SMA using repetitive navigated transcranial magnetic stimulation (rnTMS) has been proposed. The aim of this study was to validate and extend this protocol for both hemispheres and lower extremities.
To this purpose, the SMA regions of both hemispheres were mapped based on a finger tapping task performance of 22 healthy subjects (35.5±15.06, 15 females) using rnTMS at 20 Hz (120% resting motor threshold (RMT)). Points with induced errors were marked on the corresponding MRI and a SMA hotspot was identified. For this hotspot, a bimanual finger tapping task and the Nine-Hole Peg Test (NHPT) were performed additionally. Further, the lower extremity was mapped using a toe tapping task at 20 Hz (140% RMT). In 18 out of 22 healthy subjects SMA mapping of the upper extremity was successful (12 bi-hemispherically, 6 uni-hemispherically). Mean finger tapping scores were significantly reduced during stimulation (25.38 taps) compared to baseline (29.70; $p<0.01$). Bimanual finger tapping led to a significant increase in taps during stimulation (28.30 taps) compared to unimanual tapping ($p<0.01$). Compared to baseline, a significant increase in completion time for the NHPT could be observed during stimulation (baseline: 13.4s, stimulation: 16.1s; $p<0.01$). For the lower extremity, replicable errors could be induced in 20 out of 22 subjects in at least one hemisphere.
The present study validated and extended an rnTMS-based protocol to map upper and lower extremity motor function over the SMA. Hence, this protocol could further be used to acquire a better understanding of the functional SMA organization and potentially help to improve preoperative planning for patients with lesions within this region

Research Category and Technology and Methods
Clinical Research: 10. Transcranial Magnetic Stimulation (TMS)
Keywords: supplementary motor area, repetitive TMS, mapping, motor function

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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

P2.036

THE TEMPORAL BINDING WINDOW BETWEEN ICMS AND VISION DEPENDS ON BIOLOGICAL RELEVANCE OF VISUAL STIMULI

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Abstract
It is established that intra-cortical microstimulation (ICMS) of primary somatosensory cortex (S1) can elicit a variety of artificial tactile sensations in human patients, but there has been little work on how the brain processes this non-naturalistic input in multisensory contexts. Understanding the timing necessary for visual and ICMS stimuli to feel simultaneous (the temporal binding window) is essential for creating a successful closed-loop brain-computer interface (BCI) for people with spinal cord injury. Here, a tetraplegic patient implanted with microelectrode arrays (Blackrock Microsystems) in S1 received single-channel ICMS (60 or 100 μA) while observing visual cues, and assessed the relative timing of vision and elicited tactile sensations. Visual and ICMS stimuli were delivered either simultaneously or at an offset from one another (150 or 300ms). Visual events were either **abstract** (a dot moving to the end of a line) or realistic (a robotic arm tapping a first-person-perspective human arm) and were presented using virtual reality. Task performance was equal across conditions and was not affected by learning over time. Supporting prior literature, the higher stimulation amplitude elicited more sensations. In both conditions, single-channel ICMS lagged behind visual cues perceptually. In the realistic condition, stimuli were perceived as maximally synchronous when vision occurred 150ms later than ICMS. In the **abstract** condition, this temporal offset was less pronounced but still present. Additionally, the patient was more likely to perceive an order to the stimuli (vision before ICMS or ICMS before vision) in the **abstract** condition, whereas in the realistic condition the patient was more likely to perceive the stimuli as synchronous. This effect suggests that a more biologically relevant visual scene results in a larger temporal binding window between visual cues and ICMS, such that the brain can better integrate ICMS as part of a causal, multisensory environment.

Research Category and Technology and Methods
Translational Research: 14. Brain-computer Interface
Keywords: intra-cortical microstimulation, brain-computer interface, somatosensation, vision

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P2.037

COMBINING METACOGNITIVE THERAPY AND TDCS: PRELIMINARY RESULTS IN PATIENTS WITH MAJOR DEPRESSIVE DISORDER

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Abstract
Background and aim: Transcranial direct current stimulation (tDCS) and metacognitive therapy (MCT) can reduce depressive symptoms as monotherapies or associated with pharmacological treatment. Here, we investigated the effectiveness of combining these treatments in a group of patients with major depressive disorder (MDD).
Methods: So far, fourteen participants (10 females, Mage 43 ± 12) out of N= 54 estimated sample size were recruited at the Department of Neuroscience and Mental Health – Fondazione IRRCS Ca' Granda Ospedale Maggiore Policlinico of Milano. All participants were under pharmacological treatment. They were randomly assigned to three groups receiving (i) real tDCS + sham MCT (n= 7); (ii) sham tDCS + MCT (n = 6) (iii) real tDCS + MCT (n= 1). The treatment lasted eight weeks, in which participants had one weekly MCT (groups ii and iii) or clinical interview session (group i) following the tDCS. TDCS was combined with attentional training (20 minutes, 1.5 mA, anode over the left dorsolateral prefrontal cortex) and took place three times a week for the first three weeks and then once a week. Clinical standardized questionnaires measuring depressive symptoms, anxiety, worry, rumination, and meta-beliefs were administered before and after the treatment, two weeks, three, six, and twelve months after treatment's end.
Results: Due to sampling distribution, mixed effects models were run, including time and only two groups as fixed factors (i and ii) and participants' random intercept. Outcome measures revealed an effect of time, showing symptoms reduction after the treatment. Crucially, our results suggested a more robust reduction of worry and negative beliefs in the group receiving MCT compared to the one receiving only tDCS.
Conclusions: despite preliminary, our results suggest that MCT can effectively reduce core symptoms contributing to the development and maintenance of MDD. Completing data collection will allow disentangling whether tDCS can boost this effect.

Research Category and Technology and Methods
Clinical Research: 9. Transcranial Direct Current Stimulation (tDCS)
Keywords: tDCS, Cognitive Behavioral Therapy, Major Depressive Disorder

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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

P2.038

TMS AND FMRI-BASED LOCALIZATION OF THE ATTENTION NETWORK

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