

Examining Prefrontal Cortex Contributions to Creative Problem Solving With Noninvasive Electric Brain Stimulation

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Abstract

Cognitive neuroscience studies of creativity typically employ divergent thinking tasks that prioritize bottom-up processes to generate novel responses. However, real-world creative problem solving is guided by top-down thinking that puts an emphasis on the goal to be achieved. Here, we introduce the Alternative Objects Task (AOT) a novel task that incorporates both bottom-up and top-down thought during problem solving. Guided by functional neuroimaging findings, we employed transcranial direct current stimulation (tDCS) over frontopolar cortex to investigate causally the impact of transient changes in activity in this region for problem solving performance on the AOT. Participants were presented with a series of goals and generated either a common or an uncommon object that could satisfy each, while undergoing either excitatory (anodal) or sham tDCS. Analyses of accuracy, reaction times, and semantic distance highlight the importance of goal-orientation during creative problem solving and its reliance on prefrontal cortex.