Further fMRI-Based Studies of Memory and Inhibition in Prefrontal Cortex of Adults.

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Abstract:
To test among hypotheses of prefrontal function, we have developed a collection of tasks that permits various cognitive demands (e.g. memory, response inhibition) to be independently varied. Tasks were of comparable difficulty, as indicated by response times and accuracy for both children and adults. Last year we reported on the first of these tasks. A target appeared to the left or right of a fixation point; subjects pushed a button on the same or opposite side of the target depending upon the target's identity. This task, which required both the inhibition of a prepotent response (always pushing on the same side as the target) and the need to remember arbitrary response rules (same or opposite sides) yielded clear dorsolateral prefrontal cortex (DLPFC; Brodmann Areas 9/46) activation. Now we report on new tasks that vary memory and inhibition requirements. When memory load is reduced (by using arrows to indicate where the subject should respond, instead of memorized rules), DLPFC shows little or no activation. When memory load is increased (by increasing the number of memorized rules) DLPFC activation is still found, whether or not a spatially prepotent response must be inhibited (by varying the location of the targets).