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Restructuring problem-related semantic associations promotes solving success

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Abstract

While problem-solving is central in our daily life, its underlying mechanisms remain elusive. The dominant theory states that one must restructure a problem (i.e., reorganize problem-related representations) to solve it. As empirical evidence supporting this mechanism is scarce, we used network science methodology to demonstrate the key role of restructuring in problem-solving. Individual semantic memory networks were estimated before and after participants attempted to solve a riddle. These networks represent the organization of solution-relevant and irrelevant words as nodes, with edges representing the strength of the relationship between them based on the participants' relatedness judgments. Restructuring was quantified as the difference in semantic network metrics between pre- and post-solving phases. Successful problem-solving was predicted by local semantic network restructuring, only in edges and nodes assessed as helpful to solve the riddle. These results shed new light on the mental restructuring in problem-solving and provide a new method to quantify it.