User Research

Using a combined ERP/TMS protocol to investigate cortico-cortical interactions in attention

by Martin Eimer, School of Psychology, Birkbeck College, University of London, UK

It is generally acknowledged that the aim of cognitive neuroscience to identify the neural basis of cognitive functions in the human brain cannot be achieved on the basis of a single method. Developing joint-method approaches where different measurement techniques with complementary strengths are combined has therefore become a major focus in neuroscience. Transcranial magnetic stimulation (TMS) and EEG/ERP are ideal candidates to be combined in investigations of the temporal and functional organisation of cognitive processes. TMS can be used to selectively disrupt circumscribed cortical areas with high spatial as well as temporal precision, and ERPs can be employed as on-line measures of the effects of this disruption at different processing stages, and within brain regions that are anatomically remote from the area disrupted by TMS. Previous combined TMS/ERP studies (1) were primarily concerned with technical and methodological issues, and in particular with the massive EEG artefact that is inevitably induced by TMS. This artefact, which contaminates EEG/ERP measures, and can result in amplifier saturation, is especially problematic when using experimental protocols with interleaved TMS-EEG/ERP recordings (e.g., when single-pulse TMS is applied in close temporal vicinity of sensory events in order to study the impact of TMS on evoked components). While it is possible to use purpose-built EEG amplifiers and ‘blocking’ procedures to prevent saturation, this approach can lead to the loss of EEG data within critical time windows, and induce other problems such as DC baseline shifts.

We have recently demonstrated that the use of such blocking procedures is not required when using BrainAmps DC amplifiers in an interleaved TMS/ERP protocol (2). We studied the neural basis of visual attention in a visual search task where single-pulse TMS was delivered over right posterior parietal cortex (vertex). Our study suggests that right parietal TMS can interfere with attentional selectivity in remote visual areas, and also demonstrates how TMS and EEG can be combined in the study of cognitive functions.

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by Alexander Svojanovsky, General Manager

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by Alexander Svojanovsky, General Manager

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