

The Prefrontal-Parietal Dissociation During Episodic Memory Retrieval

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ACT-R (Anderson et al., 2003) relates the prefrontal cortex (PFC) to a retrieval buffer that holds information retrieved from memory and the posterior parietal cortex (PPC) to an imaginal buffer that holds problem representations. Because encoding and updating the problem representation is not necessarily correlated with retrieval difficulties, it is possible to dissociate PFC-PPC activations. In two fMRI studies, we examined the PFC-PPC distinction using the fan effect paradigm. Experiment 1 compared the recognition task, in which representation requirement remains the same regardless of retrieval difficulty, was compared with the recall task, in which both representation and retrieval loads increase with retrieval difficulty. In the recognition task, the PFC activity revealed the fan effect but not the PPC activity. In the recall task, both regions revealed fan effects. In Experiment 2, we compared visual representation and auditory representation. Both PFC and PPC regions showed essentially the same activation patterns with visual and auditory stimulus. These results further provide supporting evidence for the fronto-parietal dissociation along the retrieval-imaginal buffers. We also provide a computation model that predicts patterns of BOLD functions in these two areas during recognition and recall.