Modulation of Neuroplasticity and Cortical Excitability in Patients with Treatment Resistant Depression

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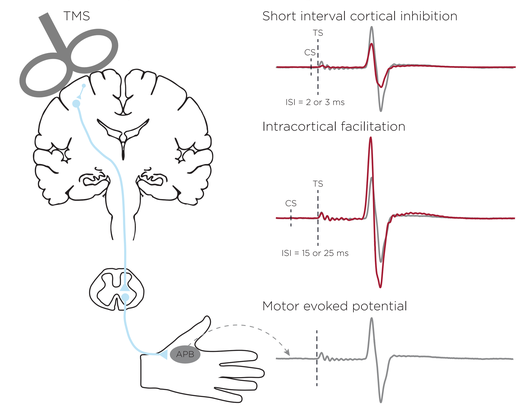
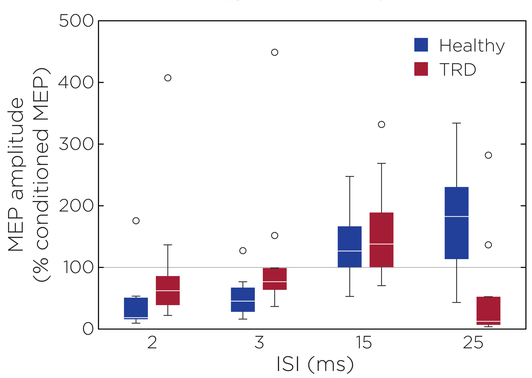
Methodological Question

- Cortical inhibitory mechanisms, especially associated with the dysregulation of GABA-ergic system, has been purported to play a role in pathophysiology of MDD
- This study aimed at assessing cortical excitability and plasticity associated with treatment resistant depression, using transcranial magnetic stimulation (TMS) combined with motor evoked potential (MEP) and electroencephalographic (EEG) recordings

Paired-Pulse TMS

- Short interval cortical inhibition ($GABA_A$-dependent)
- Intracortical facilitation (glutamate dependent)
- Significant group-by-ISI nteraction effect ($p < .05$): at 25 ms ISI, there was a significant reduction in MEP amplitude for TRD compared to controls ($p < .05$)



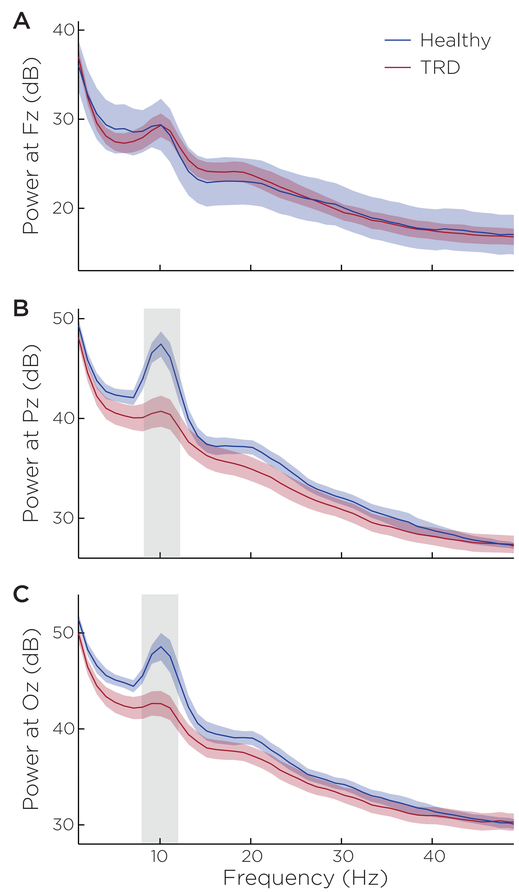


Patients

- 10 TRD patients (7♀), met DSM-IV criteria for a major depressive episode, baseline IDS-C30 ≥ 34, and at least two failed antidepressant medication trial
- 9 age-matched controls (5♀)

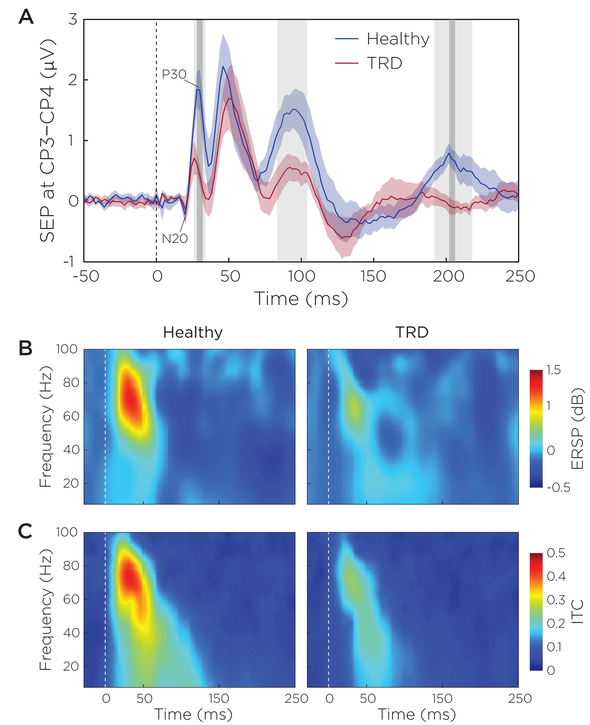
Resting EEG

- Resting, eyes-opened for 5 minutes
- Significant suppression of alpha power in TRD relative to controls at parietal and occipital sites ($p < .05$), but not in frontal cortex



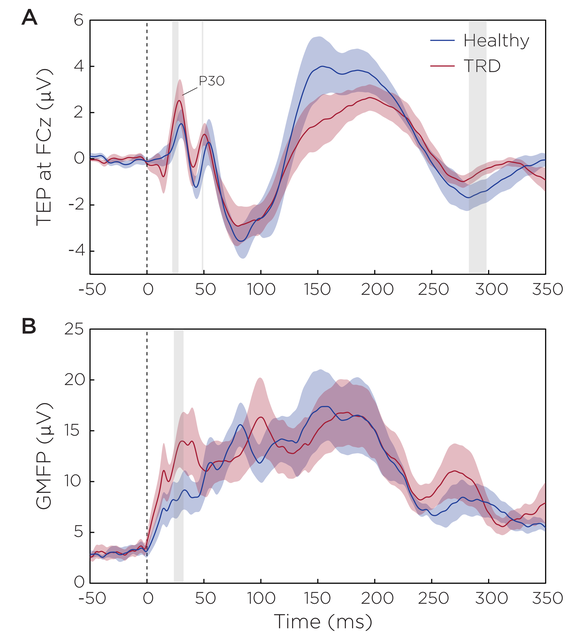
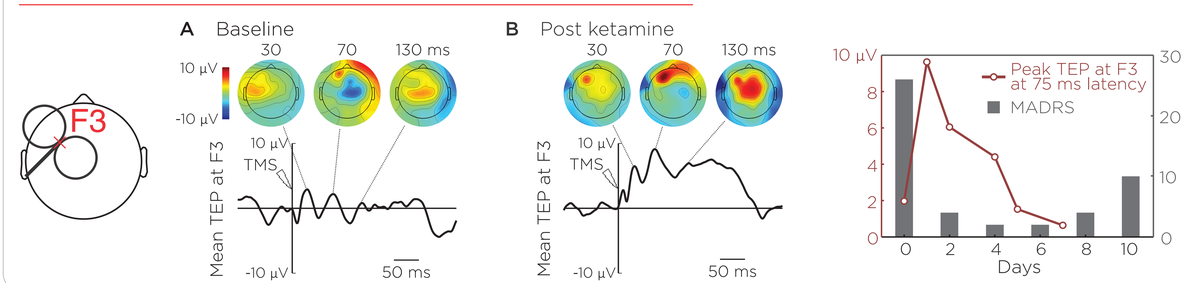
Somatosensory Evoked Potential

- EEG at CP3–CP4 recorded while subject receives electrical stim of right median nerve at 3× sensory threshold
- Suppression of P30 component for TRD relative to healthy controls ($p < .05$)



TMS Evoked Potential

- EEG recorded while TMS was delivered to dorsal lateral prefrontal cortex (F3)
- TMS artifacts removed using two rounds of ICA
- Elevation of P30 for TRD relative to controls ($p < .05$) at FCz (average reference) and in Global Mean Field Power



Sneak Peek at Preliminary Ketamine Treatment Data (N = 1)