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Central theta amplitude as a negative correlate of performance proficiency in a dynamic visuospatial task

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Highlights:

- Theta band enhancements are detrimental for dynamic visuomotor task performance.
- Fluid visuomotor performance is better guided by bottom-up than top-down attention.
- Dynamic task proficiency is related to a reduction in cognitive control.
- Task-related theta amplitude could serve as an invert index of task automatization.

Abstract

Dynamic visuospatial tasks, requiring continuous engagement of attention over long time periods, have been little studied with the electroencephalogram. Specifically, the role of the theta band in these tasks is unclear, with task-related theta enhancements improving performance in some studies, and hindering it in others. In this study, 30 participants performed the Pong videogame as a dynamic visuospatial task to analyze the influence of theta and alpha amplitude as well as alpha asymmetry on performance. The theta band increased significantly at central-parietal regions and correlated negatively with performance, especially at anterior regions. The alpha band showed a significant decrease, greater at right over left parietal regions, but neither the amplitude nor the asymmetry ratio