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Network-wise transcranial alternating current stimulation with phase lags

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Abstract

Transcranial alternating current stimulation (tACS) is an efficient neuromodulation technique to enhance cognitive function in a non-invasive manner. Using electroencephalography and functional magnetic resonance imaging, it was investigated whether a tACS with different phase lags between central executive and default mode networks modulated cognitive performance in perception, working memory, and inhibitory control. It was found that phase-lag-dependent tACS mediated improvement in task performance, neurodynamically reflected in task-relevant cortical and subcortical activation as well as prefrontal-based top-down functional connectivity. Our observations provide neurophysiological correlates of network-wise tACS-phase-dependent neuromodulation and a feasible non-invasive approach to effectively modulate fundamental cognitive functions.