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Five-Year Changes in Brain Volume and Episodic Memory in Cognitively Intact Elders with and without an Apolipoprotein ε4 Allele

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ations in the classifier employed, feature selection procedure and regions of interest. Performance improvements were also present in an information brain mapping 'searchlight' procedure. These results suggest that investigators looking to maximize their ability to detect subtle multivoxel patterns might wish to consider employing short fMRI runs.

E83

FIVE-YEAR CHANGES IN BRAIN VOLUME AND EPISODIC MEMORY IN COGNITIVELY INTACT ELDERS WITH AND WITHOUT AN APOLIPOPROTEIN ?4 ALLELE Monica A. Matthews[1], Michael Seidenberg[1], John L. Woodard[4], Sally Durgerian[2], Kristy A. Nielson[2,3], J. Carson Smith[5], Melissa A. Lancaster[1], Alissa M. Butts[3], Nathan C. Hantke[3], Stephen M. Rao[6]; [1]Rosalind Franklin University of Medicine and Science, [2]Medical College of Wisconsin, [3]Marquette University, [4]Wayne State University, [5]University of Maryland, [6]Cleveland Clinic – The apolipoprotein ?4 allele is a risk factor for Alzheimer's disease. ?4 carriers diagnosed with AD or MCI exhibit an increased rate of atrophy on MRI relative to non-carriers. Few longitudinal studies have examined the rate of atrophy and cognitive change in older ?4 carriers who were cognitively intact at study entry. In this study, structural MRI and episodic memory testing were administered on two occasions separated by 5 years to 45 cognitively intact older adults, ages 65-90 years, divided into two groups: (1) carriers with one or both ?4 alleles (n=24) and (2) demographically-matched non-carriers (n=21). Longitudinal analysis of whole brain gray matter, whole brain white matter, and hippocampal volumes were derived from Freesurfer software. Analysis of variance indicated a significant group x time interaction for both left and right cortical gray matter ($p's < .05$; 2% decrease) and left hippocampus ($p < .001$; 5.6% decrease); right hippocampus showed a marginal effect ($p=.086$; 4.9 % decrease). In all instances, the ?4 group showed greater atrophy over the five-year interval than non-carriers. White matter brain volume significantly decreased over retest interval (3.5%), but did not differ between groups. Over the same retest interval, the ?4 group also showed significantly greater decline than non-carriers on delayed word recall and percent retention on a list-learning task. These data suggest that the presence of an ?4 allele carries an increased risk for cortical gray matter and hippocampal atrophy and memory loss among older participants who were cognitively intact at study entry.

E84

COMBINING MULTIPLE DATASETS TO UNCOVER TASK-COMMON AND TASK-SPECIFIC NETWORKS UNDERLYING INTEGRATION OF EVIDENCE USING FMRI-CPCA Katie Lavigne[1,2], Paul Metzak[1,2], Todd Woodward[1,2]; [1]University of British Columbia, [2]BC Mental Health and Addictions Research Institute – We investigated functional networks associated with the integration of evidence using event-related functional magnetic resonance imaging (fMRI). This was achieved by combining data from two studies using conceptually similar tasks with constrained principal component analysis for fMRI (fMRI-CPCA). fMRI-CPCA is a multivariate analysis method combining multiple regression and principal component analysis that allows for the extraction of task-related functional networks. When applied to conceptually similar tasks from multiple datasets, fMRI-CPCA can distinguish between functional networks that are common to all tasks and those that are task-specific. 27 healthy participants completed one of two versions of a perceptual interpretation task, in which they rated the degree to which a morphed image composed of two different animals (e.g., cat, fox) appeared to be an image of one animal or the other. Participants were then presented with a second image of the animals morphed at a different ratio and were asked to re-rate the images. fMRI-CPCA revealed five functional networks, the largest of which included bilateral activations in anterior prefrontal regions known to be involved in evaluating internally-generated information. This network was specifically responsive to integration of disconfirmatory evidence for both versions of the task, suggesting that it was a task-common functional network associated with disconfirmatory evidence integration, and unrelated to methodological differences between the two tasks (e.g., differences between the timing of the stimuli). Multiple task-specific attention and response networks were also identified.

E85

IDENTIFYING COMPUTABLE FUNCTIONS AND THEIR SPATIOTEMPORAL DISTRIBUTION IN THE HUMAN BRAIN Andrew Thwaites[1,2], Ian Nimmo-Smith[2], Elisabeth Fonteneau[1,2], Roy D. Patterson[1], Paula Buttery[1], William D. Marslen-Wilson[1,2]; [1]University of Cambridge, [2]MRC Cognition and Brain Sciences Unit, Cambridge – An important goal for cognitive neuroscience is to identify the specific computations carried out by the human brain and to relate these to specific spatio-temporal patterns of neural activity. This can be achieved by testing computationally explicit models of neural functions against spatiotemporally accurate measurements of brain activity. We report here a new approach that can search representations of neural activity, captured by combined electro- and magneto-encephalographic (EMEG) whole brain recordings, to determine the neural distribution of appropriately and rigorously defined computational functions. Focusing on speech comprehension, we show how this technique can locate computational functions relating to two very different aspects of this complex process: signal based processes related to the extraction of perceptual features (loudness and pitch) and knowledge-based processes operating on the listener's representation of words in their language. Using a combination of signal correlation techniques and a temporal moving window to search EMEG source space on a searchlight basis, we are able to identify a loudness process running in L and R planum temporale at lags of 65-70 ms and 75 ms, a pitch process close to L Heschl's gyrus at 65 ms and R planum temporale at 85 ms, and a primary set of word-recognition processes running in L and R temporal lobes at 235-250 ms. These successful applications of the technique demonstrate its potential to map out the computational functions underpinning complex neurocognitive capacities.

E86

DISTINGUISHING FUTURE COGNITIVE DECLINE IN HEALTHY ELDERS USING TWO METHODS FOR MEASURING HIPPOCAMPAL VOLUMES Alissa M. Butts[1], Kristy A. Nielson[1,2], Nathan Hantke[1], Melissa Lancaster[3], Michael Seidenberg[3], John L. Woodard[4], J. Carson Smith[5], Monica Matthews[3], Michael A. Sugarman[4], Sally Durgerian[2], Stephen M. Rao[6]; [1]Marquette University, [2]Medical College of Wisconsin, [3]Rosalind Franklin University of Medicine and Science, [4]Wayne State University, [5]University of Maryland, [6]Cleveland Clinic – Alzheimer's disease (AD) pathology is thought to begin years before symptom onset. Hippocampal volume is sensitive to predicting conversion from MCI to AD. We and others have also shown that hippocampal volumes can predict future cognitive decline in cognitively intact older adults. The most sensitive methods for measuring hippocampal volumes are unknown. We compared two methods, automated FreeSurfer (FS) software versus manually traced (MT), to determine their relative sensitivity to distinguish future cognitive decline. Seventy-five cognitively intact elders underwent a baseline and 18-month follow-up neuropsychological testing. Participants were classified as Declining (n=27) or Stable (n=48) based on 18-month change scores on episodic list-learning task and general cognitive functioning scales. All subjects underwent baseline structural MRI scans. A two-way ANOVA (group X method) was conducted to determine the relative sensitivity of baseline MT and FS hippocampal volumes in distinguishing group membership. A significant Group X Method ($p=.045$) interaction was observed. Post-hoc analyses indicated that baseline MT hippocampal volumes were significantly smaller in the Declining relative to Stable group. In contrast, no group differences were observed using the automated FS method. Group differences were not enhanced by examining left versus right or anterior versus posterior hippocampal volumes. MT hippocampal volume was superior to FS in differentiating healthy older participants who subsequently developed cognitive decline from those who remained stable. These findings suggest that while manual tracings may be more labor intensive, they provide greater clinical utility than FS in identifying individuals at greatest risk for cognitive decline.