Title: The neurobiology of reading in deaf and hearing adults

Karen Emmorey

Recent neuroimaging and neurophysiological evidence has revealed how the reading system successfully adapts when phonological codes are relatively coarse-grained due to reduced or distorted auditory input. New evidence suggests that the optimal end-state for the reading system may differ for deaf versus hearing adults and indicates that certain neural patterns that are maladaptive for hearing readers may be beneficial for deaf readers. This talk focuses on deaf adults who have achieved reading success (e.g., they are matched in reading level with their hearing peers) and who use sign language in their everyday lives. Our recent work has shown that such deaf readers exhibit a more bilateral neural response to written words compared to hearing readers, as measured by evoked response potentials (ERPs; N170 component) and by functional magnetic resonance imaging (fMRI; rapid adaptation within the visual word form area, VWFA). Further, better deaf readers (but poorer hearing readers) exhibit a larger right hemisphere N170 response. Results from the rapid adaption fMRI paradigm indicate that while skilled deaf readers demonstrate coarsely tuned phonological representations in temporoparietal cortex (TPC), they develop finely tuned orthographic representations in the VWFA, suggesting that phonological tuning in the TPC may have little impact on the neural network associated with skilled reading for deaf adults. Finally, an ERP study assessing sensitivity to semantic and syntactic violations indicated that the more successful deaf readers exhibited a stronger neural response to semantic violations – the size of the N400 effect was significantly correlated with reading ability for the deaf – but not hearing – readers. In contrast, the more successful hearing readers exhibited a stronger brain response to syntactic (subject-verb agreement) violations – the size of the P600 effect correlated with reading ability for hearing, but not for deaf readers. Together these studies are beginning to illuminate the neurocognitive processes that are adopted by skilled deaf readers to decode and understand written text and suggest that the reading circuit may become differentially tuned in deaf readers.