

Phonological Control and Episodic Encoding: Single-pulse TMS to Ventrolateral Prefrontal Cortex impacts Subsequent Memory

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Phonological (articulatory) control processes, which are partially subserved by the posterior extent of left inferior prefrontal cortex (pLIPC), are thought to impact the formation of long-term memory traces during the assembly of phonological representations from orthographic inputs. A prior fMRI study revealed that the magnitude of pLIPC activation during the encoding of novel and familiar words predicted whether the words would be later remembered or forgotten (Clark & Wagner, 2003). In the current study, we used single-pulse transcranial magnetic stimulation (spTMS) to assess the necessity of pLIPC for episodic encoding. At encoding, subjects made syllable judgments about visually presented familiar (English) and novel (pseudo-English) words. Guided by our fMRI results, spTMS was applied using frameless stereotaxy to pLIPC or its right hemispheric homologue (pRIPC) at various post-stimulus onset times (250ms – 600ms). A surprise recognition memory test for the studied words was administered following encoding and a 10-min retention interval. Behavioral data from the syllable judgment task and from the subsequent memory test revealed (a) reaction time slowing during encoding that was dependent on stimulation site and timing, and (b) facilitated subsequent memory for familiar words when stimulation was applied to pLIPC, but not pRIPC, from 300-400 post-stimulus onset. These results indicate that phonological control plays a necessary role during episodic encoding.

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