Reproducibility of neuroplastic responses induced by continuous theta-burst stimulation.

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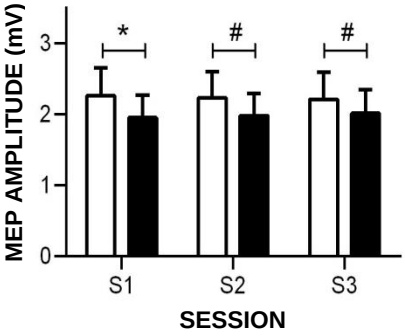
Introduction: The therapeutic potential of non-invasive brain stimulation (NIBS) is dependent on the development of protocols that induce robust and functionally relevant cortical changes that outlast the period of stimulation. A current limiting factor of NIBS is intra- and inter-subject variability in NIBS-induced neuroplastic responses. At present, there are very little data on intra-subject reliability of continuous theta-burst stimulation (cTBS)-induced neuroplastic responses.

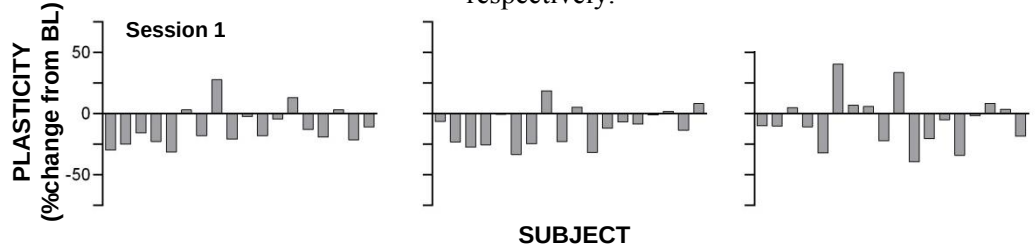
Methods: To investigate the reproducibility of neuroplastic responses induced by cTBS, motor evoked potential (MEP) input-output (IO) curves were obtained before and after cTBS in three separate experimental sessions.

Results: First, significant MEP suppression was observed following cTBS at the upper end of the IO curve (150-180% resting motor threshold; RMT). At 150% RMT, significant MEP suppression and strong relationships between neuroplastic responses were observed across experimental sessions.



Left: Raw MEP amplitudes probed at 150% RMT before (open) and after (filled) cTBS in each of the three sessions. * and # denote statistical significance at $P < .012$ and $P < .05$ respectively.

Bottom: Subject response variability to cTBS probed 150% RMT in each of the three sessions. Data represent mean percentage change of post-cTBS MEP amplitudes from baseline, with positive and negative values indicating an increase and decrease in MEP amplitudes following cTBS respectively.



Second, a significant linear relationship was evident between cTBS-induced MEP suppression (probed at an intensity that evoked MEPs ~50% of the maximal MEP) and the interval between experimental sessions.

Discussion: The current study provides the first comprehensive investigation of the between session reproducibility of cTBS-induced neuroplastic responses. Results suggest that 150% RMT is the most reliable TMS intensity to probe cTBS-induced neuroplastic responses and provide some evidence to suggest that short intervals between experimental sessions administering NIBS protocols is associated with increased NIBS-induced plasticity responses.