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Brain Connectivity-Based Prediction of Semantic Network Properties Related to Creativity

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Abstract

The associative theory of creativity proposes that creative ability relies on the organization of semantic memory, yet the relationships between semantic memory structure and brain connectivity, in relation to creativity, remain poorly understood. Here, we explored the relationships between the network properties of individual semantic memory, patterns of functional brain connectivity, and real-life creativity. To this end, we acquired functional magnetic resonance imaging data while participants underwent a semantic relatedness judgment task. Participants' relatedness ratings between word-pairs were used to estimate their individual semantic networks, whose network properties were significantly related to their real-life creativity. Using a connectome-based predictive modeling approach, we identified patterns of on-task functional connectivity that predicted creativity-related semantic memory network properties in novel individuals. Furthermore, the predicted semantic network properties partially mediated the relationship between functional connectivity and real-life creativity. These results provide new insights on how brain connectivity supports the associative mechanisms of creativity.