

The neural substrates of contextual predictions in sentence comprehension

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Successful language comprehension may be achieved in two types of processes, the bottom-up lexical retrieval of the individual words that embedded in the sentences and the top-down semantic integration to build up contextual information for active prediction of the upcoming words. By manipulating the cloze probability of the ending words that embedded in the sentences, our recent event-related potential studies demonstrated the typical centro-posterior distributed predictability effect on N400 in young adults. However, the data from elders and aphasic patient tend to showed a frontal-shifted predictability effect on N400, especially for patients with server comprehension deficit. The frontal-shifted N400 seems to imply a greater reliance on frontal mechanisms for effortful semantic integration and contextual prediction. To further examine this hypothesis, we conducted a functional Magnetic Resonance imaging (fMRI) experiments which manipulated high versus low predictability of leading context and its completion. The fMRI data revealed that, LP sentences led to greater activations in left inferior frontal gyrus (IFG), middle temporal gyrus (MTG), angular gyrus, and posterior cingulate indicating that the LP sentences posted greater cognitive demand on the readers. By contrast, HP sentences led to greater activations in left inferior temporal gyrus (ITG), bilateral temporo-occipital visual cortex that is implicated in orthographic processing, and in insula and IPL that are related for rule extraction and computation. Furthermore, that LP target words, as compared with the HP words, showed greater activations in bilateral IFG, left STG, MTG, angular gyrus, supramarginal gyrus and SPL. Together, these data demonstrated the neural substrates of predictive processes in sentence comprehension and support the dual-mechanism for effortful and automatic semantic processes.