

Phase of ongoing brain oscillation is a source of variability in TMS-EEG signal

Mohsen Poorganji; Reza Zomorodi; 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

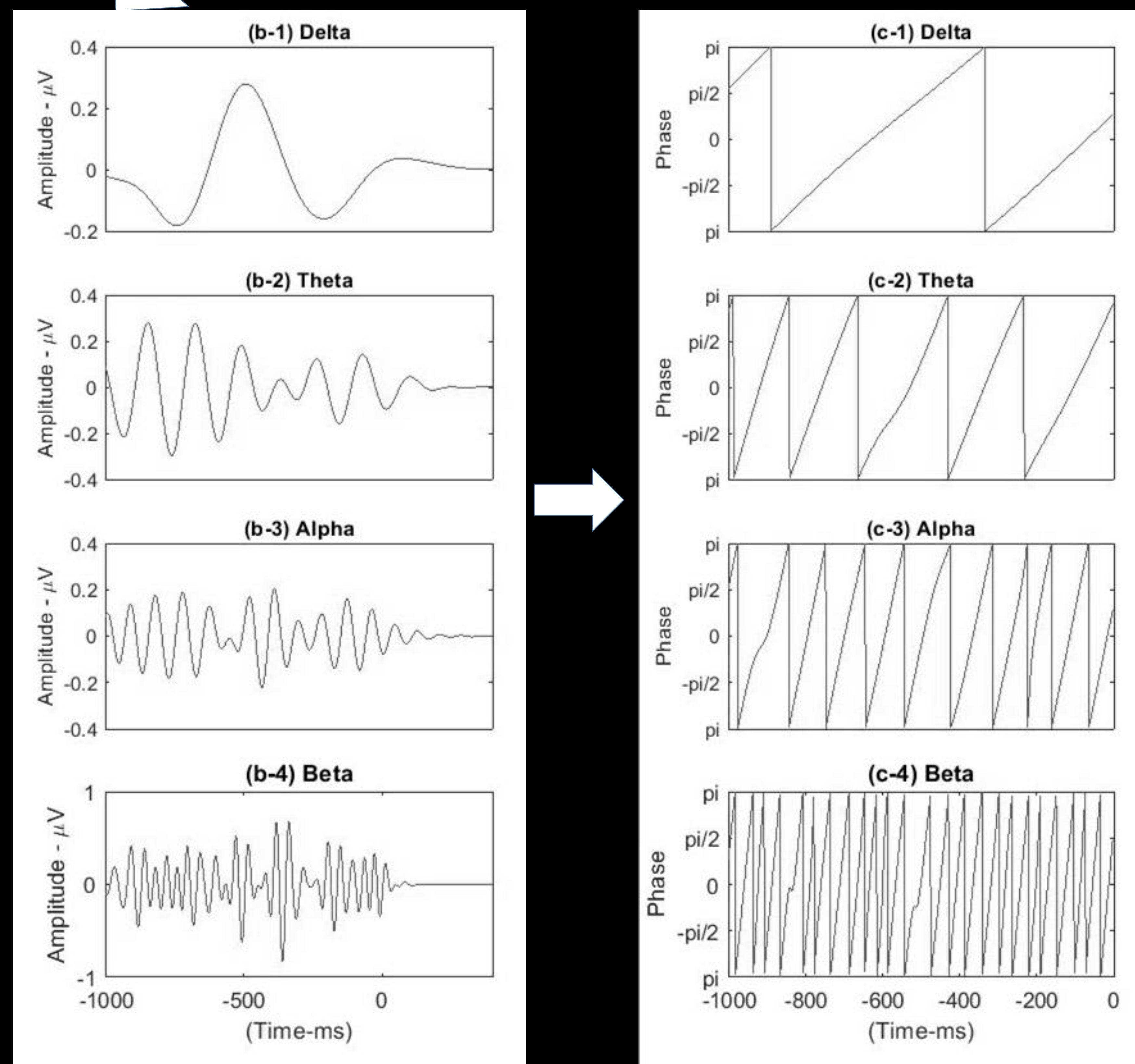
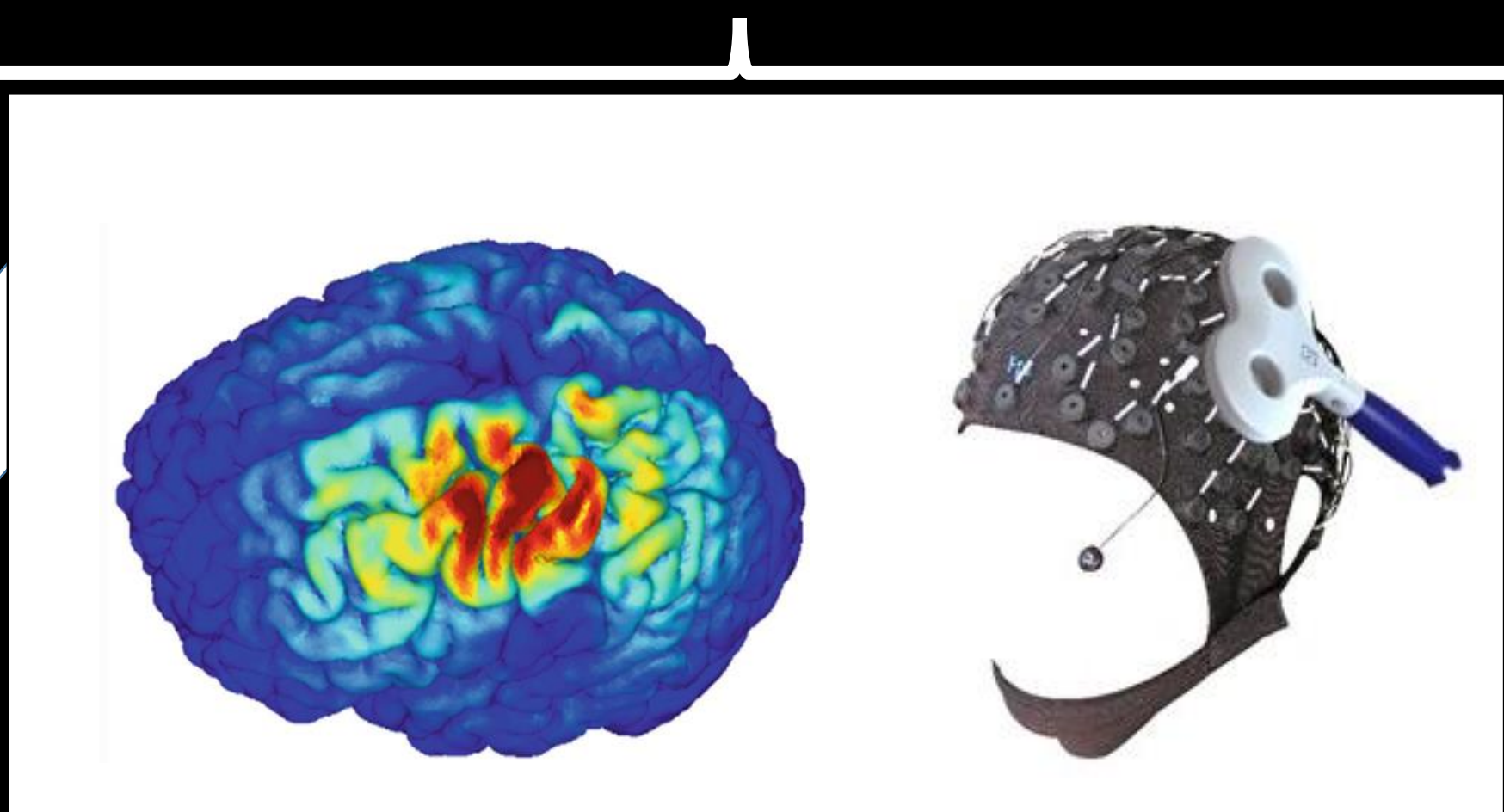
We investigate the effect of phase of ongoing brain oscillations before the TMS pulse on the TMS induced potential (TIP) for every individual trial in two separate populations, namely healthy participants and patients with MDD.

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



Positive Peak

Negative Peak

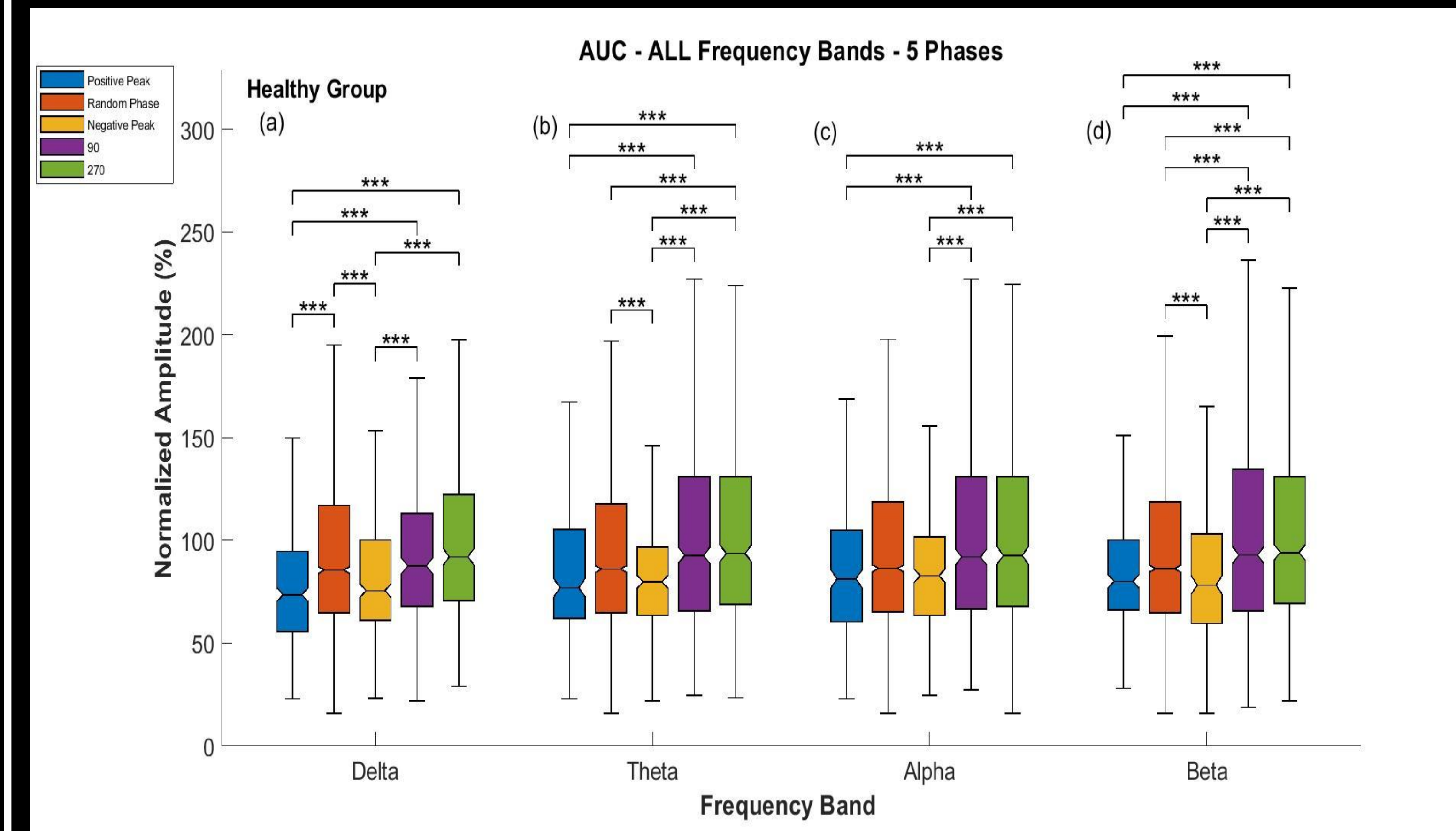
90°

270°

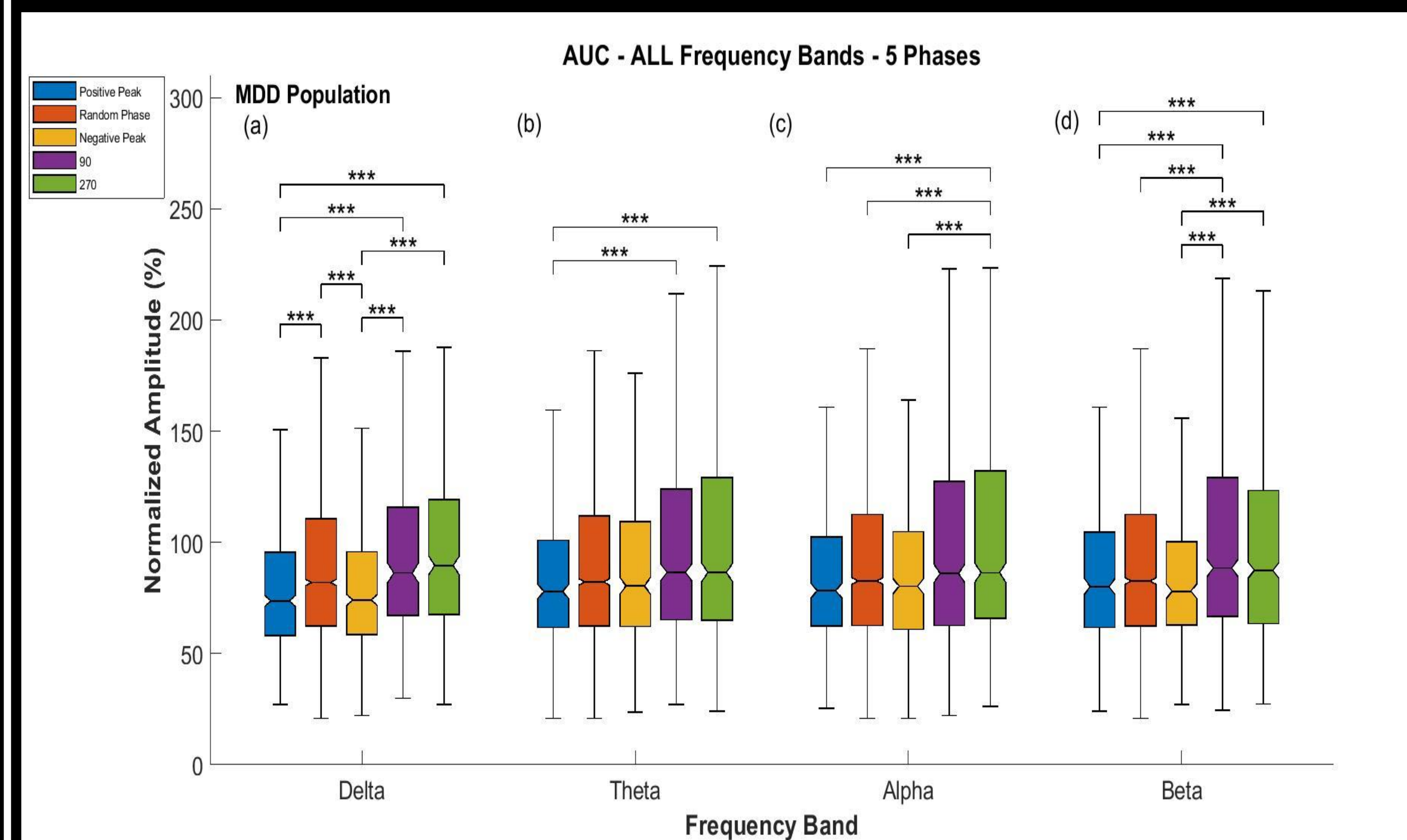
Random

Results

HC



MDD



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)