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Inferior frontal gyrus involvement during search and solution in verbal creative problem solving: A parametric fMRI study

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Abstract

In verbal creative problems like compound remote associates (CRAs), the solution is semantically distant and there is no predefined path to the solution. Therefore, people first search through the space of possible solutions before retrieving the correct semantic content by extending their search space. We assume that search and solution are both part of a semantic control process which involves the inferior frontal gyrus (IFG). Furthermore, the degree of the IFG involvement depends on how much the search space needs to be extended, i.e. how semantically distant the solution is. To demonstrate this, we created a modified CRA paradigm which systematically modulates the semantic distance from the first target word to the solution via priming. We show that brain areas (left inferior frontal gyrus and middle temporal gyrus) associated with semantic control are already recruited during search. In addition, we found a linear correlation between the BOLD activation of the IFG (pars orbitalis and triangularis) and the search space extension. However, this linear relationship could only be observed during and shortly before the correct solution but not during search. We discuss the role of the IFG in accessing semantically distant information during verbal creative problem solving.