



BARCELONA Brain Health Initiative INSTITUT GUTTMANN

Paired-Pulse Transcranial Magnetic Stimulation as a Biomarker for Transcranial Direct Current Stimulation Treatment Efficacy in Fibromyalgia and Other Central Sensitivity Syndromes

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Central sensitivity syndromes (CSS) are an intricate challenge in clinical management. Transcranial direct current stimulation (tDCS) is a potential adjunct for treating fibromyalgia (FM) syndrome, and other Chronic Pain Syndromes (CPS). The pursuit of biomarkers for diagnosing and objectively assessing neurophysiological characteristics, and posttreatment outcomes is important due to their elevated prevalence. The pulse-paired transcranial magnetic stimulation (ppTMS) paradigm is used to evaluate cortical excitability (CE), delving into its excitatory and inhibitory phenomena. These parameters might reflect intracortical and cortico-subcortical dynamics in chronic pain patients.

Objectives

- Evaluate the effectiveness of ppTMS as a pre-post-treatment analytical tool.
- Describe basal CE differences in all patient groups.
- Characterize changes in CE (SICI, ICF, LICI) within distinct patient groups and subgroups: CSS and other CPS, FM and other CSS, FM with other CSS and CPS, following tDCS.

Material and Methods

We conducted a retrospective, analytical, interventional study involving seventeen patients, evaluating universal, treatment, and CE variables (SICI, ICF & LICI) through ppTMS before-after tDCS treatment. ppTMS: Bilateral M1 stimulation, two continuous pulses, 80% & 120% RMT 3ms & 12ms intervals, and 120% RMT at an interval of 100ms. tDCS: Anode at C3 or C4, cathode at Fp2 or Fp1, intensity 2mA, return 100%, 1 daily session, 10 sessions, 20-30 min.

Table 1. Cortical Excitatory & Inhibitory Variables

3ms = SICI (short-interval intracortical inhibition) (GABA-A)

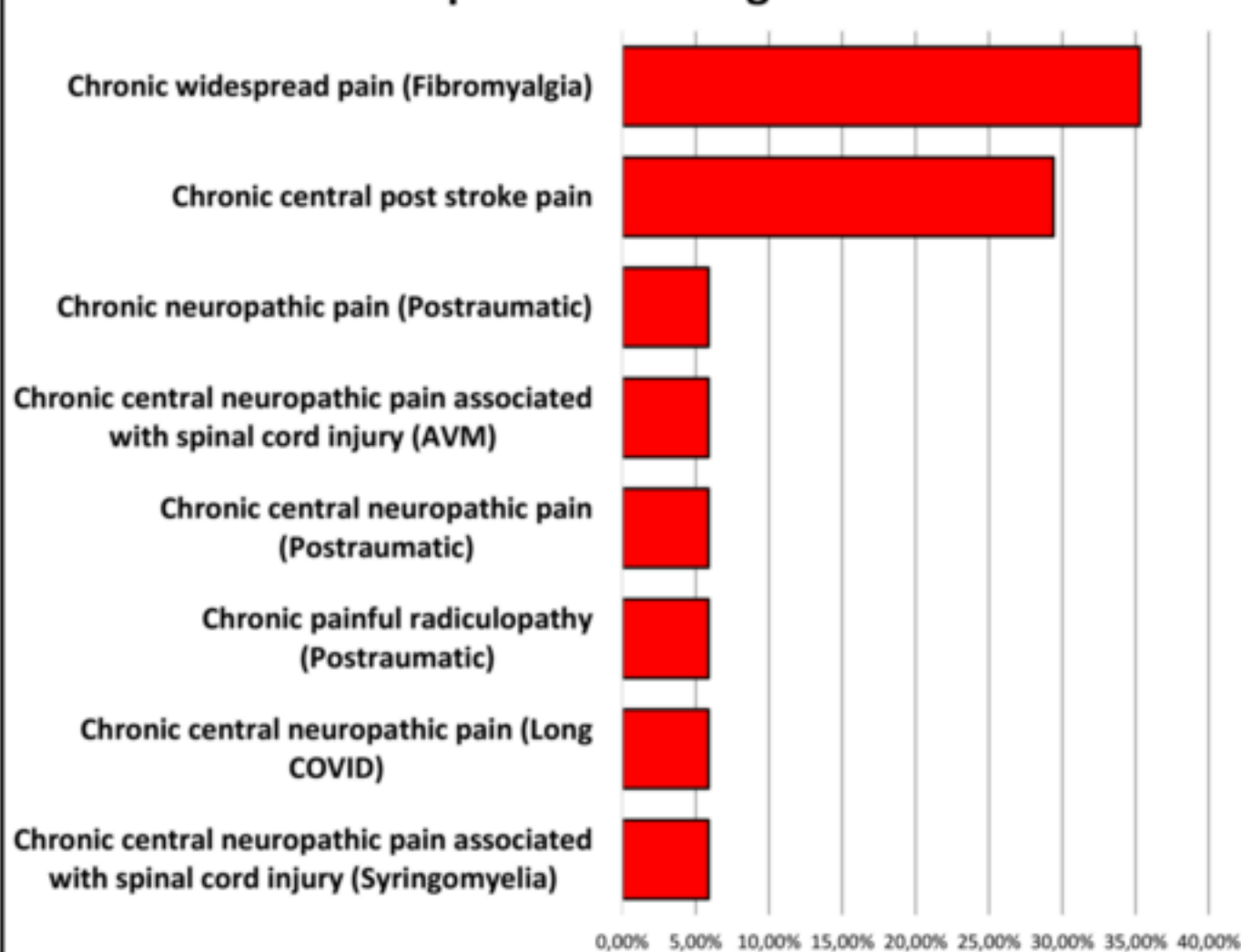
12ms = ICF (intracortical facilitation) (Glutamate)

100ms = LICI (long-interval intracortical inhibition) (GABA-B)

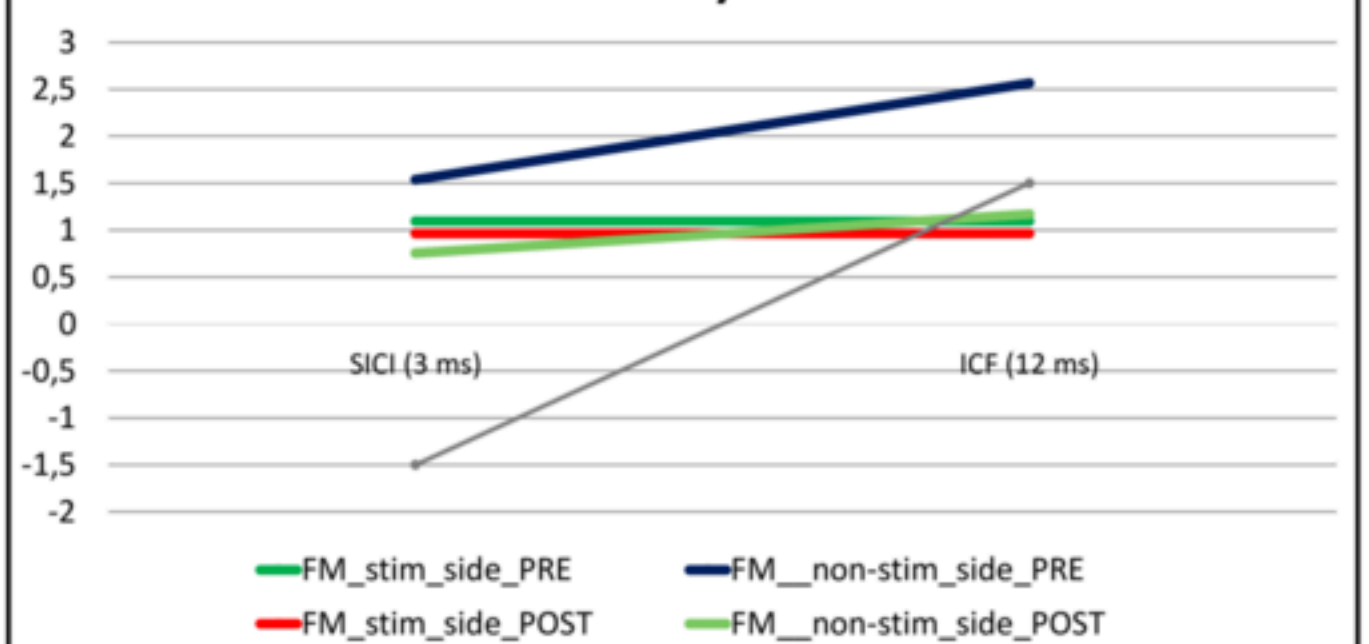
Age: 50,35 years (±3,91)

♀: 70,6% ♂: 29,4%

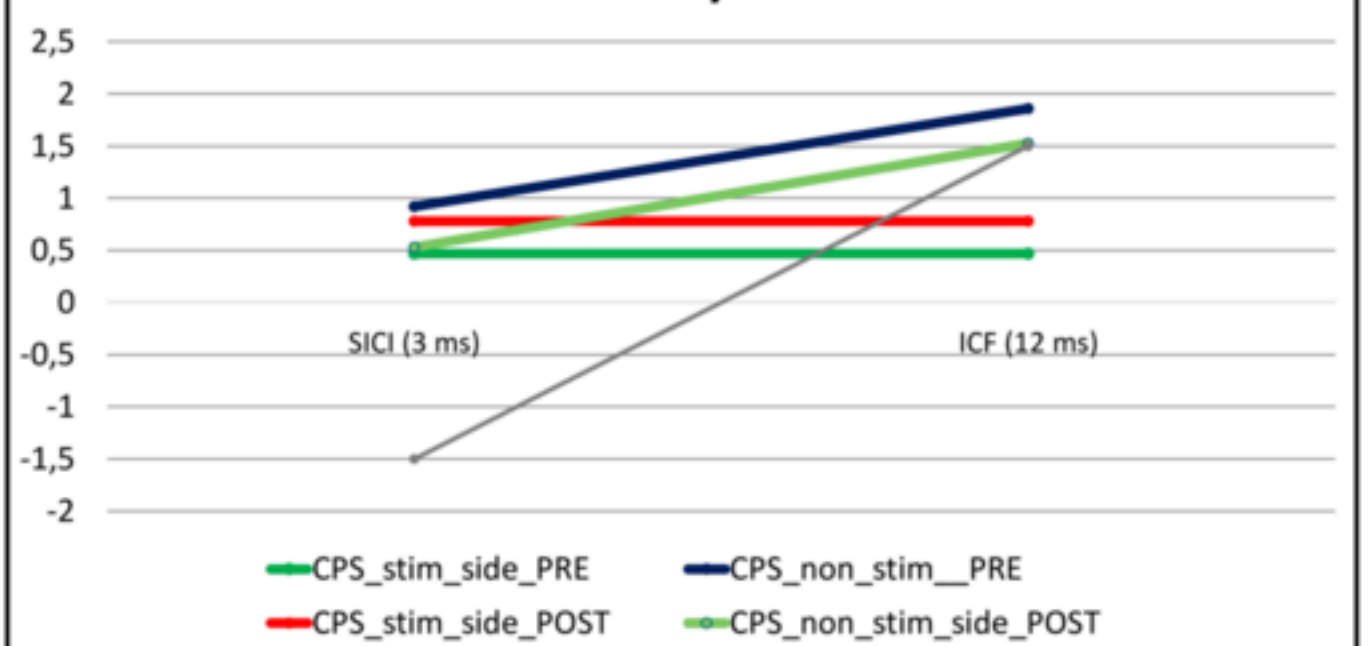
Graph 1. Main Diagnoses



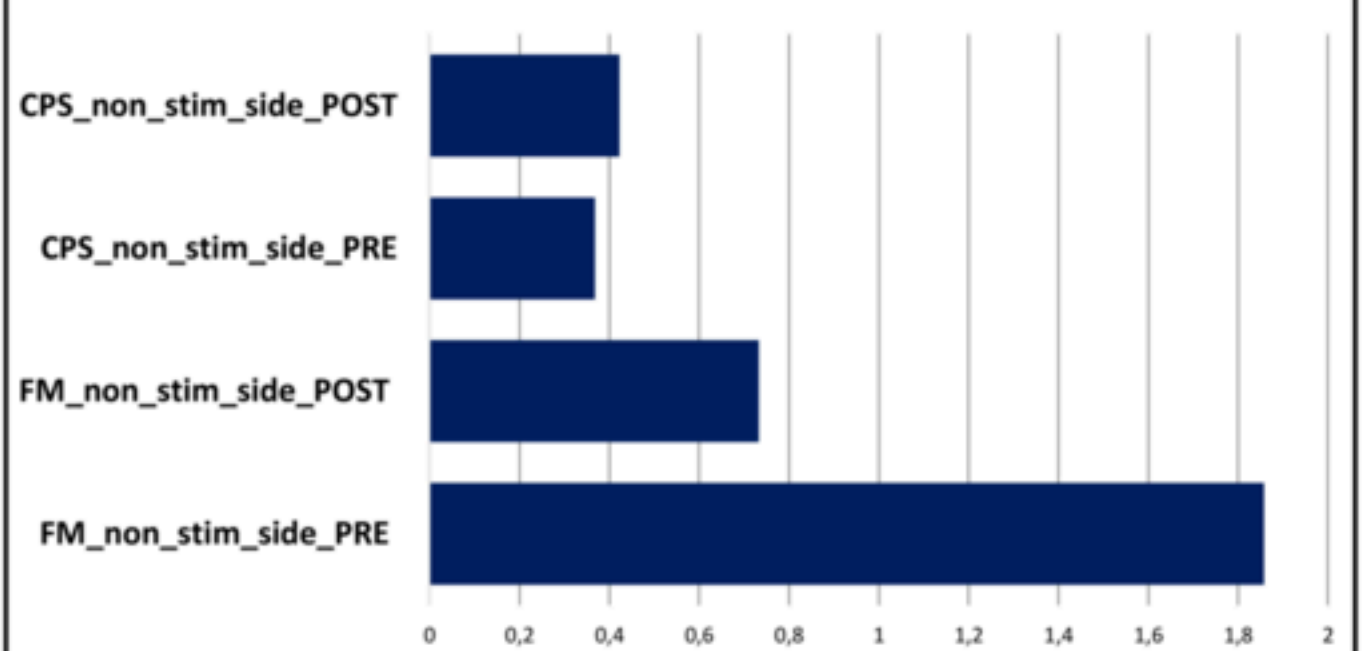
Graph 2. PRE-POST Treatment Cortical Excitability in FM



Graph 3. PRE-POST Treatment Cortical Excitability in CPS



Graph 4. Long-Interval Intracortical Inhibition in FM & CPS



Conclusions

Pretreatment variations in SICI, ICF and LICI were observed in all chronic pain patients, indicating a consistent deficit in all and across patient groups, more evidently in FM patients. These CE alterations align with the dysregulation of cortical excitability and pain inhibitory mechanisms in chronic pain syndromes. Differences between fibromyalgia and CPS are noteworthy. These results suggest that CSS and CPS are mediated by a deficit of inhibitory mechanisms, mainly in GABA (B) mediated functions. ppTMS emerges as a potential diagnostic and treatment response assessment tool, reflecting cortico-subcortical dynamics in chronic pain patients a which could be applied as a complementary biomarker for diagnosis and treatment response.

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