

the Alzheimer's disease Assessment Scale-Cognitive, and the n-back. Repeated measures analyses of variance were used to analyse differences in cognitive change scores between stimulation groups.

Results: There was a statistically significant difference in 2-back accuracy between stimulation types ($F(2,28)=5.28, p=0.01$). Post-hoc analysis using Least Significant Difference correction revealed a statistically greater improvement in 2-back accuracy following bitemporal stimulation compared to sham ($p=0.03$) and bifrontal stimulation ($p=0.02$). There were no differences in 2-back accuracy between bifrontal and sham ($p=0.99$). No differences in MoCA, recall, or recognition were found between groups.

Conclusions: In our preliminary results, working memory improved following a single session of bitemporal tDCS compared to sham. Recruitment is ongoing (target sample; $N=20$). Single-session tDCS may be able to help predict optimal electrode placement and create a profile of responders to guide future personalized treatments with tDCS.

Keywords: transcranial direct current stimulation, optimization, mild cognitive impairment, alzheimer's disease

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ENHANCING REHABILITATIVE THERAPIES WITH VAGUS AND TRIGEMINAL NERVE STIMULATION TO TREAT NEUROLOGICAL DISEASE. LESSONS LEARNED FROM TINNITUS RESEARCH

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Tinnitus is the perception of sound in the absence of a corresponding acoustic stimulus. Classical neuromodulation—which consists of applying electrical or magnetic stimuli to the nervous system to directly modulate ongoing brain activity—can temporarily disrupt these phantom sensations but has not been successful as a causal treatment. Recently, however, an exciting novel neuromodulation technique was developed in which stimulation of a cranial nerve was paired with simultaneous presentation of tones, demonstrating that it reverses a tinnitus percept in noise-exposed rats. Pairing cranial nerve stimulation with another therapy can drive activation of nuclei that are associated with modulating plasticity. Repeatedly pairing brief stimulation with sensory or motor events drives robust, event-specific plasticity in neural circuits. To determine whether this treatment approach could be effective in humans, we delivered a similar therapy in patients with chronic tinnitus who were unresponsive to previous therapies. We developed two lines of research to this end. In the first approach, we stimulated the vagus nerve paired with tones, while for the second we stimulated the trigeminal nerve paired with tones. Both treatment approaches seem to well-tolerated and adverse effects were mild. Both vagus and trigeminal nerve stimulation seem to be able to suppress tinnitus, however show a different long-term effect. These results offer concrete evidence that cranial nerve stimulation paired with tones can direct therapeutic neural plasticity.

Keywords: vagus nerve, trigeminal nerve, phantom percept, clinical outcome

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CLINICAL IMPROVEMENT AFTER RTMS THERAPY IN COCAINE ADDICTION CORRELATES WITH FUNCTIONAL CONNECTIVITY CHANGES IN THE FRONTO-STRIATAL CIRCUIT

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To this date, no treatment exists that effectively and completely reduces drug craving and consumption in cocaine addiction. RTMS has shown promise as a possible treatment. The main goal of this study was to determine if rTMS improves clinical outcome after 2 weeks of treatment in cocaine addicts, and the neural correlates of the effect. We are currently performing an RCT with double-blind sham in crack-cocaine addicts (CA) at the National Institute of Psychiatry in Mexico City. To date, we have recruited 30 CA. First, we acquired clinical, cognitive and neuroimaging

data at baseline (T0). Patients were randomly assigned to real or sham groups and treated for 2 weeks with rTMS at 5Hz (5,000 pulses daily), on the left DLPFC, and after 2 weeks we acquired data again (T1). Craving and impulsivity (BIS-11) were measured as clinical outcome. Resting state fMRI (rsfMRI) and structural T1w images were acquired using a Philips Ingenia 3T scanner. RsfMRI data was preprocessed and then analyzed using seed-based functional connectivity (FC) analysis. We performed a paired t-test controlling for multiple comparisons. The final sample size for the clinical analysis was 24 subjects and 10 for the rsfMRI with completed 2 weeks of rTMS treatment. Real-rTMS significantly reduced craving ($F(1,22) = 5.63, p = 0.03$) and impulsivity ($F(1,22) = 6.54, p = 0.02$) more than placebo after 2 weeks of treatment. We found a significant increase of FC between the left ventral striatum and right putamen, and a decrease in FC between the right ventral striatum and the left DLPFC after treatment. These FC changes correlated with a decrease in craving. Our preliminary results show that rTMS therapy for 2 weeks reduces craving and impulsivity in cocaine addicts. The effect seems to be related to changes in the fronto-striatal circuit.

Keywords: addiction, connectivity, cocaine, rTMS

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CORTICAL LANGUAGE FUNCTION IN GLIOMA PATIENTS AS MEASURED BY NRTMS

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Background: The localization of brain function is often altered in glioma patients due to tumor growth. This must be considered for the language network, whose localization is disseminated over the perisylvian area. Moreover, cortical language function is highly individualized and frequently changes due to functional reorganization. The present study aims to provide a probability map for the cortical localization of language function in glioma patients as visualized by a new protocol for the fusion of language maps.

Methods: We included 30 patients with a mean age of 51.17 ± 17.36 years who underwent language mapping by navigated repetitive transcranial magnetic stimulation (nrTMS) prior to resection of a left-sided perisylvian glioma. DICOM files were converted to the NIFTI file format. We normalized and smoothed the maps using SPM12. The resulting image files were then applied to the normalization brain image template as an overlay in MRICron. Subsequently, we created a heat map as a fusion of all nrTMS mappings.

Results: Histopathology showed glioma in all cases (2 WHO grade I, 5 WHO grade II, 5 WHO grade III, 18 WHO grade IV). Tumors were located frontal in 16 cases (53.3%), parietal in 7 cases (23.3%), and temporal in 7 cases (23.3%). We found high density of cortical language function within the opercular and triangular part of the inferior frontal gyrus, the posterior middle frontal gyrus, the ventral precentral gyrus, and the middle superior temporal gyrus. Localizations with a lower intensity were the anterior part of the supramarginal gyrus and the posterior part of the superior temporal gyrus.

Conclusion: By the present results we present a new protocol for the fusion of language mappings. Furthermore, the cortical localization of language function in glioma patients as measured by preoperative nrTMS matches with those measured by direct cortical stimulation during awake surgery in former publications.

Keywords: Neurosurgery, Glioma, TMS, Language

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CORRELATION OF LANGUAGE-ELOQUENT WHITE MATTER PATHWAYS WITH THE COURSE OF LANGUAGE FUNCTION IN GLIOMA PATIENTS

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Background: As various studies show, damage to white matter pathways leads to permanent functional deficits in a high percentage of patients. Particularly the subcortical language network is complex, and its visualization has a tremendous relevance for neurosurgeons. This study aims to correlate language-eloquent white matter pathways with the course of language function after the resection of left-sided perisylvian gliomas.

Methods: We included patients who underwent resection of highly language-eloquent high- and low-grade gliomas. We performed navigated