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# Abstracts Presented at the Twenty-Fifth Annual International Neuropsychological Society Conference

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## WEDNESDAY AFTERNOON, FEBRUARY 5, 1997

Poster Session 1/4:30–7:30 p.m.

### IMAGING—1

**H. A. WHITAKER, D. POEPEL, & D. HOCHMAN. A Logical Problem in the Interpretation of Functional Brain Images: The Need for Independent Evidence.**

PET and fMRI brain images acquired during human cognition typically show increased activity in so-called regions of interest (ROI). The problem is that these are usually accompanied by decreased activity in other brain regions that are rarely identified as ROI. Since these decreases are statistically correlated with the experimental variables, they are logically equivalent data that demand interpretation. However, since the increases and decreases are opposites, interpretation requires independent (non-imaging-derived) data, such as those from lesion studies.

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**R. LINN, A. LOCKWOOD, H. SZYMANSKI, R. MOSCATI, M. PAROSKI, M. COAD, & B. MURPHY. Parsing the PASAT: A <sup>15</sup>O-water PET Activation Study in Normal Adults.**

The Paced Auditory Serial Addition Test (PASAT), a multivariate measure of cognition, assesses divided attention, working memory, speed of information processing, and calculation ability. Although frequently used in clinical evaluations of brain injury, the neuroanatomical systems responsible for intact functioning on the PASAT are not known. In this study of normal adults, cerebral blood flow (CBF) measured during <sup>15</sup>O-water PET scans was evaluated during performance of the PASAT and associated control contrast tasks. Compared to rest, the PASAT produced significantly increased CBF in the bilateral cerebellum, bilateral superior temporal gyri, and right anterior cingulate. Compared to a control task (repeating previously heard numbers aloud), increased CBF was present posteriorly, including the posterior cingulate region bilaterally, and the left precuneus. These findings indicate that normal performance of the PASAT involves a complex distributed network of cerebral components, and suggest that the impaired PASAT performances typical in brain-injured samples may reflect damage to any one of a number of neuroanatomical regions.

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**I. TROPE, D. LOPEZ-VILLEGAS, & R. LENKINSKI. Alterations in the Metabolism of the Brain of a Child Exposed to Lead: A Noninvasive, In Vivo Proton Magnetic Resonance Study.**

This study examined the *in vivo* use of Magnetic Resonance Spectroscopy (MRS) for the evaluation of the neurotoxic effects of lead on the nervous

system. A 10-year-old boy with elevated blood lead levels and associated neuropsychological deficits was evaluated using MRI and MRS methods. The findings were compared to those of his 9-year-old sibling who did not suffer lead poisoning. While both children had a normal MRI examination of the brain, the lead poisoned boy evidenced a significant alteration in brain metabolites on MRS, with a reduction in N-acetylaspartate/creatine ratio. Since N-acetylaspartate is a brain metabolite shown to decrease in processes that involve neuronal loss, these findings suggest that lead has an effect on brain metabolites as detected by MRS *in vivo*.

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**C.B. BRADSHAW. Localization of Receptive Prosody in the Right Hemisphere: Evidence From Intraoperative Mapping and Functional Neuroimaging.**

Interpretation of the emotional prosody (or affective intonation) of language has been attributed to the posterior right hemisphere. This talk reviews two studies assessing right hemisphere support of receptive prosody: an intraoperative mapping study, and an fMRI study. In the first study, we performed functional cortical mapping with an Ojemann stimulator on epilepsy patients undergoing awake right- and left-side craniotomies. During cortical stimulation, subjects were aurally presented with content-neutral sentences that varied in prosody. During stimulation of the left cortex, subjects did not demonstrate deficits recognizing prosody. During stimulation of the right cortex, 5 of 6 subjects made errors identifying the prosody. Areas sensitive to disruption of receptive prosody were in the posterior superior temporal gyrus. In the second, fMRI study, 3 normal adult subjects judged the prosody of aurally presented content-neutral sentences, while undergoing right-side functional MRI scanning. In the contrasting control scanning condition, the subjects were aurally presented with random numbers, and determined whether each number was odd or even. The difference in activation between the prosody discrimination task and the number differentiation task revealed activation sites primarily within the right posterior superior temporal gyri. Our findings provide additional support for, and more precise localization of, the right hemisphere's role in receptive prosody.

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**M.E. QUIG, T. TURKINGTON, T. HAWK, & K.A. WELSH-BOHMER. The Neural Correlates of the Working Memory and Secondary Memory Deficits in Alzheimer's Disease Using Resting State FDG-PET.**

The current study explores the neural correlates of the working memory and secondary memory deficits of Alzheimer's disease (AD) using resting

state FDG-PET. 18 AD patients were administered a brief neuropsychological battery and underwent FDG-PET scan procedures. The results showed that performance deficits on measures of delayed verbal recall were related to hypometabolism in discrete neural regions of the temporal lobe. Unexpectedly, performance on measures of working memory and executive function did not relate to metabolic rates in the frontal lobes. Systematic regional metabolic change in 3 sub-groups of AD patients is also addressed.

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**T.D. ELKIN, W.E. REDDICK, J. GLASS, M.Y. KIBBY, A.A. BIEBER-ICH, & R.K. MULHERN. White Matter Loss and Specific Deficits in Pediatric Medulloblastoma Patients.**

Neuropsychological deficits, especially those related to learning and memory, are problematic among survivors of childhood medulloblastoma, and are hypothesized to be secondary to either cranial radiation therapy (CRT)-induced loss of functional white or gray matter. We present data associating quantitative indices of white matter volume with intellectual performance and working memory in 28 long-term survivors (7–20, median = 14 years). All patients were greater than 1 year postcompletion of CRT. White, gray, and partial matter were classified from axial T1, T2, and proton density MRI using an automated segmentation algorithm. Results indicate that white matter volume, corrected for intracranial volume (ICV), and time since CRT significantly predict Verbal IQ better than gray matter corrected for ICV, but measures of working memory and Performance IQ were unaffected.

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**M. CHERRIER, L. ERCOLI, S. BOOKHEIMER, M. COHEN, & J. WANG. Changes in Cortical Activity During a Spatial Versus Phonological Verbal Fluency Task.**

Using fMRI techniques, we investigated the nature of neural activation associated with a geographical verbal fluency task. Two different word generation strategies (phonological vs. spatial) were used and compared to a control task (category fluency). Three subjects and two runs per subject were analyzed. Scans were performed on a GE 3 Tesla specially designed brain mapping instrument. T values above a selected threshold were examined for signal intensity-weighted images. The geographical fluency task, spatial strategy, evidenced activation of primary visual and secondary visual association areas. These areas were not activated with the category fluency or geographical fluency phonological strategy tasks. Our findings support the view that visual imagery frequently engages cortical visual areas generally associated with primary visual perception and suggests that cognitive maps contain both semantic and spatial information which activate unique brain regions.

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**T. BAUMGARDNER, S. MOTT, A. REISS, G. AAKALU, & M. DENCKLA. Neurofibromatosis Type 1 (NF-1): Enlarged Corpus Callosum (CC) Correlates with Specific Motor Findings.**

To determine whether the CC in children with NF-1 is enlarged to a degree in excess of megalencephaly, common in NF-1, we measured the midsagittal CC and intracranial (IC) areas of 14 NF-1 subjects and their unaffected siblings (ages 6–16 years). Five CC segments (1-5, caudal-rostral) were also measured and Wilcoxin signed rank test showed larger CC/IC ratio in the NF-1 affected children ( $p < .009$ ) and in segment 3/IC ratio ( $p < .006$ ). The NF-1 group segment 3 CC area correlated  $-.64$  ( $p = .02$ ) with total score for overflow movements observed during neuromotor exami-

nation. The CC appears to be abnormally large in NF-1, enlargement that appears to be related to inhibition of motor overflow.

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**D. JOHNSON-GREENE, K.M. ADAMS, S. GILMAN, R.A. KOEPPE, L. JUNCK, K. J. KLUIN, S. MARTORELLO, & M. HEUMANN. Effects of Abstinence and Relapse Upon Neuropsychological Function and Cerebral Glucose Metabolism Studied with PET in Severe Chronic Alcoholism.**

Prolonged excessive consumption of alcohol has been associated with a variety of cognitive disorders, particularly those subserved by the frontal lobes. Studies with positron emission tomography (PET) have shown decreased local cerebral metabolic rates for glucose (ICMRglc) in frontal regions, with correlated abnormalities in executive function on neuropsychological tests. This investigation was designed as a pilot study to examine the effects of abstinence and relapse in severe chronic alcoholic subjects studied longitudinally with PET, and with neuropsychological evaluation to assess executive functions. Six patients, including 4 who remained abstinent and 2 who relapsed following their initial evaluation, were studied twice, with interevaluation intervals ranging from 10 to 32 months. These findings suggest that abstinence is associated with at least partial recovery of ICMRglc in two of three divisions of the frontal lobes and improvement on tasks of executive function, whereas relapse leads to further declines in these areas. These results suggest the potential for at least partial recovery in abstaining alcoholic patients.

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**A. ROSEN, S.M. RAO, P. CAFFARRA, A. SCAGLIONI, S.W. WOODLEY, J. CUNNINGHAM, J. BOBHOLZ, T.A. HAMMEKE, C. UMITLA, D. SALMASO, & C. LANGER. Functional MRI Correlates of Spatial Attention and Inhibition.**

Spatial orienting can either be directed by endogenous (internal) or exogenous (external) cues. Endogenous attention is thought to involve anterior brain structures, whereas exogenous attention is purported to involve posterior and subcortical brain structures. While both endogenous and exogenous cuing result in facilitation of attended and inhibition of unattended locations, inhibition of return (IOR) generally occurs only for exogenously cued stimuli. In IOR, reorientation to a previously attended region of space is slower than to a different location. Nine normal subjects performed the attentional tasks while undergoing whole-brain functional MRI (fMRI). Reaction time data demonstrated inhibition of invalid cues in the endogenous condition and IOR in the exogenous condition. The fMRI images supported the existence of separable brain systems mediating exogenous and endogenous orienting.

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**A.R. WOODARD, B.P. HERMANN, A. BACHHUBER, S.B. PERLMAN, R. DE LA PENA, J. ROSENBEK, D. CARISKI, J.C. JONES, P. RUTECKI, & N.W. SPENCER. Preliminary Examination of the Relationship Between PET Scan Temporal Lobe Asymmetry and Level of Performance on Measures of Memory, Naming, and Verbal Intelligence in Epilepsy Surgery Candidates.**

The degree of left temporal lobe metabolic asymmetry (PET) among 25 candidates for dominant (left) anterior temporal lobectomy was correlated with preoperative scores on the Auditory Verbal Learning Test, Boston Naming Test, and WAIS-R Verbal IQ. The relative severity of left temporal lobe metabolic asymmetry was not associated with VIQ and confrontation naming performances, but was associated with signifi-