

Translational Research: 6. Pulsed Ultrasound (pUS)

### Keywords

transcranial Focused Ultrasound Stimulation System, 3D Matrix Array Ultrasound Transducer, 3D beam shaping and steering, arbitrary stimulation patterns

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### P3.196

#### TRAJECTORIES OF RESPONSE TO TDCS IN TREATING NEGATIVE SYMPTOMS IN SCHIZOPHRENIA: RESULTS FROM A MULTICENTER RANDOMIZED CONTROLLED TRIAL

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### Abstract

**Objective:** Negative symptoms represent a substantial burden in schizophrenia. One proposed treatment is transcranial direct current stimulation (tDCS). While there is evidence for its efficacy, there is heterogeneity in symptom profiles and longitudinal patterns of symptom improvement have not been investigated. This study investigated both in data from a randomized controlled trial (RCT) on tDCS in schizophrenia.

**Methods:** This was a secondary analysis of an RCT (N=100) comparing active tDCS (10 sessions performed twice daily for 5 days) and sham in patients with schizophrenia. Patients had stable negative and positive symptoms and  $\geq 20$  points in the negative symptoms subscale of the Positive and Negative Syndrome Scale (PANSS). Latent trajectory modeling was used to identify distinct subgroups of patients with similar trajectories of response over 12 weeks. Baseline symptom profiles were derived using hierarchical clustering. Assignment to trajectories was compared between groups and symptom profiles using multinomial logistic regression.

**Results:** Two trajectory classes distinct in response speed and intensity (labeled "strong", "weak" improvement) were identified. Trajectory class assignment differed significantly between groups with more patients in the strong improvement class after active tDCS (12=8.74,  $p=.003$ ). We identified 3 and 4 distinct PANSS baseline profiles for negative and positive symptoms, respectively, which significantly predicted treatment trajectories within the active group. Patients with poor rapport and lack of spontaneity in conversation had higher odds for showing strong improvement while positive symptom patterns with spikes on hallucinatory behavior were more likely to show weak improvement.

**Conclusion and Relevance:** Schizophrenia patients treated with tDCS showed distinct, clinically relevant trajectories of response, which were associated with their symptom profiles at baseline. The number of patients with strong improvement differed between active and sham tDCS. Early identification of strong responders could be key for individualizing treatment.

Trial registration: clinicaltrials.gov NCT02535676

### Research Category and Technology and Methods

Clinical Research: 9. Transcranial Direct Current Stimulation (tDCS)

### Keywords

schizophrenia, negative symptoms, trajectories, symptom clusters

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### P3.197

#### EFFECT OF RTMS ON IMPROVEMENT OF BALANCE AND MUSCLE CONTROL IN PATIENTS WITH CEREBELLAR ATAXIA

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### Abstract

Cerebellar ataxia (CA) characterized by poor motor abilities and balance disturbances affects approximately 3 in 100,000 individuals. This study aims to evaluate the effectiveness of repetitive transcranial magnetic stimulation (rTMS) targeting the cerebellum in improving motor control and to explore the role of the frontal lobe in motor tasks in individuals with CA.

Ten CA patients (4 males, aged  $57.5 \pm 9.01$  years) completed rTMS targeting the cerebellum for five consecutive days. We assessed balance performance and motor control of the leg using the Balance Trainer 2204 (BT4) and surface electromyography (sEMG) respectively. We also acquired hemodynamic responses in the frontal lobe using functional near-infrared spectroscopy (fNIRS) during a dual task: patients were asked to tap either the left or right foot with 3-digit subtraction.

We found significant differences of balance parameter in BT4 ( $p = 0.004$ ,  $d = 0.364$ ) between pre-treatment and post treatment. We also found significant differences of balance parameter in BT4 ( $p = 0.018$ ,  $d = -0.331$ ) between post-treatment and follow-up.

The fNIRS data were analyzed during task performance, revealing significant relationship between balance parameter and superior frontal gyrus (SFG,  $p = 0.008$ ,  $r = -0.78$ ). The SFG was also associated with mean power frequency ( $p = 0.013$ ,  $r = 0.75$ ) and STD amplitude ( $p = 0.018$ ,  $r = 0.72$ ) in the right leg medial sEMG.

This study shows that the potential positive effects of rTMS on balance, motor control and brain activation for higher-level motor function in a complex way for CA patients. Our findings suggest that multimodal approach is necessary for precise understandings of how rTMS improves multiple levels of motor functions in CA patient. This also demonstrates that continuous rTMS treatment may be necessary to sustain the therapeutic benefits.

### Research Category and Technology and Methods

Clinical Research: 10. Transcranial Magnetic Stimulation (TMS)

### Keywords

repetitive TMS, cerebellar ataxia, electromyography, functional near-infrared spectroscopy

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### P3.198

#### GAMMA FREQUENCY TRANSCRANIAL ALTERNATING CURRENT STIMULATION ENHANCES ASSOCIATIVE MEMORY RETENTION OVER THE LEFT POSTERIOR PARIETAL CORTEX

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### Abstract

**Background:** Transcranial alternating current stimulation (tACS) has been reported to improve associative memory (AM) by modulating the frequency of neural vibrations in the brain. Previous studies have observed that gamma-frequency tACS has an immediate effect on memory performance in different brain regions. It remains unclear whether gamma frequency tACS during encoding has a delayed effect on memory retention. The purpose of this study was to determine whether gamma frequency tACS on the left posterior parietal cortex (LPPC) enhances AM memory retention.

**Methods:** This study used a randomly assigned, double-blind, repeated-measures, sham-control design. A total of 22 healthy adult participants were randomly assigned to either the gamma frequency (60 Hz) tACS group [ $n = 11$ ] or the sham group [ $n = 11$ ]. The experiment was conducted over three sessions on days 1, 7, and 28. The learning phase consisted of encoding and cued recall 50 pairs of unrelated nouns, repeated three times on Day 1. This was followed by a cued recall task, which was repeated on days 7 and 28. The participants received either tACS or sham stimulation during the day 1 encoding task. The number of correct responses and the rate of change in correct responses in the cued recall task were measured at three time points: day 1, day 7, and day 28.