THE INFLUENCE OF CORTICAL ALPHA OSCILLATORY ACTIVITY ON MOTOR CORTICAL EXCITABILITY AND PLASTICITY INDUCTION

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Introduction: Alpha oscillations (8-12 Hz) might reflect bouts of cortical inhibition. If inhibitory tone is reduced during particular phases of the oscillation, then phase-dependent application of plasticity-inducing protocols, such as theta-burst stimulation (TBS), might lead to less variable, longer-lasting plasticity responses. We have previously shown that motor evoked potentials (MEPs), evoked by single-pulse transcranial magnetic stimulation (TMS), are larger during the down-going than the up-going phase of the endogenous alpha oscillation. Technical difficulties prevent the application of TBS on different phases of the endogenous alpha oscillation, therefore, we used transcranial alternating current stimulation (tACS) to *entrain* the alpha oscillation and applied continuous TBS (cTBS) on the down- and up-going phases of the applied alternating current. **Methods**: tACS (10 Hz sinusoidal) and cTBS were applied simultaneously for 40-seconds, with cTBS bursts triggered on either the down-going or up-going phase of the applied alternating current. MEPs were recorded at baseline and several time-points following tACS-cTBS application. **Results**: Repeated-measures ANOVA showed no significant interaction between phase and time suggesting that application of cTBS on the down-going and up-going phases of the applied alternating current did not differentially affect plasticity responses to cTBS. **Conclusion**: This finding suggests that application of plasticity-inducing protocols on different phases of an entrained alpha oscillation does not lead to less variable plasticity responses. It is possible that [1] 40-seconds of tACS is not sufficient to entrain the alpha oscillation or [2] bouts of cortical inhibition evident with endogenous alpha oscillations are not evident in tACS-entrained oscillations.