CONCURRENT TMS-fMRI – SYSTEMATIC REVIEW OF METHODOLOGICAL DIFFERENCES AND SOURCES OF BIAS

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Introduction: Concurrent TMS-fMRI is a method which TMS pulses, bursts, or trains are interleaved with fMRI. Using this technique, the immediate effects of TMS can be measured while the subjects are being scanned with fMRI. To describe the methodological strengths and limitations across research, we conducted a systematic review on previously published concurrent TMS-fMRI studies.

Method: On April 16, 2021, literature was systematically collected from PubMED, Ovid Medline, and Embase. After deduplication, 4911 articles were included in a PRISMA screening and eligibility check was completed by two raters independently. 77 interleaved TMS-fMRI papers were identified. Out of those, 63 articles with at least 5 human subjects were examined in detail.

Results: A synopsis of studies may be downloaded from the link on the poster. Only four of the 63 publications were pre-registered, and only twelve were conducted with patients. Motor cortex research accounted for over half of the papers (28). There were three potential causes of bias that we discovered:

- different motor threshold (MT) measurements (31 with resting MT, 21 with MT in MR environment, 6 with electromyography),
- different motion control (35 stabilized the head with cushions or straps, 48 reported motion removal from fMRI image (i.e. removal of datasets with excessive motion, insertion of motion as covariate, denoising during preprocessing),
- lack or variation of control conditions (7 studies with sham TMS, 7 with low intensity, 7 with control location).

Discussion: To date, only 23 institutes in seven countries have published all of these studies. The majority investigated the motor cortex function in healthy subjects. Researchers are encouraged to collaborate not only to share their knowledge of the complex technological setting, but also to minimize the source of bias.

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EFFICACY OF TRANSCRANIAL DIRECT CURRENT STIMULATION TO IMPROVE INSIGHT IN PATIENTS WITH SCHIZOPHRENIA: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

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Importance: Lack of insight in schizophrenia, i.e. the unawareness of illness and its consequences, is associated with poor outcomes and usual treatments do not appear to convincingly improve it. While transcranial direct current stimulation (tDCS) may represent a potentially useful treatment strategy to relieve various symptoms of schizophrenia, its impact on insight remains unclear.

Objective: To investigate the association between repeated sessions of tDCS and insight improvement in patients with schizophrenia.

Methods: PubMed and ScienceDirect databases were systematically searched up until March 2021. Eligible randomized sham-controlled trials were those comparing active *versus* sham tDCS, including at least 10 sessions, in patients with schizophrenia. Only studies measuring insight with the PANSS #G12 item were selected. Of 116 studies identified, 17 studies were selected and 13 were included. Effect sizes were calculated for all studies and pooled using a random-effects model. Meta-regression and subgroup analyses were conducted. The primary outcome established prior data collection was the change of insight score, assessed by PANSS #G12 item, following active tDCS sessions compared to sham stimulation.

Results: Thirteen studies including 587 patients with schizophrenia were included (297 receiving active stimulation and 290 receiving sham stimulation). A significant pooled effect size of -0.46 (95% CI [-0.62; -0.30]) was observed, suggesting that 10 sessions of active treatment was associated with a greater improvement in insight compared to sham treatment. Age and G12 score at baseline were identified as significant moderators.

Conclusions: This study suggests that patients with schizophrenia showing poor insight may benefit from treatment with tDCS with the anode over the dorsolateral prefrontal cortex, using either bifrontal or frontotemporal montage. This effect could contribute to beneficial outcomes observed following stimulation.

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THE ROLE OF THE CEREBELLUM ON SOCIAL SEQUENCES: PRELIMINARY FINDINGS OF A CONCURRENT tDCS-fMRI STUDY

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The cerebellum is a brain structure traditionally known for its role in motor sequences. However in the last decades the posterior cerebellum has shown to be involved in understanding social sequences as well (Heleven et al. 2019). In order to understand these social sequences humans use complex cognitive processes such as mentalizing. Mentalizing is the ability to attribute mental states such as desires, intentions and beliefs to other people. This ability helps us to predict future behaviour by generating social sequences. The ability to mentalize seems to be impaired in some clinical populations such as the autism spectrum (Olivito et al. 2018), thus the possibility of using brain stimulation in order to enhance it sounds enticing.

In order to prove the causal role of the cerebellum in social sequences we conducted an experiment that included a pictorial sequencing task in order to compare false belief sequences (which require mentalizing) with other types of social and non-social sequences. A within-subjects sham-controlled design