no inhibitory effects during the SAI paradigm, indicating that cholinergic function in the DLPFC would be impaired in patients with aMCI but may be intact in the HC group.

Research Category and Technology and Methods

Clinical Research: 10. Transcranial Magnetic Stimulation (TMS)

Keywords: Dementia, Mild cognitive impairment, TMS-EEG, Short latency afferent inhibition

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Abstract key: PL- Plenary talks; S- Regular symposia oral; FS- Fast-Track symposia oral; OS- On-demand symposia oral; P- Posters

P1.125

FREQUENCY DEPENDENT REDUCTION OF CYBER-SICKNESS NAUSEA IN VIRTUAL REALITY BY TRANSCRANIAL OSCILLATORY STIMULATION OF THE VESTIBULAR CORTEX

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Abstract

Introduction: Virtual reality (VR) applications are pervasive of everyday life, as in working, medical and entertainment scenarios. Despite technological advances of VR devices, there is yet no solutions to nausea, dizziness, and general discomfort that most of users undergo. This is what is referred to as cyber-sickness (CS), a disabling vestibular syndrome resulting from a mismatch of integration among visual, proprioceptive, and vestibular information. We propose an innovative treatment approach consisting of an online oscillatory neuromodulation with transcranial alternating current stimulation (tACS) at 10 Hz, biophysically modeled to target the vestibular cortex.

Methods: 41 healthy young adults (all right-handed; 25 males and 16 females; mean age: 26.5 ± 3.1 years; education: 15 ± 2,78 years) participated in this study, during a VR rollercoaster ride experience displayed through an Oculus Quest 2. Galvanic Skin Response (GSR) was also recorded in 25 subjects during the VR experience.

Results: 10Hz tACS significantly reduced nausea during VR immersion compared with 2Hz tACS and placebo condition (52.6% or responders), while it did not affect the recovery time. Additionally, the GSR was reducedduring 10Hz tACS than during 2Hz tACS. The higher was the nausea experienced during Sham, the better was the treatment response to 10 Hz tACS.

Discussion: results show that 10 Hz-tACS, if biophysically modeled to appropriately target the vestibular cortex bilaterally, could represent an effective strategy to reduce CS nausea during VR performances.Oscillatory neuromodulation with tACS may be considered for treatment of other vestibular dysfunctions.

Research Category and Technology and Methods

Translational Research: 8. Transcranial Alternating Current Stimulation (tACS)

Keywords: Virtual Realty, tACS, Cyber-sickness, Vestibular Cortex

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Abstract key: PL- Plenary talks; S- Regular symposia oral; FS- Fast-Track symposia oral; OS- On-demand symposia oral; P- Posters

P1.126

THE PREDICTIVE BRAIN: LINKING MOTOR AND SENSORY ATTENUATION USING COMBINED TMS-EEG

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Abstract

When sensory inputs can be predicted by an organism's own actions or external environmental cues, neural activity is downweighted compared to sensory inputs that are unpredictable. We have recently demonstrated that this downweighting to predictable inputs is also observed when stimulating the motor system with transcranial magnetic stimulation (TMS). Akin to sensory attenuation, predictable TMS excites the motor system less effectively than unpredicted TMS.

In Experiment 1 we used a dual site TMS setup and measured corticospinal attenuation to motor cortex stimulation using motor-evoked potentials (MEP). We showed that MEP attenuation was specific to stimulation of the motor cortex and was not due to anticipatory consequences of receiving a TMS pulse by matching the predictability of TMS to a control brain site.

In Experiment 2 we used a combined TMS-EEG setup and measured corticospinal attenuation using MEPs, while simultaneously measuring sensory attenuation to the sound of TMS (a coil "click") using event-related potentials (ERP). We found that both ERPs and MEPs were downweighted to predictable TMS compared to unpredictable TMS. Critically, the magnitude of ERP suppression predicted the magnitude of MEP suppression.

Our results reveal a close correspondence between attenuation of the sensory and motor systems. The findings provide compelling evidence that predictive coding is governed by domain-general properties across distinct neural systems and has shared mechanisms responsible for all forms of predictive learning. The findings also have important methodological implications for designing TMS experiments that control for the predictability of TMS pulses.

Research Category and Technology and Methods

Basic Research: 10. Transcranial Magnetic Stimulation (TMS)

Keywords: Predictive coding, Temporal expectation, Sensory attenuation, Motor system

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Abstract key: PL- Plenary talks; S- Regular symposia oral; FS- Fast-Track symposia oral; OS- On-demand symposia oral; P- Posters

P1.127

NO MODULATION OF OBJECT-LOCATION MEMORY THROUGH HIGH-DEFINITION TRANSCRANIAL DIRECT CURRENT STIMULATION OF THE RIGHT TEMPOROPARIETAL LOBE

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Abstract

Background: Object-location memory (OLM) has been shown to be mediated by the right temporoparietal lobe, with structural plasticity in lateral and medial parietal areas induced by learning.

Objective: We investigated whether high-definition transcranial direct current stimulation (HD-tDCS) of the right temporoparietal lobe has immediate and sustained effects on OLM performance.

Methods: Fifty-two participants performed a two-day OLM training, requiring to remember the positions of the second objects in pairs of pictures. HD-tDCS (2 mA, 20 min) was applied during first training. Training gains were additionally assessed on the subsequent day. Performance levels were compared between an anodal and a sham group. Baseline structural and microstructural parameters were extracted and

electric fields induced on individual brain surfaces were estimated. The study was preregistered (https://osf.io/h5x6j).
Results: Participants showed training gains over time with no difference between anodal and sham groups on either training day. Neither individual electric field magnitudes, nor volume or microstructure in the stimulation target and related right-hemispheric memory-relevant structures were associated with training gains. Neuropsychological data showed no correlation with visual-spatial memory scores. Further exploratory analyses revealed associations with volume and microstructure of left-hemispheric areas and pathways (such as the hippocampus and the cingulum bundle) and with verbal learning memory scores.
Conclusion: Focal stimulation of the right temporoparietal lobe did not enhance training gains of the OLM task. This group-level finding was confirmed by non-existent associations of individual benefits with electric fields or regional (micro)structural parameters in the stimulation target. The null effect may be explained by choosing a "wrong" target for the modulation of performance in this particular task rather than by inter-individual variability in responsiveness. Our study shows that the integration of neuropsychological, behavioral, and neuronal measures, can provide more specific insights into underlying brain plasticity modulation, further promoting the understanding of null effects.
Research Category and Technology and Methods
Basic Research: 9. Transcranial Direct Current Stimulation (tDCS)
Keywords: non-invasive brain stimulation, visuo-spatial memory, diffusion tensor imaging, electric field simulations

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P1.129

TRAIT AGGRESSION-DEPENDENT EFFECTS OF CEREBELLAR TDCS IN A SOCIAL DOMINANCE TASK

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Abstract
Background: Neuroevolutionary theories propose that primate dominance/submission relationships are automatically and non-aggressively established through dominance competitions like face-to-face stare-downs. Indeed, behavioral research has shown interrelations between human aggression, social anxiety, and reactive gaze-aversion behavior from angry faces. Evidence from fMRI studies and brain stimulation studies suggests involvement of the cerebellum in such oculomotor behaviors as well as emotional face processing.
Objective: The current study investigated cerebellar involvement in reactive gaze-aversion from face-to-face confrontation.
Methods: Thirty-six healthy participants underwent 15 minutes of sham-controlled cathodal transcranial direct current stimulation (tDCS) of the medial cerebellum (cathode placement: 1 cm under the inion, anode placement: deltoid muscle, 5x7 cm each) at 2mA while performing a social dominance eye-tracking task. In this task, participants were subliminally shown neutral, angry and happy faces using backward masking and instructed to avert their gaze to a target that matched the mask color. Longer gaze aversion latencies from subliminally presented angry compared to happy and neutral faces (i.e. emotion-modulated response times to the target) in this paradigm form an index for reactive dominance. Furthermore self-reported state anxiety, trait social anxiety and aggression were recorded and explored as possible moderators of tDCS-related effects.
Results: Analyses reveal no effect of facial emotion, nor an emotion-specific effect of stimulation condition, on gaze aversion latencies. However, we find an interaction between self-reported aggression and stimulation condition. Unexpectedly, cerebellar stimulation increased gaze aversion latency in highly aggressive individuals relative to lowly aggressive individuals.
Conclusion: Our findings suggest that cerebellar tDCS affects oculomotor behavior in a trait aggression-dependent manner. However, we find that this effect is nonspecific to the presented emotional face and therefore independent of subliminal activation of dominance-submission motives. We propose a more general motivation (e.g. approach motivation) modulated by the cerebellum may instead underlie this pattern.

Research Category and Technology and Methods
Basic Research: 9. Transcranial Direct Current Stimulation (tDCS)
Keywords: cerebellum, eye tracking, social anxiety, aggression

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Abstract key: PL- Plenary talks; S- Regular symposia oral; FS- Fast-Track symposia oral; OS- On-demand symposia oral; P- Posters

P1.130

PRE-SURGICAL MAPPING OF MOTOR AND LANGUAGE FUNCTIONS IN BRAIN TUMOR PATIENTS USING NAVIGATED TRANSCRANIAL MAGNETIC STIMULATION

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Abstract
Awake surgery is employed on an individual patient basis as gold standard to identify eloquent cortical regions. However, its invasiveness and the ineligibility of all patients limits its widespread adoption. Coupling navigated Transcranial magnetic stimulation (nTMS) with Diffuse tensor imaging fiber tracking reconstruction (DTI-FT) allows to obtain an accurate pre-surgical functional map of both cortical and subcortical pathways, exploitable during intraoperative navigation to visualize the functional structures close to the lesion to preserve. Here, we report the feasibility of nTMS-DTI-FT as pre-surgical mapping of eloquent brain areas.
28 patients (17 females, 11 males, age range 12-79) underwent a nTMS session through Nexstim device. Cortical nTMS spots related to motor and/or language areas were identified by coupling the anatomical landmarks and the behavioral responses elicited by TMS (motor twitch and/or naming error). Through the Sthealth Work Station, the subcortical fibers reconstruction was performed. Both cortical and subcortical maps were uploaded to the navigation system supporting the surgery.
Tumor resection was total in 46,5% of the surgeries, in the 46,5% was subtotal and only in 7% was partial. After 3 months, most of the patients presented unchanged or better Karnofsky performance status and unchanged or better neurological status. 90% had to continue antiepileptic therapy. 2 cases in partial resection group had novel seizures requiring for therapy increase. 1 patient of the same group underwent second surgery for precocious re-grow of the lesion.
nTMS coupled with DTI-FT is a valid pre-surgical aid to approach lesions in eloquent areas. This technique could be useful to increase the extend of resection of the lesions, preserve the functional anatomical structures, increase the survival and quality of life of patients and, finally, their outcome. This technique showed to be a valid alternative to awake surgery, whenever the case it cannot be performed.
Research Category and Technology and Methods
Clinical Research: 10. Transcranial Magnetic Stimulation (TMS)
Keywords: transcranial magnetic stimulation, brain tumor, preoperative mapping, eloquent areas

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P1.131

THE FUNCTIONAL ROLE OF THETA-GAMMA OSCILLATIONS IN HEALTHY HUMAN MOTOR LEARNING USING THETA-GAMMA PHASE AMPLITUDE COUPLING TACS

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