Modulating serial biases in spatial working memory with transcranial magnetic stimulation in inter-trial intervals

Rebecca Martinez, IDIBAPS
E-mail address: beccam724@gmail.com.

Working memory is a cornerstone of cognition, accounting for our ability to maintain stable representations of stimulus properties across noise-induced temporal and spatial changes. An emerging body of evidence suggests that our mental representations of spatial cues are systematically biased towards previous information in a spatial working memory task. Modeling studies have suggested that this may be mediated by activity-dependent subthreshold mechanisms that maintain stimulus information between trials of the task. This information may thus still be accessible despite having ceased to be maintained at a neuronal spiking level. Indeed, previous studies show that memories that are not detected in electrophysiological activity can be reactivated through use of a non-specific external input such as targeted transcranial magnetic stimulation. Here, we use single-pulse transcranial magnetic stimulation to investigate the validity of current computational models of serial biases in spatial working memory. The study will examine the effect of external input during the intertrial interval of a spatial working memory task on the serial biases observed in behavioral responses. According to computational models, unspecific external input prior to the memory cue should reactivate previous memories from synaptic traces and increase their impact on the newly memorized item, thus increasing serial biases. Our study examines serial bias through a randomized trial delayed response task where participants report with a mouse click the location of a briefly displayed dot following a short delay interval (1 s). Due to the critical role played by the dorsolateral prefrontal cortex and posterior parietal cortex in spatial working memory, we counterbalance blocks with a single TMS pulse specifically targeted to these locations. Inspired by the computational model, we hypothesize that during trials involving TMS, participants will exhibit a heightened serial bias compared to controls.

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