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MEDIAL TEMPORAL SCLEROSIS MODULATES THE NEURAL SIGNATURE OF EPISODIC MEMORY IN PATIENTS WITH TEMPORAL LOBE EPILEPSY

Marie St-Laurent[1,2,3], Morris Moscovitch[1,3], Mary Pat McAndrews[1,2]; [1]University of Toronto, Canada, [2]Toronto Western Research Institute and Krembil Neuroscience Center, Canada, [3]Rotman Research Institute, Toronto, Canada — Mesial temporal sclerosis (MTS) is commonly observed in individuals who suffer from medial temporal lobe epilepsy (mTLE). MTS affects the integrity of hippocampal tissue, a structure known to play a role in long-term memory; however, the mechanisms through which MTS affects memory are not well understood. Our goal was to assess how the presence of MTS modulates the neural correlates of memory tasks known to engage the hippocampus at retrieval. We tested individuals with right-lateralized TLE on a functional magnetic resonance imaging (fMRI) task in which individuals retrieved episodic memories with (autobiographical events) and without (laboratory events) personal relevance. We used FreeSurfer, an automated brain segmentation software, to quantify hippocampal volume asymmetry, which is a marker of MTS. Then, we conducted a multivariate analysis (Partial Least Squares) that assessed global patterns of brain activation correlating with MTS within our memory tasks. Greater right MTS was associated with poor modulation of task-relevant activity in the right hemisphere. Specifically, we observed reduced activation in several regions typically engaged during episodic memory retrieval (including the hippocampus, posterior cingulate cortex and angular gyrus) and reduced de-activation in regions typically 'turned down' during retrieval relative to our baseline condition (including the lingual gyrus and middle frontal gyrus). Further, greater atrophy correlated positively with magnitude of activation in left-lateralized regions typically engaged in retrieval such as the angular and inferior frontal gyri. Our results provide brain-wide neural mechanisms through which focal damage to the medial temporal lobe can disrupt the recollection of memory episodes.

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QUALITATIVELY DISTINCT MEMORY PROCESSES DURING THE COURSE OF AN EPISODIC RETRIEVAL TASK

Lucy Sykes[1], Lisa Evans[1], Damian Cruse[1], Edward Wilding[1]; [1]Cardiff University Brain Research Imaging Centre (CUBRIC), School of Psychology, Cardiff University — We investigated changes in neural activity over the course of a memory retrieval task, assuming that the demands placed on monitoring the contents of retrieval would increase as the numbers of stimuli to which memory judgments were required also increased. Participants first studied words in one of two colours. Studied and new words were then presented in a neutral colour. Event-related potentials (ERPs) were acquired while people made old/new and then study colour judgments to the test words. The differences between ERPs associated with correct judgments to new words (correct rejections) and correct colour judgments to old words were compared for the first and the second halves of the retrieval task. These ERP old/new effects differed qualitatively from approximately 1000ms post-stimulus, indicating that not entirely the same retrieval processes were operating in support of accurate memory judgments over the retrieval task. The absence of evidence for this change in another experiment where auditory rather than visual contexts were used at study suggests the outcome is not simply an effect of time on task. It is possible that the effects specific to the second half of the retrieval task index additional processes engaged as the demands placed on distinguishing between similar memory representations increase. Irrespective of the accuracy of this account, the findings indicate there are circumstances where making functional inferences about patterns of neural activity in brain imaging experiments based on data averaged over the entirety of retrieval tasks might lead to inaccurate functional characterisations.

PERCEPTION & ACTION: Audition

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NEURAL PLASTICITY OF AUDITORY-VOCAL INTEGRATION FOLLOWING SHORT-TERM PITCH TRAINING

Hanjun Liu[1], Zhaocong Chen[1], Francis Wong[2], Peng Liu[1], Dongfeng Huang[1]; [1]Department of Rehabilitation Medicine, The First Affiliated Hospital, Sun Yat-sen University, Guangzhou, P. R. China, 510080, [2]Department of Communication Sciences and Disorders, Northwestern University, Evanston, U.S.A., 60208 — Speech perception and production are tightly coupled, and both skills activate many overlapping regions of the brain. Neural mechanisms underlying auditory-vocal integration, however, are poorly understood. By examining the cortical responses to pitch errors in auditory feedback during vocalization following short-term pitch training, the present study was to address how perceptual learning of vocal pitch cues can alter the neural processing of auditory-vocal integration. Within a five-day perceptual training, native Mandarin-speaking adults learned to identify English pseudosyllables superimposed with five lexical pitch patterns of Thai language. At the time course of before, immediately after, and one week after training, both the experimental and the control subjects participated in a vocalization experiment, where they heard their voice pitch in auditory feedback shifted briefly and randomly during a sustained vocalization, and we measured the cortical responses to these pitch perturbations. Following training, the experimental subjects' perception to lexical pitch patterns was significantly improved as reflected by increased accuracy in differentiating the five lexical tones after training. Their cortical responses to pitch perturbation in voice auditory feedback were significantly larger after the pitch training than before training, and this training-induced enhancement even existed a week after the training. These findings demonstrate a neural plasticity in the auditory-vocal integration following perceptual speech learning, suggesting that our brain can effectively adjust the mechanisms underlying voice motor control as it gets exposed to dynamic changes in speech perception.

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WORKING MEMORY RELATES TO NEURAL TIMING IN OLDER ADULTS

Travis White-Schwoch[1], Samira Anderson[1], Alexandra Parbery-Clark[1], Nina Kraus[1]; [1]Northwestern University — Successful speech perception relies on the accurate neural encoding of sound. Delays in neural timing can account for a wide array of auditory processing deficits. One population at risk for these deficits is older adults; aging results in decreased neural synchrony, increased neural recovery time, and a reduction in inhibitory neurotransmitters —all important factors for precise neural encoding. What's more, cognitive abilities such as attention, working memory, and overall executive function decline with age. Here, we investigated the relationship between cognitive ability—specifically, auditory working memory—and neural precision in older adults. Subjects comprised a group of older adults (? 60 years old) with normal hearing who were tested on cognitive measures of auditory working memory and neural measures of speech encoding. Working memory related to neural timing, such that individuals with higher working memory capacities had earlier neural response timing. As such, these results suggest that the age-related declines in memory may be associated with deficits in temporal resolution. These findings contribute to our understanding of the cognitive and neural implications of aging and have consequences for potential remediation strategies. This work is supported by a NRSA Institutional Training Grant (T32 DC009399-01A10) and the NIH (R01 DC01510).

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THE EFFECT OF EEG ALPHA PHASE ON AUDITORY EVENT-RELATED POTENTIALS

Adam J. Culbreth[1], Molly A. Erickson[1], William P. Hetrick[1]; [1]Indiana University-Bloomington — Optimal stimulus encoding is dependent upon the nervous system's state of preparation. For instance, it has been shown that perception of simple stimuli, such as tones and lights, is dependent upon the phase of prestimulus alpha in the EEG at the