Temporal Binding Across Timing Domains: Behavioral Evidence and a Protocol for Causal Manipulation via Transcranial Direct Current Stimulation

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Abstract

This project investigates temporal binding as a probe of distinct temporal abilities underlying event timing and interval timing. In a behavioral experiment, participants completed four temporal binding tasks under causal and non-causal conditions across multiple action-effect intervals and repeated sessions. Robust and reliable binding effects were consistently observed in event-timing paradigms, particularly the Libet Clock and Response Mapping tasks, whereas interval-timing tasks showed weaker and interval-dependent effects. These results support a functional dissociation between mechanisms supporting temporal localization of events and duration estimation or reproduction. In the second experiment, the causal role of the left angular gyrus was examined using anodal transcranial direct current stimulation in a double-blind within-subject design. Preliminary analyses indicate that stimulation modulates temporal binding in a task- and interval-dependent manner, with clearer effects in interval-based judgments and limited modulation in event-timing tasks. Together, these findings suggest partially dissociable neural substrates for temporal binding across timing domains.

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