

THE NEURAL SUBSTRATE OF REASONING: AN fMRI STUDY

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Abstract

OBJECTIVE: This was a functional magnetic resonance imaging (fMRI) study aimed at providing insight into the neural substrate of human reasoning ability.

MATERIAL-METHOD: We scanned 15 subjects with fMRI, using an event-related design, while they engaged in reasoning tasks based on arguments, which were either valid statements (Aristotelian) or paradoxes. Participants were required to draw a logical conclusion concerning the accuracy of the valid syllogisms or the paradoxes. In the current study, we compared the reasoning tasks with an additional task (control task), in which the subjects had to examine the correctness of the spelling of several arguments. **RESULTS:** Clusters of significant activation for deductive reasoning were located in left middle frontal gyrus and bilateral posterior parietal cortex. Clusters of significant activation for paradoxes were located in left inferior frontal gyrus, inferior temporal gyrus and bilateral superior frontal gyrus. What's more, compared to the reasoning tasks, the control task resulted in significantly greater activation of clusters in the right supramarginal gyrus and bilateral middle frontal gyrus.

CONCLUSIONS: These results indicate that deductive reasoning mainly engages a left lateralized fronto-parietal brain system, whereas paradoxes engages a left fronto-temporal brain system. Our findings are consistent with previous studies and provide additional insight into the neural substrates of deductive reasoning.