Phase of ongoing brain oscillation is a source of variability in TMS-EEG signal
Mohsen Poorganji; Reza Zomorrodi; Aiyush Bansal; Colin Hawco; Aron T. Hill; Itay Hadas; Tarek K. Rajji; Robert Chen; Daphne Voineskos; Daniel M. Blumberger; Zafiris J. Daskalakis

Background
The cortical response to transcranial magnetic stimulation (TMS) has notable inter-trial variability.

Objective
We investigate the effect of phase of ongoing brain oscillations before the TMS pulse on the TMS induced potential (TIP) for every individual trial in two separate populations, namely healthy participants and patients with MDD.

Hypothesis
different phases of the EEG signal over the delta, theta, alpha, and beta frequency bands 3ms before the TMS pulse will induce significantly different TIP amplitudes.

Method
100 Single Pulse over Left-DLPFC
35 Healthy Participants; 33 MDD patients

Results

HC
MDD

Positive Peak
Negative Peak
90°
270°
Random

Conclusion
Aligning the TMS pulse with a specific phase of EEG might reduce variability in the neurophysiological measurement, and subsequently can produce more robust long lasting plastic changes and increase efficacy after neuro-modulatory treatment.

Coming soon
Isolating somatosensory and auditory artifacts in TMS-EEG signal (in preparation).
Isolating auditory artifacts in TMS-EEG signal (in press).
Testing the current findings in an online setting.

Reference
https://www.magstim.com
https://compumedicsneuroscan.com
https://doi.org/10.1007/978-3-030-21293-3_1 (Saturnino et al., 2019)