White Matter vs. Grey Matter: Target-Specific Cortical EEG Changes from Cerebellar FUS of the Dentate Nucleus (DEN) and the Superior Cerebellar Peduncle (SCP)

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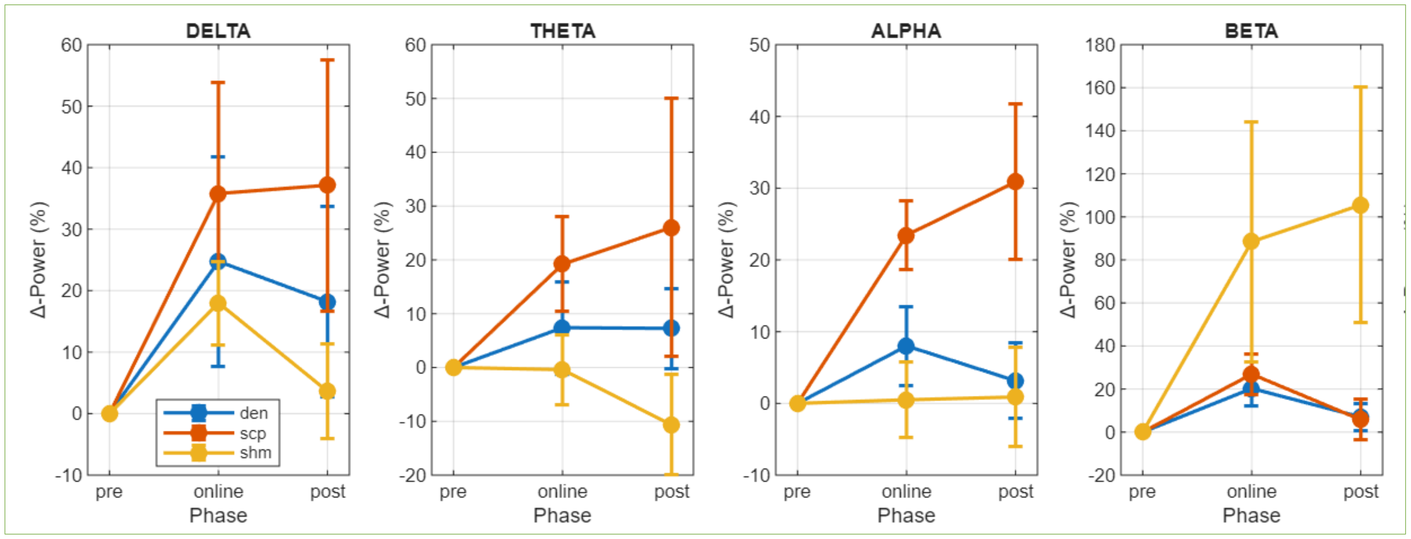
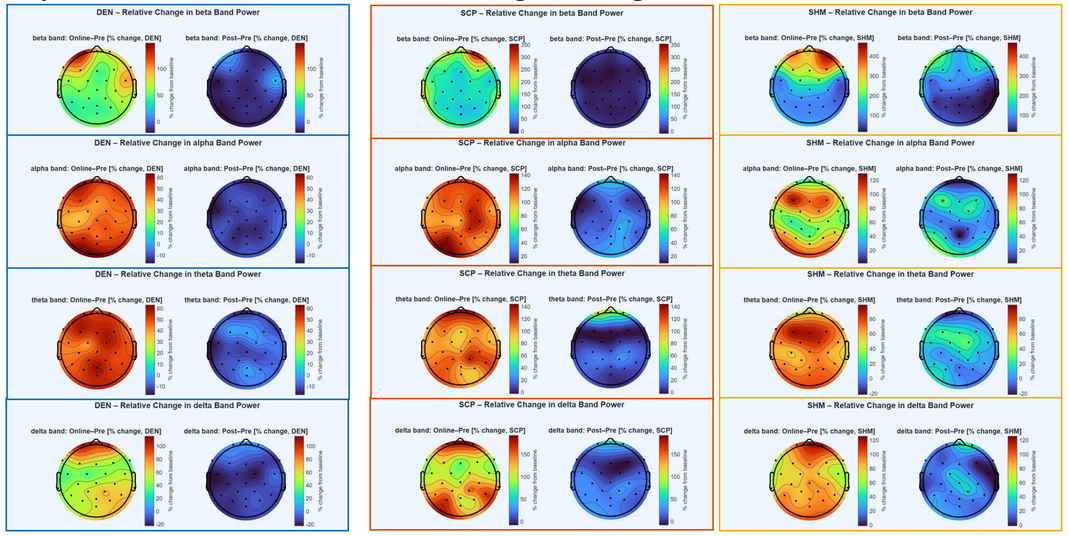
Global Changes Across Frequency Bands and Stimulation Phases



Spatial Distribution of EEG Power Changes During Stimulation



ABOVE: Delta and Theta bands show strongest power increase in Dentate (**den**) and Superior Cerebellar Peduncle (**scp**) during online and post-stimulation phases (**online** and **post**, respectively) relative to pre-stimulation (**pre**). Alpha band shows persistent relative increase in power well into post-stimulation. Gamma and Beta show very large increases in Sham experiment (**shm**) with high variance (error bars). **TOP RIGHT:** Topographic maps showing online and post changes relative to pre. Online-pre shows most bands with strong frontal and central increases in power, especially for SCP and DEN. Post-pre shows much smaller or disappearing effects for most bands/conditions, except possibly SHM in gamma (some large sustained changes). **BOTTOM RIGHT:** Shows mean % change by ROI (Frontal, Central, Parietal, Temporal), phase difference (Online–Pre, Post–Pre), and condition (DEN, SCP, SHM). SCP shows robust increases in all ROIs, mainly during online vs. pre. (Bar heights and dots cluster high, especially in Frontal/Central.) DEN shows more moderate effects but still clear increases during online phase. SHM sometimes shows big effects (esp. gamma/beta), but high variability and possibly less reliable.

FUS parameters:
5 W/cm2 Isppa at-target, normalized for all participants
5Hz PRF "Theta-Burst" protocol
10% Duty Cycle; 20ms US pulse every 200ms
10 minute total sonication duration

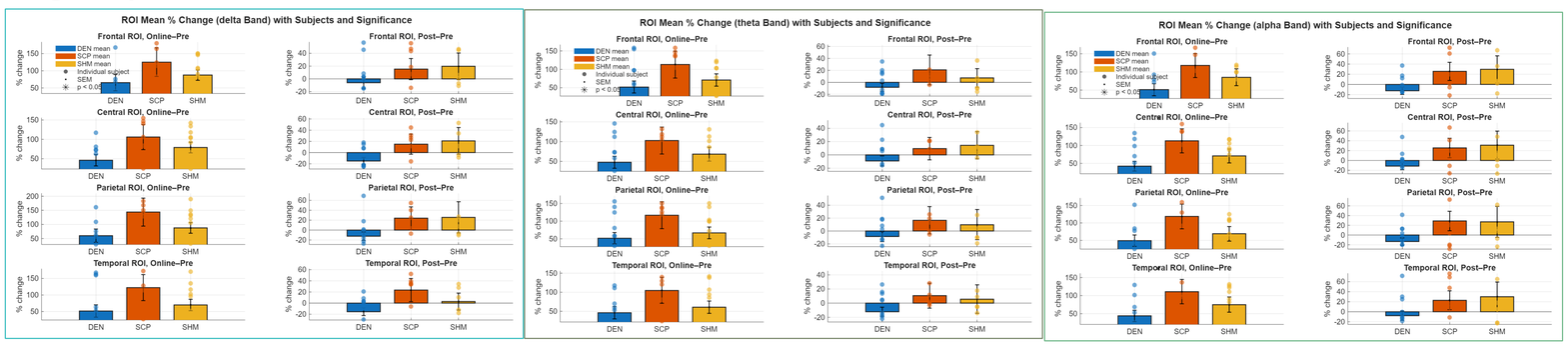
EEG Acquisition:
20 minute continuous EEG split into
5 minute pre-stimulation
10 minutes during FUS (online, no task)
5 minutes post-stimulation

These results are preliminary findings from 10 healthy participants
Cognitive testing after stimulation has also been performed; analysis pending.

Focused ultrasound of the superior cerebellar peduncle (SCP, white matter) and the dentate nucleus (DEN, grey matter) both increased cortical low-frequency EEG power, but SCP stimulation yielded significantly larger and more widespread effects compared to Dentate.

Both targets showed larger effects than sham—demonstrating structure-dependent responses to identical neuromodulation parameters.

Region-Specific Effects



Please feel free to contact the author through the QR code for any inquiries.
As this in an ongoing study, there will inevitably be updates