated 2.5 hours after the treatment.

Results: MS patients performed more slowly than healthy controls and showed signs of cognitive fatigue. A part of patients showed higher bilateral frontal activation than controls. Rivastigmine uptake appeared to affect differently the patients and controls by improving task performance and by increasing anterior frontal and cerebellar activations only in the patient group.

Conclusions: The present results shed light to the mechanisms of cognitive fatigue and indicate that cholinergic agonist may enhance cognitive performance and alter related brain activation in patients with MS. Correspondence: Päivi I. Hämäläinen, PhD, Docent, Masku Neurological Rehabilitation Centre, Seppäläntie 90, PO Box 15, Masku 21251, Finland. E-mail: paivi.hamalainen@ms-liitto.fi

S. LAATU, R. PARKKOLA, J. RINNE, J. RUUTIAINEN & J. VIRTÄ. Positron Emission Tomography Shows Increased Brain Acetylcholinesterase Activity in Multiple Sclerosis Patients with Marked Cognitive Impairment.

Objective: Neuropsychological studies of patients with multiple sclerosis (MS) have indisputably demonstrated the presence of cognitive dysfunction that results from disruption of cortical and subcortical pathways. It has been proposed that structures of cholinergic system in temporal lobe, hippocampus and thalamus, may be related to this impairment. There is, however, no studies concerning the acetylcholinesterase (AChE) activity in MS. Our objective was to compare the activity of the AChE in MS patients who show marked cognitive impairment with that in healthy persons.

Participants and Methods: Ten healthy cognitively intact subjects and ten patients with a secondary progressive MS disease and marked cognitive impairment (MMSE scores 18-26) were studied with positron emission tomography (PET) using tracer 11C-MP4A. The tracer radioligand is metabolized by AChE and thus the rate of tracer accumulation in brain tissue represents the local AChE activity.

Results: The PET measurements revealed an increase of AChE activity in MS compared to healthy controls. The increase was most pronounced in the medial temporal cortex ($31.3 \pm 19.0\%$, $p = 0.010$) and otherwise uniform across other neocortical regions (frontal cortex $19.9 \pm 15.7\%$, $p = 0.046$; lateral temporal cortex $22.2 \pm 9.5\%$, $p = 0.028$, parietal cortex $20.8 \pm 8.6\%$, $p = 0.040$).

Conclusions: In a homogeneous group of MS patients with marked cognitive impairment, a systematic increase in AChE activity was found in several brain areas as compared with healthy controls, especially in medial temporal cortex.

Correspondence: Päivi I. Hämäläinen, PhD, Docent, Masku Neurological Rehabilitation Centre, Seppäläntie 90, PO Box 15, Masku 21251, Finland. E-mail: paivi.hamalainen@ms-liitto.fi

**Invited Symposium:
Holistic Neuropsychological Rehabilitation
Symposium**

Chair: Sanna Koskinen

4:00–5:30 p.m.

S. KOSKINEN, W. KÜHNE, C. CAETANO, M. VINK & J. SARAJUURI. Holistic Neuropsychological Rehabilitation Symposium.

Symposium Description: The main elements of the holistic rehabilitation programs include the promotion of a therapeutic milieu, psychotherapy and cognitive retraining carried out in individual and group settings, supported work trials, family education and therapeutic assistance, as well as follow-up procedures. The neuropsychotherapeutic process is vital for helping patients to achieve a sense of identity, to learn to behave in their own best self-interests, to cope with the demands of the situations he or she is confronted with, and to reconstruct life after brain injury.

Creating and maintaining a therapeutic milieu is the practical basis of the holistic rehabilitation setting. Key features of program development, staff competencies, sharing of information and cooperation within the rehabilitation setting will be discussed. Besides the milieu created by the

staff, patients, and their significant others, it has been increasingly recognized that architecture, interior design and physical frameworks influence treatment. Research findings and rehabilitation examples will be provided to elucidate how healthcare design can contribute to the rehabilitation process.

Facilitating more adaptive coping styles may improve emotional adjustment. Results of a study examining changes in the coping styles after holistic neuropsychological rehabilitation will be presented. The effectiveness of holistic programs in enhancing psychosocial functioning, including productivity, has been supported by studies. Case-examples will be provided to highlight different pathways to productive living. The presentations will be given by four members of the European Holistic Working Group, founded in 2001 to promote and unify the holistic approach in neurorehabilitation as well as to develop the methods within the holistic frame of reference.

Correspondence: Sanna Koskinen, Käpylä Rehabilitation Centre, P.O. Box 103, Helsinki 00720, Finland. E-mail: sannakos@gmail.com

C. CAETANO. The Physical Context of Rehabilitation: Is There a Healing Architecture?

Objective: It has been increasingly recognized that architecture, interior design and physical frameworks influence treatment. Evidence-based healthcare design is a means by which optimal therapeutic environments can be created. Research findings and rehabilitation examples will be provided to elucidate how healthcare design can contribute to the rehabilitation process. Primary consideration will be given to post-acute rehabilitation for children and adults with acquired brain injury, within a holistic theoretical framework. This is particularly challenging as the latter approach emphasises the milieu, the co-ordinated activities of the multi-disciplinary team and multiple management of cognitive, emotional, interpersonal and educational/occupational concerns pertaining to the brain-injured individual and their significant others. Healthcare design in this context requires creating physical environments to address diversity and complexity not only by the appropriate structuring of physical space but also by the integration of innovative, interactive technologies in the building design. Examples will be used to highlight the challenges faced in creating an optimal health care design for post-acute rehabilitation of acquired brain injury and how such designs contribute to the treatment process. Correspondence: Sanna Koskinen, Käpylä Rehabilitation Centre, P.O. Box 103, Helsinki 00720, Finland. E-mail: sannakos@gmail.com

W. KÜHNE & P. FROMMELT. Establishing a Therapeutic Milieu - Theory and Practice.

Objective: Based on the principles of the work of Ben-Yishay, Prigatano and Christensen this presentation will focus on some special challenges in the process of creating and maintaining a therapeutic milieu. Key features of necessary program development, staff competencies, sharing of information and cooperation within the rehabilitation setting will be discussed. Critical group processes and demands of group development that need special attention and appropriate intervention will be addressed. Finally we will also report appropriate therapeutic options for interventions with group members whose behaviour is disruptive to the milieu. Correspondence: Sanna Koskinen, Käpylä Rehabilitation Centre, P.O. Box 103, Helsinki 00720, Finland. E-mail: sannakos@gmail.com

M. VINK. Coping with Brain Injury: Theoretical Aspects and Clinical Findings in Holistic Neuropsychological Rehabilitation.

Objective: Coping with brain injury: Theoretical aspects and clinical findings in holistic neuropsychological rehabilitation
In the theoretical background of holistic neuropsychological rehabilitation, the concept of coping is prominent. Among other theories, this approach in rehabilitation is based on Kurt Goldstein's idea of the need for offering a structured environment for brain injured patients with changed cognitive and functional life-competencies. By making it possible for the patient to cope with the demands of the situations he or she is confronted with, the patient will be able to feel "in a state of health".

Coping has been defined as constantly changing cognitive and behavioural efforts to manage specific internal and external demands that are appraised as exceeding the resources of the individual. In the case of brain injury, cognitive, emotional and behavioural changes interact in the coping process, which complicates the adjustment to the new situation.

In rehabilitation, the facilitation of more adaptive coping styles might improve emotional adjustment, and the improvement of emotional adjustment may increase adaptive coping.

For studying changes in coping style after holistic neuropsychological rehabilitation, a group of patients (N=61) with chronic brain injury who participated in a 16-week intensive holistic group program were assessed before and after completing the program. Assessment involved neuropsychological testing and questionnaires on coping and emotional functioning.

Changes in coping style, and the relationship with cognitive and emotional functioning were studied. The results of this study will be presented. Correspondence: *Sanna Koskinen, Käpylä Rehabilitation Centre, P.O. Box 103, Helsinki 00720, Finland. E-mail: sannakos@gmail.com*

J. SARAJUURI & S. KOSKINEN. Many Pathways to Productive Living via Holistic Rehabilitation.

Objective: The effectiveness of holistic neuropsychologically-oriented post-acute rehabilitation programs in enhancing psychosocial functioning of patients with traumatic brain injury (TBI) has been supported by studies. Research findings also suggest that successful outcomes need to be expanded to include the ability to engage in a sufficiently wide range of activities in addition to gainful employment.

Due to the heterogeneity of TBI patients, many pathways are to be tailored to attain productive living. The starting point of each individual pathway is a thorough and expert neuropsychological assessment which deepens during the intervention. On completion of the rehabilitation period, patients should have substantial knowledge about TBI, giving them a sound basis for understanding and coping with TBI-related changes, and for participating in productive living according to their own best self-interests. When considered an adapted and practical goal patients are encouraged to have supported work trials in the general market where they could possibly continue afterwards. These vocational interventions are worked out during the program and organized with the local social and health-care units and the compensation system liable for the care in each case. Adequate neuropsychological follow-up support and coaching have shown to be important for success in trials of work and education and for the achievement of good psychosocial balance. Case-examples will be provided to highlight some of the pathways to productive living.

Correspondence: *Sanna Koskinen, Käpylä Rehabilitation Centre, P.O. Box 103, Helsinki 00720, Finland. E-mail: sannakos@gmail.com*

Symposium 6:

Training Reading Fluency: What does Research Have to Say?

Chair: Mikko Aro

4:00–5:30 p.m.

M. ARO, S.M. HUEMER, P. SNELLINGS, J. TIJMS, M. ARO & J. HAUTALA. Training Reading Fluency: What does Research Have to Say?

Symposium Description: Although the number of studies published on reading and reading disorders is large, knowledge concerning reading fluency - the ability to read text quickly and effortlessly - remains limited. This is unfortunate, as among practitioners there is a need to employ theoretically and scientifically well-grounded intervention methods to improve reading speed. It is only in the last few years that in-

creased attention has been paid to reading fluency. One reason for this increased attention is the evidence showing that in the languages with more transparent orthographies (e.g., Dutch or Finnish) children with reading deficits have problems mainly in reading speed or fluency. In this symposium different types of training approaches targeted at reading fluency among children with reading deficits are presented.

In the presentations by Aro and Huemer, and Hautala and colleagues the training outcomes of repeated reading of syllables among Finnish-speaking children are reported. Of special interest is the examination of the training outcomes using two different methodologies: traditional reading tasks and eye movement recordings. Two other studies to be presented are conducted among Dutch-speaking children. Snellings presents the effects of a training method, in which the presentation rate of sentences is accelerated, on reading speed and comprehension. Tijms and colleagues present an experimental training study in which reading fluency is considered from the point of view of skill acquisition and the role of explicit versus implicit learning in it. Together these presentations will provide an insight into the current research interests concerning training of reading fluency.

Correspondence: *Sini M. Huemer, M.A., Niilo Mäki Institute, Sonnenweg 96/4, Anthering 5102, Austria. E-mail: sini.huemer@nmi.fi*

P. SNELLINGS. The Effects of Reading Acceleration Training on Visual-Auditory Integration and Reading Fluency of Reading Disabled Children.

Objective: In a relatively transparent language like Dutch, reading disabled (RD) children show slow reading and naming speed (de Jong & van der Leij, 2003). Breznitz (2006) demonstrated that Hebrew speaking adults with reading disabilities benefited from a training in which reading rate was experimentally manipulated. She hypothesized that for RD adults the time span of visual-auditory integration was out of synchrony, causing problems in reading rate and fluency. To determine whether reading rate, decoding accuracy and comprehension could be increased in Dutch speaking children, in the current experiment with 59 Dutch speaking normally achieving (NA) and RD children, reading rate was experimentally increased. We examined whether silent reading training enhanced the sentence reading rate and comprehension of RD children, and whether results found in Hebrew equally applied to an orthographically transparent language. Training results of 59 Dutch NA and RD children showed that children with reading disabilities were able to increase their sentence reading rate with high comprehension levels when pushed to do so with accelerated reading training. Posttest results showed that transfer to routine reading was less strong for both accelerated and unaccelerated reading. Only accelerated training allowed RD children to read at high speed while maintaining high comprehension levels. To determine whether reading rate manipulation was effective in altering the underlying mechanisms, we will also present results on visual auditory integration tasks and discuss the implications of fluency training for changing this deficit in reading disabled children.

Correspondence: *Sini M. Huemer, M.A., Niilo Mäki Institute, Sonnenweg 96/4, Anthering 5102, Austria. E-mail: sini.huemer@nmi.fi*

J. TIJMS, S. ARAVENA & M. VAN DER ZEE. Training Reading Fluency in Children with Dyslexia: Explicit, Rule-Based Learning versus Implicit, Associative Learning.

Objective: In our study, we transposed the discussion on explicit versus implicit learning in skill acquisition to the area of training reading fluency. As knowledge of phonetic-graphemic relations and the ability of using them instrumentally in reading are considered the core aspects of developing reading fluency, these two elements were the focus of our training study. To control for possible differences in previous exposure to orthography between dyslexics and non-dyslexics, an artificial orthography was used to train both regular and irregular phonetic-graphemic relations in a computerized intervention.

Children with dyslexia and non-dyslexic controls were provided with one of three experimental training conditions: a) an explicit, algorithmic rule-based training, b) an implicit associative training using repetitive exposure, c) a combination of a and b. Both their knowledge of the phoneme-grapheme relations and their reading fluency in this artificial orthography were tested during and after training. Preliminary results suggest that children with dyslexia a) are less susceptible to acquire reading fluency skills than non-dyslexics, and b) develop better reading fluency skills with the combined training than with the implicit, associative only training condition. Using multilevel analyses, a detailed window on these acquisition differences will be presented and the implications of these findings on the intervention of reading fluency will be discussed.

Correspondence: *Sini M. Huemer, M.A., Niilo Mäki Institute, Sonnenweg 96/4, Anthering 5102, Austria. E-mail: sini.huemer@nmi.fi*

M. ARO & S. HUEMER. Repeated Reading of Syllables among Finnish-Speaking Poor Readers.

Objective: In two short-term training studies the effects of repeated reading of syllables on reading speed were evaluated among Finnish-speaking children with poor reading skills. In both studies the participants were able to read with quite a high level of accuracy; however, they were slow readers. In Study I the results showed that the repeated practice was associated with a gain in the reading speed of the trained syllables. In addition, the reading speed of pseudowords containing the trained syllables improved significantly. Thus, a generalization effect was found from the syllable-level to a larger orthographic context.

In Study II the main findings of Study I were replicated: both the reading speed of the trained syllables and transfer pseudowords containing the trained segments improved significantly. In Study II the generalization effects were investigated in more detail. The results showed that the speed improvement was specific to the syllable as a unit. Improvement was not seen when reading trained letter combinations within different syllables. An additional finding of Study II was related to the training method: the training method emphasizing speeded responding was associated with similar gains in the reading speed as the method emphasizing accurate responding. The results imply that the repeated reading of sublexical items might offer one way to improve reading speed; however, its effects seem to be specific to the trained material.

Correspondence: *Sini M. Huemer, M.A., Niilo Mäki Institute, Sonnenweg 96/4, Anthering 5102, Austria. E-mail: sini.huemer@nmi.fi*

J. HAUTALA, S. HUEMER & M. ARO. Reading of Syllables Led to a Reduced Number of Fixations among Poor Readers.

Objective: To study if it is possible to improve reading fluency by training sublexical units, a syllable training study was conducted. School-aged poor readers received syllable training consisting of 50 repetitions of 30 different syllables within 2-3 weeks. Training led to an improvement in the reading speed of the trained syllables and pseudowords containing the trained syllables. To study where in the observable reading process the training effect was allocated, 18 voluntary children from the training study participated into an eye tracking study. Eye movements of these subjects were recorded when reading the same stimuli used in the training study, prior and post training. The results of the eye movement study are in accordance with the behavioral study: the trained syllables were read faster and received fewer eye fixations than the control syllables. The pseudowords containing the trained syllables received fewer first glance eye fixations than control pseudowords. No training effect on mean fixation duration was found. Results support the possibility that readers learned to recognize the trained sublexical units in a more parallel manner, and that the training affected also early phases of the word recognition process.

Correspondence: *Sini M. Huemer, M.A., Niilo Mäki Institute, Sonnenweg 96/4, Anthering 5102, Austria. E-mail: sini.huemer@nmi.fi*

Symposium 7: Neuropsychology in Psychiatric Disorders

Chair: Annamari Tuulio-Henriksson

4:00–5:30 p.m.

A. TUULIO-HENRIKSSON, M. TORNIAINEN, M. ANTILA, A. CASTANEDA, M. LINDGREN & A. LATVALA. Neuropsychology in Psychiatric Disorders.

Symposium Description: In this symposium, we will present data from the study samples collected at National Institute of Health and Welfare (formerly National Public Health Institute, Helsinki, Finland) with a neuropsychological point of view on psychiatric disorders. Our studies cover cognitive functioning in schizophrenia, bipolar disorder, major depressive disorder, anxiety disorders, and premorbid psychiatric symptoms, as well as substance abuse disorders. First, we have investigated whether male and female patients with schizophrenia differ in neuropsychological test performance, and whether discrepancies in clinical features modify the discrepancies in cognition between genders. Secondly, we present results from our study on patients with bipolar disorder. We have found that information processing speed may be a core cognitive deficit in bipolar disorder, and that verbal learning and memory impairments often observed in this disorder may be mediated by slowed processing speed. Third, in studying cognitive functioning among young adults with depression and anxiety, we have found only minor impairments, but they seem to associate with more severe forms of these disorders and low psychosocial functioning. Fourth, we will present results from our clinical study on cognitive functioning of adolescent psychiatric patients with high risk for psychosis. The fifth presentation will handle the relationship between substance abuse disorders and cognitive functioning among young adults showing that slowed psychomotor speed is associated with these disorders already at young adulthood. Our results will give an overview on psychiatric neuropsychology from representative population based samples of subjects from a large range of psychiatric disorders.

Correspondence: *Annamari Tuulio-Henriksson, PhD, Department of Mental Health and Alcohol Research, National Public Health Institute, Mannerheimintie 166, Helsinki 00350, Finland. E-mail: annamari.tuulio-henriksson@ktl.fi*

M. TORNIAINEN, J. SUVISAARI, J. LÖNNQVIST & A. TUULIO-HENRIKSSON. Sex Differences in Cognition among Schizophrenia Patients.

Objective: Many consistently documented sex differences are related to schizophrenia. Male patients have earlier onset of illness, more negative symptoms, and worse short term outcome than women with schizophrenia. These sex differences might imply that also cognitive deficits would be greater in men with schizophrenia. Research has, however, rarely supported this view, but studies with large random samples are still missing on the subject. The present study focuses on sex differences in cognition and investigates the role of clinical features in modifying these differences.

Participants and Methods: The present study used a population-based sample of 219 schizophrenia patients and 99 controls. The patients in the study had a familial form of the illness. The subjects were carefully diagnosed, and a neuropsychological test battery assessing intelligence, working memory, verbal memory, attention, and executive functions was administered.

Results: The sex differences in neuropsychological test scores were mainly similar in the schizophrenia group and in the control group, and only minor group-by-sex interactions were detected.

Conclusions: Despite sex differences in clinical features, schizophrenia does not directly affect the general observations of sex differences in cognition. Correspondence: *Annamari Tuulio-Henriksson, PhD, Department of Mental Health and Alcohol Research, National Public Health Institute, Mannerheimintie 166, Helsinki 00350, Finland. E-mail: annamari.tuulio-henriksson@ktl.fi*

M. ANTILA, T. KIESEPPÄ, T. PARTONEN, J. LÖNNQVIST & A. TUULIO-HENRIKSSON. The Effect of Information Processing Speed on Cognitive Functioning in Patients with Familial Bipolar I Disorder and Their Unaffected Relatives.

Objective: Regardless of increasing evidence of cognitive dysfunctions in bipolar I disorder, the evidence is still relatively sparse whether these dysfunctions arise from a single core deficit or from multiple impairments. Especially memory performance is affected by other cognitive functions, and the role of slowing in processing speed on verbal memory has been evidenced in other disorders. According to previous studies, information processing speed may be potential endophenotype for the bipolar disorder. The aim of the present study was to investigate the effect of processing speed on other cognitive functions in a population-based sample of familial bipolar I disorder patients, their first-degree relatives and controls.

Participants and Methods: Diagnostic interview and a neuropsychological test battery were administered to 32 familial bipolar I disorder patients, 40 of their unaffected first-degree relatives, and 55 controls, all representing population-based samples.

Results: The information processing speed had a significant effect in nearly all measures of cognitive functions. After adjusting for the effect of information processing speed, the significant differences disappeared between patients and controls/relatives in measures of verbal learning and encoding, and in executive functioning but remained indicative of significance in short-delay cued recall, and in long-delay recalls. There were no differences in cognitive functioning between relatives and controls after controlling the effect of information processing speed.

Conclusions: Information processing speed impairment may be potential cognitive core deficit and endophenotype in bipolar I disorder. Verbal memory impairments may be more related to the full-blown disorder, and partly mediated via impairment in information processing speed. Correspondence: *Annamari Tuulio-Henriksson, PhD, Department of Mental Health and Alcohol Research, National Public Health Institute, Mannerheimintie 166, Helsinki 00350, Finland. E-mail: annamari.tuulio-henriksson@ktl.fi*

A. CASTANEDA, J. SUVISAARI, M. MARTTUNEN, J. PERÄLÄ, S. SAARNI, T. AALTO-SETÄLÄ, J. LÖNNQVIST & A. TUULIO-HENRIKSSON. Cognitive Functioning among Young Adults with Depressive or Anxiety Disorders.

Objective: Cognitive functioning among young adults with depressive or anxiety disorders has received little investigation. The present studies examine cognitive functioning among young adults in general population with unipolar depressive or anxiety disorders in comparison to healthy peers.

Participants and Methods: Verbal and visual short-term memory, verbal long-term memory and learning, attention, psychomotor speed, and executive functioning were measured in a population-based sample of 21-35-year-olds. Performance was compared firstly between participants with pure non-psychotic depression (n=68) and healthy peers (n=70), secondly between pure (n=69) and comorbid depression (n=57), and thirdly between anxiety disorders (n=76) and healthy peers (n=71).

Results: Young adults with depressive or anxiety disorders, with or without psychiatric comorbidity, were not found to have major cognitive impairments when compared to healthy peers. Only mildly compromised verbal learning was found among depressed participants. Pure and comorbid depression groups did not differ, either. Among depressed participants, received treatment associated with more impaired verbal memory and executive functioning, and earlier onset with more impaired executive functioning. In anxiety disorders, psychotropic medication and low psychosocial functioning associated with deficits in executive functioning, psychomotor speed and visual short-term memory.

Conclusions: In general population, depressive or anxiety disorders among young adults may not be associated with major cognitive deficits. Psychiatric comorbidity may not aggravate cognitive functioning. However, treatment-seeking associated with cognitive deficits, suggesting that these deficits relate to more distress. Additionally, early-onset depression may represent a more severe form of the disorder. In anxiety disorders, symptom severity with low psychosocial functioning may associate with cognitive impairments.

Correspondence: *Annamari Tuulio-Henriksson, PhD, Department of Mental Health and Alcohol Research, National Public Health Institute, Mannerheimintie 166, Helsinki 00350, Finland. E-mail: annamari.tuulio-henriksson@ktl.fi*

S. THERMAN & M. LINDGREN. The Relationship between Psychotic-Like Symptom Intensity and Cognitive Performance among Adolescents at Heightened Risk for Psychosis.

Objective: Psychotic illnesses, in particular schizophrenia, are usually preceded by psychotic-like prodromal symptoms. Various criteria have been developed for detecting a so-called Ultra-High Risk (UHR) state, with a high probability for psychosis within the following six or twelve months. The most widely employed criterion sets do not, however, address cognitive deterioration. As cognitive decline has been shown to be present already in the premorbid phase, and is fully developed in the first psychotic episode, including measures of cognitive functioning could improve on the discriminability of current UHR detection criteria. The present study aims at determining which aspects of cognition are related with stronger psychotic-like symptoms.

Participants and Methods: In the Helsinki Prodromal Project, we have identified 70 adolescent psychiatric patients matching UHR criteria. These patients were recruited from the consecutive new patients aged 15-18 in the adolescent psychiatric units in Helsinki with a two-stage screening process, consisting of a self-report form and the Structured Interview for Prodromal Symptoms (SIPS). The SIPS addresses in detail all the main dimensions of psychotic-like symptomatology: "negative" (e.g. avolition, social withdrawal), "positive" (e.g. perceptual distortions, odd thinking), and "disorganized" (e.g. subjective disorientation and concentration difficulties) symptoms, as well as mood. The UHR patients and a clinical control group were also administered a large, standardized neurocognitive test battery.

Results: Previous research indicates that visuospatial working memory deficiencies are associated with stronger negative symptoms. We intend to test this association and explore the linear associations between the main dimensions of psychotic-like symptoms and cognitive performance.

Conclusions: Our results will aid in identifying cognitive risk-markers of psychosis.

Correspondence: *Annamari Tuulio-Henriksson, PhD, Department of Mental Health and Alcohol Research, National Public Health Institute, Mannerheimintie 166, Helsinki 00350, Finland. E-mail: annamari.tuulio-henriksson@ktl.fi*

A. LATVALA, A.E. CASTANEDA, J. PERÄLÄ, S.I. SAARNI, T. AALTO-SETÄLÄ, J. LÖNNQVIST, J. KAPRIO, J. SUVISAARI & A. TUULIO-HENRIKSSON. Cognitive Functioning in Substance Abuse and Dependence: A Population-Based Study of Young Adults.

Objective: We investigated whether DSM-IV substance use disorders (SUDs) are associated with verbal intellectual ability, psychomotor processing speed, verbal and visual working memory, executive function, and verbal learning in young adults. Comorbid psychiatric disorders and several risk factors for SUD were studied as confounding factors, and associations of SUD characteristics with cognitive performance were studied, as well.

Participants and Methods: We used a population-based sample (n=466) of Finnish young adults aged 21-35 years, and based the diagnostic assessment on all available information from a structured psychiatric interview (SCID-I) and in- and outpatient medical records. Established neuropsychological tests were used in the cognitive assessment. Risk factors for SUDs represented behavioral and affective factors, parental factors, early initiation of substance use, and education-related factors. Adjusted for age and gender, lifetime SUDs were associated with poorer verbal intellectual ability, measured with WAIS-R Vocabulary, and slower psychomotor processing, measured with WAIS-R Digit Symbol.

Results: Poorer verbal intellectual ability was accounted for by own and parental low basic education, whereas the association with slower psychomotor processing remained after adjustment for SUD risk factors. Poorer verbal intellectual ability was related to substance abuse rather than dependence, whereas other SUD characteristics were not associated with cognition.

Conclusions: In conclusion, poorer verbal intellectual ability and less efficient psychomotor processing are associated with lifetime alcohol and other substance use disorders in young adulthood. Poorer verbal intellectual ability seems to be related to own as well as parental low education, whereas slower psychomotor processing associates with SUD independent of risk factors.

Correspondence: *Annamari Tuulio-Henriksson, PhD, Department of Mental Health and Alcohol Research, National Public Health Institute, Mannerheimintie 166, Helsinki 00350, Finland. E-mail: annamari.tuulio-henriksson@ktl.fi*

Invited Plenary: Brain Basis of Social Interaction

Speaker: Riitta Hari

5:30–6:30 p.m.

R. HARI. Brain Basis of Social Interaction.

Social interaction continuously modulates the human brain and mind. The complexity of the direct and technology-mediated interaction between people forms an enormous challenge for modern neuroscience that

attempts to explore brain function in as-natural-as-possible experimental conditions. A part of the social interaction is supported by “mirroring systems”, brain circuitries that are activated during both performing and observing certain actions. The mirroring systems provide a plausible neuronal substrate for intersubjectivity, the sharing of common understanding of the world—including other people’s behavior—despite each individual’s private mental contents. Mirroring relies on various nonverbal cues, such as facial expressions, gestures, and voice, which effectively transmit information of the other persons’ intentions and emotions.

The time scales relevant for social interaction range from milliseconds to seconds. For example, the human “mirror-neuron system” has a characteristic temporal activation sequence, progressing in steps of 40–60 ms from visual areas in the back of the brain to temporal and parietal lobes, then to the inferior frontal lobe and finally to the motor cortex; the parieto-frontal part of sequence is abnormal in Asperger subjects.

Any comprehensive study of the brain basis of social interaction requires appreciation of the situated and embodied nature of human cognition, motivating simultaneous monitoring of brain and bodily functions within a socially relevant environment. Because single-person studies alone cannot unravel the dynamic aspects of interpersonal interactions, “two-person neuroscience” most likely forms the next conceptual and experimental challenge, necessary for understanding both normal brain function and many psychiatric and developmental disorders.

Correspondence: *Riitta Hari, MD PhD, Brain Research Unit, TKK, P.O. Box 5100, Espoo 02015 TKK, Finland. E-mail: hari@neuro.hut.fi*

SATURDAY AFTERNOON, AUGUST 1, 2009

Invited Plenary: Episodic Memory-2009

Speaker: Endel Tulving

12:00–1:00 p.m.

E. TULVING. Episodic Memory-2009.

The formulation of episodic memory has changed considerably since 1972. This lecture presents a thumbnail sketch of these changes and describes the current state of episodic memory, from the point of view of memory theory, empirical evidence, and clinical relevance. Episodic memory shares many features and properties with semantic memory, but also has features and properties that make it unique. The essence of episodic memory lies in the conjunction of three concepts: self, subjective time, and ‘autonoetic’ consciousness. The shaping of the definition and characterization of episodic memory has been and continues to be guided by empirical findings from sources such as developmental psychology, clinical cases of brain damage, and functional neuroimaging studies. The concept of episodic memory has recently been extended to cover conscious awareness of the future and is thus closely associated with ‘mental time travel.’ A lively ongoing debate focuses on the issue of episodic memory in nonhuman animals. Impairment of episodic memory is frequently the earliest symptom of Alzheimer’s disease. It has also come to be associated with psychiatric illnesses such as schizophrenia.

Correspondence: *Endel Tulving, Rotman Research Institute of Baycrest, 3560 Bathurst Street, Toronto M6A 2E1. E-mail: tulving@psych.utoronto.ca*

Symposium 9: Psychological Adjustment to Acquired Brain Injury

Chair: Michael Schönberger

Discussant: Ritva Laaksonen

2:30–4:00 p.m.

M. SCHÖNBERGER, F. GRACEY, R. LAAKSONEN, T. OWNSWORTH, M. SCHÖNBERGER, K. ARENA & H. WILLIAMS. Psychological Adjustment to Acquired Brain Injury.

Symposium Description: Acquired brain injury (ABI) has serious consequences for the individual’s life, and it has been postulated that emotional distress in individuals with ABI is caused by problems adjusting to the consequences of the brain injury. It is also assumed that poor adjustment leads to poor long-term psychosocial outcome. However, few studies have examined the causes and consequences of psychological adjustment and maladjustment.

In the symposium, four papers will be presented each concerned with aspects of psychological adjustment to ABI at different time points post-injury and highlighting the role of factors relating to level of impairment and disability, coping, self-discrepancy and social processes. In the first talk, Tamara Ownsworth will present a study indicating that emotional adjustment after brain injury is related to the occurrence of sentinel events during the hospital-to-home transition. In the second talk, Michael Schönberger will show how the injury consequences and the way the individual reacts to and copes with these are related to psychological adjustment. Consequences for the individual’s emotional status and engagement in rehabilitation will be demonstrated. In the third talk, Katia Arena will present data

suggesting self-discrepancy mediates between level of functioning and emotional status. In the fourth presentation, Huw Williams will present data from a large sample on the social dimension of psychological adjustment indicating that individuals with ABI struggle to accept a changed identity and fear of stigma can lead to social self-isolation and emotional distress. Finally, all four presentations will be summarized and their clinical implications discussed by Ritva Laaksonen.

Correspondence: *Michael Schönberger, Ph.D, SPPPM, Monash University, Clayton Campus building 17, Wellington Road, Clayton, VIC 3800, Australia. E-mail: michael.schonberger@med.monash.edu.au*

T. OWNSWORTH, J. FLEMING, E. NALDER, P. CORNWELL, L. WORRALL, T. HAINES, M. KENDALL & L. CHENOWETH. Occurrence of Sentinel Events and Emotional Adjustment During the Hospital to Home Transition Following Acquired Brain Injury.

Objective: To investigate the occurrence of sentinel events during the hospital-to-home transition and their relationship to emotional adjustment following ABI.

Participants and Methods: Design: A prospective longitudinal study with three time points; pre-discharge, 1-month post-discharge and 3-months post-discharge

Methods: 92 adults with acquired brain injury were recruited pre-discharge from rehabilitation and acute neurosurgery units of a major metropolitan hospital. Participants completed the Sentinel Events Questionnaire (SEQ) and Depression Anxiety Stress Scale at pre-discharge and 1- and 3-months post-discharge. The SEQ measures the occurrence of key events proposed to impact transition success, including negative events (financial strain, relationship breakdown, restricted living situation, cessation of therapy) and positive events (return to work/study, community access, home independence, and return to driving).

Results: The occurrence of sentinel events was unrelated to emotional adjustment at pre-discharge; however, a higher number of positive events was significantly associated with lower depression and anxiety at 1-month post-discharge ($p < .005$). At 3-months post-discharge a higher number of negative events was significantly related to increased depression ($p < .05$), anxiety ($p < .01$) and stress ($p < .05$). In a regression analysis, the number of negative events predicted level of depression at 3-months post-discharge after controlling for age, gender, length of hospital stay and functional status. Cessation of therapy services was the sentinel event most related to emotional distress at 3-months post-discharge.

Conclusions: Sentinel events represent critical adjustment periods during which individuals may benefit from more intensive psychological support to manage emotional distress.

Correspondence: *Michael Schönberger, Ph.D, SPPPM, Monash University, Clayton Campus building 17, Wellington Road, Clayton, VIC 3800, Australia. E-mail: michael.schonberger@med.monash.edu.au*

M. SCHÖNBERGER, J. PONSFORD, H. HARRINGTON, D. WONG, A. MCKAY, M. MEALINGS & S. LAMBERT. Psychological Adjustment to Traumatic Brain Injury in the Early Phase of Community-Based Rehabilitation.

Objective: The purpose of this ongoing study is to comprehensively describe the process of psychological adjustment to a traumatic brain injury (TBI) during the course of rehabilitation. The focus of this paper is on factors related to psychological adjustment early in rehabilitation.

Participants and Methods: A questionnaire package is administered to adult individuals with TBI as well as their therapists every third month throughout the course of a community-based, inter-disciplinary rehabilitation. Data from time point 1 and 2 are presented. Measures: Reactions to Impairment and Disability Inventory (RIDI; Adjustment and Acknowledgement Subscales); Hospital Anxiety and Depression Scale (HADS); Coping Scale for Adults (CSA) short form; General Self-Efficacy Scale (GSE); Self-awareness of deficits interview (SADI); Sydney Psychosocial Reintegration Scale, (SPRS), client and therapist form B; Working Alliance Inventory (WAI-S-R), client and therapist form; Engagement in rehabilitation scale.

Results: Preliminary analyses based on $N=21$ subjects revealed significant associations of the RIDI adjustment scale with the HADS, SPRS and GSE as well as close-to-significant relationships with the CSA, SADI, WAI and the Engagement scale. At the conference, results based on a sample of approximately 40 subjects will be presented.

Conclusions: The results are consistent with the assumption that psychological adjustment is related to the severity of the injury consequences and the way an individual copes with these. A good working alliance might provide a framework within which injury consequences can be addressed. This might be way of supporting clients in their adjustment process and thereby increasing their emotional well-being and engagement in rehabilitation.

Correspondence: *Michael Schönberger, Ph.D, SPPPM, Monash University, Clayton Campus building 17, Wellington Road, Clayton, VIC 3800, Australia. E-mail: michael.schonberger@med.monash.edu.au*

K. ARENA & M. ADAMS. Self-Discrepancy, Emotional Distress, and Functioning in Traumatic Brain Injury.

Objective: Background: Individuals who have sustained a traumatic brain injury (TBI) may face a number of challenges in physical, psychological, and social domains, which may result in emotional distress. Changes in level of functioning and self-concept are particularly salient in emotional distress, as individuals with TBI may mourn the loss of their previous abilities, roles, and relationships defining their identity.

Objectives: To examine whether the relationship between level of functioning and emotional distress may be explained by discrepancies between pre-injury and post-injury self-concept.

Participants and Methods: Design: A single sample within-group design investigating the associations between self-discrepancies, level of functioning, and emotional distress.

Method: Seventy individuals with TBI were recruited from statutory and voluntary services. Participants completed the Head Injury Semantic Differential III to measure self-discrepancies, the Beck Depression Inventory II and the Beck Anxiety Inventory to measure emotional distress. The Mayo-Portland Adaptability Inventory-4 was completed by a health professional or significant other to obtain a measure of participants' current level of functioning on domains of abilities, adjustment and participation.

Results: Significant associations were found between lower levels of functioning and higher levels of self-discrepancies. Regression analyses provided support for the hypothesis that higher psychological distress and lower levels of functioning would be mediated by self-discrepancies.

Conclusions: Self-discrepancies play an important role in level of functioning and experience of emotional distress post-TBI. The complex interaction between these constructs requires future research to further elucidate their relationships.

Correspondence: *Michael Schönberger, Ph.D, SPPPM, Monash University, Clayton Campus building 17, Wellington Road, Clayton, VIC 3800, Australia. E-mail: michael.schonberger@med.monash.edu.au*

W.H. WILLIAMS, J.M. JONES, J. JETTEN, A. HARRIS, P. YATES & S.A. HASLAM. The Role of Social Identity in Determining Outcomes After Acquired Brain Injury.

Objective: Traumatic Brain Injury (TBI) survivors can suffer a range of physical, emotional, cognitive, and behavioural problems leading to difficulties in maintaining their social group memberships. However, these social groups may be critical in the recovery -providing a sense of social identity important for self-continuity, and the basis for social support. Adjustment may be particularly compromised if one believes that the "new" identity may invoke stigma. Survivors may be inhibited in informing others about their injury. Conversely informing others about this new identity may foster social support for adjustment to occur. The aim of this study was to investigate the role that social identities play in the recovery process.

Participants and Methods: The outcomes of individuals admitted to the Emergency Department with mild TBI (n = 40) were compared to those admitted for orthopaedic injuries (n = 22).

Results: Individuals with TBIs and orthopaedic injuries did not differ in perceived injury severity or number of group memberships that were maintained or gained after injury. However, individuals with mild TBIs were less willing to disclose their injuries relative to individuals with orthopaedic injuries. Both groups showed a strong positive relationship between the number of new groups they had formed since their injuries and well-being. Partial correlations suggest that new group memberships may be benefiting individuals in different ways depending on the types of injuries they have sustained, when controlling for willingness to disclose.

Conclusions: Importantly, these findings highlight the need to consider the social dimensions to neurodisability in processes of assessment and rehabilitation.

Correspondence: *Michael Schönberger, Ph.D., SPPPM, Monash University; Clayton Campus building 17, Wellington Road, Clayton, VIC 3800, Australia. E-mail: michael.schonberger@med.monash.edu.au*

Paper Session 5: Developmental Consequences of Prematurity or Brain Damage

2:30–4:00 p.m.

K. YEATES, H. TAYLOR, J. RUSIN, B. BANGERT, A. DIETRICH, K. NUSS & M. WRIGHT. Premorbid Child and Family Functioning as Predictors of Post-Concussive Symptoms in Children with Mild Traumatic Brain Injuries.

Objective: This study sought to determine whether mild traumatic brain injury (TBI) during childhood results in post-concussive symptoms (PCS) more often than mild orthopedic injuries (OI), and whether premorbid child and family functioning moderates or explains any group differences in PCS.

Participants and Methods: This prospective and longitudinal cohort study included 8 to 15 year old children, 186 with mild TBI and 99 with mild OI, who were recruited from consecutive admissions to Emergency Departments in two large children's hospitals. Parents and children rated current PCS within 3 weeks of injury and at 1, 3, and 12 months post injury. At baseline, parents also provided retrospective ratings of pre-injury symptoms, as well as of child behavioral adjustment, overall family functioning, and other stressors and resources in the family environment.

Results: Mixed models indicated that children with mild TBI reported more PCS than those with OI, as did their parents, even after taking into account premorbid child and family functioning. Group differences were moderated by premorbid child and family functioning, such that they were more pronounced among children with better premorbid adjustment, from higher functioning families, and from families with more environmental resources.

Conclusions: Children with mild TBI are more likely than children with mild OI to display PCS. These effects are more evident in higher-functioning children and families. Higher-functioning children may be more sensitive to the effects of mild TBI, or the effects may be more difficult to differentiate from other causes of PCS in lower-functioning children. Correspondence: *Keith Yeates, The Ohio State University, Dept. of Psychology, Nationwide Children's Hospital, Columbus, OH 43055. E-mail: keith.yeates@nationwidechildrens.org*

H.E. MILLER, S. MATTYS, R.J. MCCARTER & P.M. SHARPLES. Hierarchical Linear Modelling of the Effects of Injury Severity, Time, Age and Gender on Verbal and Non-Verbal Memory, Following Paediatric Severe/Moderate and Mild Traumatic Brain Injury (TBI).

Objective: Injury severity is an established predictor of recovery rate post TBI, but controversy surrounds the contribution of other variables. The aim was to use a linear growth curve model to investigate verbal and non-verbal memory in TBI and control children and the effects of time since injury, age at injury and gender on long-term outcome.

Participants and Methods: Longitudinal prospective study with 52 severe/moderate TBI (mean age 11.8 years) and 52 mild TBI (mean age 11.9 years) and 49 control children (mean age 11.3 years). TBI severity was classed by admission Glasgow Coma Scale. Children's Memory Scale was used to assess memory function. A 'population average model', provided coefficients for estimated population means at initial-status post TBI, and estimated constant growth over the study period.

Results: Analysis at initial status showed that severe/moderate TBI children had significantly lower visual and verbal memory scores compared to controls (p=.001 and p<.001, respectively). There was no effect of age. Gender had an initial moderating effect on verbal memory. The largest deficit in estimated mean at intercept occurred for verbal delayed memory in severe/moderate TBI males, with little evidence of catch-up for this group. Growth for visual memory was similar for all children.

Conclusions: Severe/moderate TBI males had the greatest deficit for immediate/working verbal memory and were less able to store, consolidate and retrieve verbal material. Growth curve models set the stage for more specific investigation of the determinants of neurological and cognitive outcomes of TBI and provide a deeper understanding of the effects of individual characteristics on memory function post TBI.

Correspondence: *Helen E. Miller, BSc (hons), Neuropsychology, Frenchay Hospital, Room 1 Academic Centre, Frenchay Park Road, Bristol BS16 1LE, United Kingdom. E-mail: helen.miller@bristol.ac.uk*

K. VAN BRAECKEL, E. ROZE & A. BOS. Neuropsychological Outcome at School Age of Preterm Children with Periventricular Hemorrhagic Infarction: An Optimistic View.

Objective: Periventricular hemorrhagic infarction (PVHI) is found in 1-3% of preterm infants with mortality ranging between 30-60%. Although PVHI is often followed by withdrawal of care, neuropsychological outcome of survivors is largely unknown. We investigated neuropsychological outcome at school age, and the relation with PVHI localisation and extension in preterm children with PVHI.

Participants and Methods: We included all preterm children with PVHI admitted to our NICU between 1995-2003. Ultrasound scans were reviewed for localisation and extension of PVHI. At 4-12 years of age, we assessed intelligence (WPPSI-R or WISC-III), verbal memory (AVLT), visuospatial integration (VMI), and visual perception (TVPS-R).

Results: Of 38 infants, 15 died. Two children were lost to follow-up, 21 were included. Median TIQ was 83 (range 55-103, SD 11), median VIQ was 88 (range 55-115), median PIQ was 80 (range 40-100). Forty percent had a TIQ \geq 85. Verbal memory was normal (P>15) and subclinical (P5-P15) in 39%, and clinical (P \leq 5) in 22%. Visuospatial integration was normal in 42%, subclinical in 21%, and clinical in 37%. Visual perception was normal in 62%, subclinical and clinical in 19%. When corrected for mental age, verbal memory was normal in 50%, subclinical and clinical in 25%; visuospatial integration was normal in 74%, subclinical in 16%, and clinical in 10%; visual perception was normal in 88%, and subclinical in 12%. PVHI characteristics were not related to neuropsychological functions.

Conclusions: Given the lesion's severity, neuropsychological outcome was surprisingly good. Therefore, withdrawal of care should not be standard procedure. Poor visuospatial integration and visual perception were rather related to a general intellectual deficit, while verbal memory was specifically impaired. Although larger lesions are commonly thought of being prognostic for adverse outcome, results suggest that outcome at school age in children with PVHI was rather influenced by other perinatal medical complications or environmental factors.

Correspondence: *Koen Van Braeckel, PhD, Neonatology, Beatrix Children's Clinic, Postbus 30.001, Huispostcode CA51, Groningen 9700 RB, Netherlands. E-mail: k.van.braeckel@bkk.umcg.nl*

A. LUNDEQUIST, B. BÖHM & A. SMEDLER. Neuropsychological Profiles in 5 ½ Year Old Children Born Preterm: Medical Risk and Long-term Outcome.

Objective: Follow-up studies of preterm children have reported a range of cognitive deficits, particularly in executive functions, visuospatial abilities and learning. However, few researchers have adopted a person-oriented approach, exploring individual neuropsychological profiles. The aim of this study was to identify typical neuropsychological profiles among preterm children and control children, respectively. A second aim was to investigate if neuropsychological profile at age 5 ½ might be associated with perinatal medical risk factors, as well as later cognitive outcome.

Participants and Methods: As part of the longitudinal Stockholm Neonatal Project, NEPSY for 4-7 year old children was administered to 175 preterm and 125 control children at age 5 ½ years.

Results: For the present study, the NEPSY-results of each child were transformed into summary z-scores for each of the five neuropsychological domains. Subsequently, Ward's cluster analysis was performed for the preterm and control groups separately, identifying five neuropsychological profiles in both groups, explaining around 60% of the variance among preterms and controls respectively. Overall, preterm children had lower results in all neuropsychological domains, but also more diverging profiles compared to controls. Subgroups with more diverging profiles tended to have experienced more medical risks, but this was not statistically significant and appeared to reflect cumulative risk more than specific mechanisms.

Conclusions: The results suggest that prematurity in itself, in interaction with genetic and environmental factors, may affect preterm children's neuropsychological development. In addition to these findings, preliminary results on the relation between early neuropsychological profiles and cognitive outcome at age 18 (WISC-III) will be presented.

Correspondence: *Aiko Lundequist, Institutionen för kvinnors och barns hälsa, Astrid Lindgrens Barnsjukhus, Q2:07, 171 76 Stockholm. E-mail: aiko.lundequist@ki.se*

M. LEVAV, J. AHONNISKA-ASSA, T. SHANY-UR, J. LANDA, S. FRANK, T. PERETZ & A. BREZNER. Neurocognitive and Behavioral Profile of Children Affected with Posterior Fossa (PF) Tumors.

Objective: Studies on children affected with PF tumors have reported disturbances in motor, executive and visual-spatial function, processing speed, expressive language and affect modulation. Some reports have shown cognitive differences related to pathology, treatment methods (e.g. radiation vs. surgery) or age at diagnosis. The objective of the research is to assess cognitive, behavior and executive functions in a clinical sample.

Participants and Methods: The sample included 23 children (14 males) with PF tumors (11 with medulloblastoma, 12 with astrocytoma). Average age at testing was 11 years. A comprehensive neuropsychological assessment of the children was performed. Parents were administered the Child Behavior Checklist and the Brief Rating Inventory Executive Function.

Results: Children with PF tumors had significant difficulties ($Z \leq -1$) in general intelligence, fine motor functions, processing speed, verbal short-term and visual long-term memory, and arithmetic. No significant differences were found by pathology or by age groups in the areas assessed. Parents reported high levels of anxiety, withdrawal, social problems and attention together with problems in working memory, mild inhibition and a low level of initiation in their children.

Conclusions: Children treated for PF tumors suffer from serious cognitive deficits. Contrary to previous studies, we found deficits in general intelligence and arithmetic, but none in executive and visual-spatial functions and expressive language. The relatively small number of patients in all the PF studies together with the heterogeneity of the assessment methods used could account for the discrepant results.

Correspondence: *Jaana Ahonniska-Assa, PhD, Shafrir Children's Hospital, Sheba Medical Center, Tel HaShomer 52621, Israel. E-mail: assa@netvision.net.il*

**Paper Session 6:
Cognitive Assessment**

2:30–4:00 p.m.

R. TATE, N. LANNIN, C. TAYLOR, A. PFAFF, D. WAKIM, P. DAVID, B. COWARD & C. WHITTY. The Functional Independence Measure for People with Traumatic Brain Injury: How Good is the Cognitive Scale for Measuring Neuropsychological Impairments?

Objective: The Functional Independence Measure (FIM) is one of the most widely used measures in rehabilitation practice and is extensively used in research. Although there is substantial psychometric evidence to support the validity of the Motor Scale of the FIM, surprisingly little empirical data are available for the Cognitive Scale. Aim: to examine the criterion and construct validity of the Cognitive Scale of the FIM.

Participants and Methods: Fifty-two people with traumatic brain injury from inpatient rehabilitation (n=27) and community outreach (n=25) programs in Sydney, Australia were administered the FIM and other measures. Validating instruments were selected to specifically target each of the five FIM cognitive items, and included both objective cognitive tests and relative report using standardized questionnaires.

Results: Correlation coefficients between similar constructs were, at best, modest. Coefficients for objective cognitive tests ranged between $r=0.20$ (FIM-Comprehension vs Measure of Cognitive Linguistic Abilities (MCLA)—receptive score) and $r=0.64$ (FIM-Expression vs MCLA—expressive score). Somewhat higher coefficients were found for the questionnaire data, ranging from $r=-0.44$ (FIM-Problem Solving vs Frontal Systems Behavior Scale—Executive) to $r=-0.68$ (FIM-Memory vs Prospective and Retrospective Memory Questionnaire). Only one FIM cognitive item discriminated between subgroups stratified by injury severity (Expression: $t=2.58$, $p=0.014$) and none discriminated between the acute rehabilitation and community samples.

Conclusions: These results raise questions about the criterion and construct validity of the Cognitive Scale of the FIM for people with traumatic brain injury. Further critical evaluation of the applicability of this tool in assessing the complex neuropsychological deficits found in the TBI population is needed.

Correspondence: *Robyn Tate, PhD, Rehabilitation Studies Unit, University of Sydney, PO Box 6, RYDE, Sydney, NSW 1680, Australia. E-mail: rtate@med.usyd.edu.au*

P. MONTANES, D. MATALLANA, F. SIERRA, A. GAMEZ & E. NUÑEZ. Semantic and Phonological Fluency in Colombian AD Patients.

Objective: Verbal fluency tests are used extensively in neuropsychological assessments, but few authors report an influence of order of presentation of the semantic (SF) and phonological fluency (PF) tasks.

Participants and Methods: In a first study, we assessed 168 healthy Colombian adults (>60 years), and 87 AD patients in order to develop norms for the Colombian population. Our tasks in this study comprised first two semantic and then two phonemic categories. In a second study, the objective was to evaluate the effect of order of presentation. Results of condition 1 (SF-PF) in 90 AD patients, and 30 controls, and condition 2 (PF-SF) in other 90 AD patients and 30 controls, studied at the Memory Clinic, paired on demographic variables and degree of the disease were compared, using total scores of word production and z scores.

Results: In the first study, consistent with previous investigations, our data are consistent with previous findings regarding the influence primarily of education and age on verbal fluency scores. The variable sex was not significant. With a cut-off of 10, sensitivity and specificity were high for SF (0,86 and 0,80) but not for PF (0,56 and 0,87). In controls, we found the expected task difference favoring semantic over phonemic verbal fluency. But, contrary to what is generally reported in the literature, we also found better performance for SF in the AD patients. We first attributed this finding to the language structure of Spanish and to culture-specific characteristics.

In the second study, we found that with total scores, better performance for SF was obtained, as in the first condition. In condition 2, no significant differences were found. With z scores, in all comparisons, best performance on PF was obtained.

Conclusions: The debate about the sum of aging + disease effects, of access failure, impairment of semantic memory structure, mental initiation, organization skills and access to lexical memory stores are discussed.

Correspondence: *Patricia Montanes, PhD, Universidad Nacional de Colombia, Calle 128A 70D-43, Bogota 0000, Colombia. E-mail: patriciamontanes@gmail.com*

A. JANSARI, R. AGNEW, S. DUNCOMBE, M.G. ILLINGWORTH, T. EDGINTON, L. DAWKINS, R. LANGFORD, K. DEBRECENI & A. BARTFAI. Using Virtual Reality for Ecologically-Valid Assessment of Executive Functions.

Objective: The accurate assessment of individuals with dysexecutive syndrome (DS) is vital for effective rehabilitation. Although neuropsychological tests of executive function exist, they are not necessarily ecologically-valid or predictive of real-world adjustment (Shallice & Burgess, 1991). The JAAM (Jansari, Agnew, Akesson & Murphy, 2004) paradigm is an office-based role-playing task constructed to tap the major deficits seen in DS. Four sets of studies using JAAM assessed its utility to assess executive impairment in DS, the effects of nicotine on executive functions in healthy individuals, executive deterioration through normal ageing and the possibility of translation into Swedish.

Participants and Methods: Two sets of individuals in brain rehabilitation centres and matched controls were used in London and in Sweden. Age and IQ matched healthy individuals took part in the nicotine study; IQ matched under 40- and over 60-year olds took part in the ageing study. The Virtual Reality assessment was administered on a standard laptop computer.

Results: Results showed that JAAM can successfully differentiate patients with DS from normal controls; importantly, the same paradigm was successful on a Swedish population. As well as showing overall performance, the assessment provides a profile of performance across eight cognitive constructs central to executive functions; this means that the fine-grained analysis of an individual's performance to guide future rehabilitation is possible. Further, JAAM is also sensitive to changes in executive functions as a result of healthy ageing and intake of nicotine and can therefore be used as a tool in these areas of research.

Conclusions: The use of Virtual Reality to assess executive functions in an ecologically-valid manner is an exciting prospect for the future. Translations into a number of other languages are planned.

Correspondence: *Ashok Jansari, PhD, School of Psychology, University of East London, Romford Rd, London E15 4LZ, United Kingdom. E-mail: a.jansari@uel.ac.uk*

T. SILBERG & J. LANDA. Theory of Mind Task in Children after TBI: What Can Picture Arrangement Cartoons Tell Us about Evaluation of Others' Mental States?

Objective: Several studies show that traumatic brain injury (TBI) is associated with deficits in the recognition of basic emotions and the capacity to infer mental states of others, also known as "Theory of Mind" (ToM). Developmentally, ToM is one of the cognitive abilities that enable children to engage in social interactions and think about other people's mental states and use it to better understand and predict others' behavior. The purpose of the current study was to examine the existence of deficits in social cognition and in ToM ability in children after TBI, using a friendly (Schubi) non-verbal animation-card sorting task.

Participants and Methods: 15 children aged 9-18 years with severe TBI who documented frontal lobe damage were compared to 50 controls on a non-verbal ToM task. Schubi animation cards were used as a non-verbal measure of ToM abilities. Participants were asked to make mental state attributions and general inferences while organizing the cards into a logical story. Different measures were interpreted from the participant's performance.

Results: The TBI group was significantly impaired relative to controls in basic emotion recognition, humor comprehension and in monitoring measurements. No difference was found in ability to pay attention to details and in total time performance. Also, a developmental attribution was found in the control, but not in the TBI group

Conclusions: TBI in childhood may disrupt the developmental acquisition of emotion recognition and advanced ToM skills. There are clinical and theoretical implications for such findings, both in the assessment and treatment of children who have experienced TBI.

Correspondence: *Tamar Silberg, PhD, Psychology, Bar-Ilan University, P.O.B 3500, Gadera 70710, Israel. E-mail: tamarsilberg@gmail.com*

M.P. CHEVIGNARD, C. CATROPPA, J. GALVIN & V. ANDERSON. Development of an Open-Ended Ecological Task to Assess Executive Functioning in Children Post TBI: a Cooking Task.

Objective: Traumatic brain injury (TBI) often leads to executive functions (EF) deficits, responsible for severe and longstanding disabilities in daily life activities. Sensitivity and ecological validity of neuropsychological tests of EF have been questioned. The aims of this study were to pilot an ecological open-ended assessment of EF in children, to study its discriminant validity and compare it to more traditional ecological measures of EF.

Participants and Methods: Twenty-five children with mild (n=10) or moderate-to-severe TBI (n=15), and 21 matched controls (aged 8 to 20 years) participated in the study. An open-ended cooking task was designed to tap multi-tasking abilities. It requires the preparation of two simple recipes with specific structured instructions but little help from the examiner. Outcome measures included the number of errors and an overall qualitative analysis of the cooking task. Other measures of EF also included the six-part test from the Behavioural Assessment of the Dysexecutive Syndrome for Children, and two questionnaires answered by the child's primary care-giver: the BRIEF and the Dysexecutive Questionnaire for Children (DEX-C).

Results: The results in each group were compared using non-parametric tests (Mann Whitney). Performance in the cooking task significantly improved with age in both groups. Children with TBI significantly differed to the control group for the number of errors in the cooking task (p=0.004), and for the qualitative analysis of the task, such as time to complete the task (p=0.02) and necessity for an adult to intervene (p=0.02). The patients who failed to complete the task without the intervention of an adult had significantly lower scores on the DEX-questionnaire (p=0.001) and somewhat lower scores in the six-part test (p=0.06), suggesting a role of EF in the management of this complex task.

Conclusions: This study highlights the need for naturalistic assessments to better approach brain injured patients' dysexecutive impairments in complex activities of daily living.

Correspondence: *Mathilde P. Chevignard, MD, PhD, INRA, Hopital National de Saint Maurice, 14, Rue du Val d'Osne, Saint Maurice 94410, France. E-mail: m.chevignard@hopital-saint-maurice.fr*