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The Application of Navigated TMS in Speech and Language Studies

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Abstract

Non-invasive transcranial magnetic stimulation (nTMS) has emerged as a valuable tool in speech and language research, offering a unique method for defining the individualized localization of language in the human brain. By applying magnetic pulses to specific cortical areas, nTMS modulates neural activity, enabling researchers to map speech and language functions with high spatial resolution. Studies have demonstrated that nTMS can outperform functional MRI (fMRI) in certain contexts, providing more reliable insights into brain-behavior relationships. As such, nTMS has become a critical tool for multiple applications, including but not limited to presurgical mapping, radiological treatment planning, rehabilitation, and neurocognitive research. While nTMS holds significant promise, challenges remain in establishing study designs with uniformly high specificity of defined areas. Nonetheless, the growing body of research highlights the potential of nTMS to advance our understanding of the neural mechanisms underlying speech and language and to offer novel avenues for exploring their neuroanatomical organization. Further studies are needed to refine and expand its clinical applications.

Keywords: Transcranial magnetic stimulation (nTMS), Language mapping, Neural mechanisms of speech

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