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COMPARISON OF THE HEART-BRAIN COUPLING PARADIGM BETWEEN THE DORSOMEDIAL AND DORSOLATERAL PREFRONTAL CORTICES AND EVALUATION OF ITS ASSOCIATION WITH RESPONSE TO ACCELERATED ITBS TREATMENT TARGETING THE DORSOMEDIAL PREFRONTAL CORTEX

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BACKGROUND AND AIM: Precise coil positioning is critical for optimal TMS efficacy. While MRI-guided neuronavigation is effective, its high cost limits widespread clinical use. Heart-Brain Coupling (HBC), based on heart rate deceleration during stimulation, has been proposed as a biomarker for accurate targeting, specifically relying on the connectivity between the DLPFC and the subgenual anterior cingulate cortex (sgACC). We aimed to investigate HBC in the DMPFC, hypothesizing that DMPFC—due to stronger anatomical connectivity with the ACC—would exhibit higher HBC values than the DLPFC and that these values would predict treatment response.

METHODS: (Ethics Committee Approval must be obtained and the number should be specified). Thirty patients with treatment-resistant major depression were recruited. HBC was measured using a Polar H10 heart rate monitor and the HeartBrainConnect app at four sites: left/right DMPFC and left/right DLPFC. Patients underwent an accelerated iTBS protocol targeting the bilateral DMPFC (600 pulses left, 600 right per session; 4 sessions/day). Response was defined as a ≥50% reduction in HAMD-17 scores after 20–30 sessions. The study protocol was approved by the Clinical Research Ethics Committee of Istanbul University–Cerrahpaşa (Approval No: E-83045809-604.01-1014334, June 12, 2024).

RESULTS: 19 patients responded to treatment, while 11 were non-responders. HBC values were significantly higher in the Left DMPFC compared to the Left DLPFC (t(df)=29(2.76), p=0.01) and in the Right DMPFC compared to the Right DLPFC (t(df)=29(2.17), p=0.038). However, no significant correlation was found between HBC values and HAMD-17 reduction. Furthermore, ROC analysis revealed that HBC values failed to distinguish responders from non-responders (AUC = 0.575, p = 0.509).

CONCLUSIONS: This study confirms that the DMPFC exhibits stronger heart-brain coupling than the DLPFC, reflecting its robust anatomical and functional connectivity with autonomic control networks. However, despite its physiological relevance, HBC did not serve as a predictive biomarker for clinical response to accelerated iTBS in this cohort. Future studies might investigate whether dynamic changes in HBC during treatment offer better predictive value.

Keywords: DMPFC, DLPFC, Heart Brain Coupling, iTBS, TMS