

**Keywords:** VNS, ECT, treatment resistant depression

### P1.106

#### A LARGE OPEN SOURCE NEUROMODULATION DATASET OF CONCURRENT EEG, ECG, BEHAVIOR, AND TRANSCRANIAL ELECTRICAL STIMULATION

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#### Abstract

We present a dataset combining human-participant high-density electroencephalography (EEG) with physiological and continuous behavioral metrics during transcranial electrical stimulation (tES). Data include within participant application of nine High-Definition tES (HD-tES) types, targeting three cortical regions (frontal, motor, parietal) with three stimulation waveforms (DC, 5 Hz, 30 Hz); more than 783 total stimulation trials over 62 sessions with EEG, physiological (ECG, EOG), and continuous behavioral vigilance/alertness metrics. Experiment 1 and 2 consisted of participants performing a continuous vigilance/alertness task over three 70-minute and two 70.5-minute sessions, respectively. Demographic data were collected, as well as self-reported wellness questionnaires before and after each session. Participants received all 9 stimulation types in Experiment 1, with each session including three stimulation types, with 4 trials per type. Participants received two stimulation types in Experiment 2, with 20 trials of a given stimulation type per session. Within-participant reliability was tested by repeating select sessions. This unique dataset supports a range of hypothesis testing including interactions of tDCS/tACS location and frequency, brain-state, physiology, fatigue, and cognitive performance.

**Keywords:** EEG, tDCS, tACS, Attention

### P1.108

#### FOCAL STIMULATION OF MOVEMENT RELATED CORTICAL POTENTIALS IN MICE USING A NOVEL TMS CIRCUIT DESIGN

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#### Abstract

Discrete brain areas exhibit local activity patterns with distinct temporal and spatial characteristics. Circuit level perturbations to rhythmic patterns are characteristics of altered arousal states and behaviors. Using pulsed electromagnetic fields, transcranial magnetic stimulation (TMS) alters states of cortical excitability and motor output. Current techniques to understand the mechanism and scope of TMS as a therapeutic are limited by the lack of a robust and focally stimulating murine model. Developing a focally stimulating TMS model in mice is a multivariate problem requiring proper consideration of both circuit design and coil construction. A high voltage, fast switching, insulated-gate bipolar transistor (IGBT) pulse generator delivering large current pulses was developed for the generation of focal electromagnetic fields. To compare the validity of the presented design with current methods, stimulating pulses were delivered to mice using a butterfly coil attached to a standard TMS system compared to a compact coil attached to the novel circuit. Changes in cortical electrical potentials were recorded at two cortical surface electrode sites using electroencephalography (EEG). Butterfly coil stimulation resulted in movement related cortical potentials (MRCs) at both EEG recording sites while stimulation with the compact coil elicited MRCs at a single recording site. Furthermore, the compact coil evoked MRCs similar in amplitude to MRCs evoked by the butterfly coil. This novel circuit design enables exemplar stimulation of focal and robust MRCs. The potential for focal stimulation in murine models will provide valuable insight into stimulation of discrete cortical areas affected by disease, like stroke.

**Keywords:** TMS, cortex, stroke, EEG

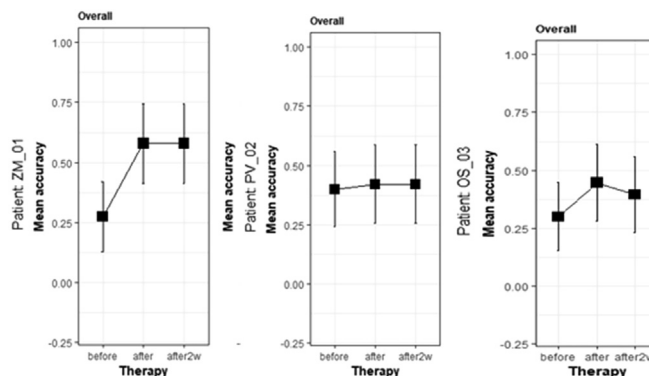
### P1.109

#### TRANSCRANIAL MAGNETIC STIMULATION COUPLED WITH BEHAVIORAL INTERVENTION APPEARS TO IMPROVE SENTENCE COMPREHENSION IN EARLY ALZHEIMER'S DISEASE

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#### Abstract

We present preliminary results on the application of behavioral language intervention coupled with repetitive transcranial magnetic stimulation (rTMS) in one individual with mild and two individuals with moderate Alzheimer's disease (AD). Behavioral language intervention in the form of Treatment of Underlying Forms (TUF, Thompson, 2007), has been beneficial for aphasic patients. TUF focuses on complex sentence structures and operates on the premise that training underlying properties of language allows for effective generalization to untrained structures that share similar linguistic properties. Combined with rTMS, the beneficial effect of TUF is substantially amplified (Thiel et al., 2013; Martin et al., 2014). The current study investigates the combined effect of these two methods in neurodegenerative conditions. We use TUF and placebo-controlled rTMS over the left and right dlPFC in Slovenian-speaking individuals with AD. Participants are randomized to groups A (high-frequency 10-Hz rTMS) and B (placebo), followed by 60min of behavioral treatment (5 session/week, 4 weeks), using the TUF method. They are trained in comprehension of centre-embedded relative clauses of the type *The girl who the mom kissed holds the mirror*. Up to now preliminary data (Fig. 1) from 3 participants (1 with mild-AD, and 2 with moderate-AD) all of them from group A, showed a therapy effect for the participant with mild-AD both immediately and 2 weeks after therapy ( $z=2.58$ ,  $p=.01$ ). Participants with moderate-AD did not show any effect in the tested structures (overall main effect of therapy:  $\chi^2 = 1.62$ ,  $p=.44$  for the first patient and overall main effect of therapy:  $\chi^2 = 2.25$ ,  $p=.32$  for the second participant). Results are promising for the beneficial effects of behavioral therapy and rTMS in complex sentence comprehension, at initial stages of dementia, something which is demonstrated in the literature for the first time.



P1: mild dementia P2: moderate dementia P3: moderate dementia

**Keywords:** sentence comprehension, rTMS, behavioral intervention, Alzheimer's disease

### P1.110

#### THE EFFECT OF NON-INVASIVE TRANSCUTANEOUS AURICULAR VAGUS NERVE STIMULATION (TAVNS) ON HYPOXIC-ISCHEMIC INJURY IN NEWBORN RATS

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