EMOTION PROCESSING TASK AS A NEW STRATEGY FOR LOCATING INDIVIDUALIZED TMS TARGETS

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Introduction: Dysfunctions in emotion processing and regulation are common in subjects suffering from MDD, paradigms involving emotion processing and regulation might be ideal for revealing the corresponding neurocircuitry. Functional MRI localisers using emotion processing paradigms reveal individual dorsolateral prefrontal cortex (DLPFC) activation clusters. This method could be advantageous as these regions may then be used as targets for TMS treatment. In this study, we compared targets derived from individual functional localisers to targets commonly used in TMS for MDD.

Methods: Twenty-eight patients diagnosed with acute MDD (16f/12m, mean age: 28.7±7.1) participated in the study and performed a facial emotion discrimination task (EDT). Data acquisition was performed on an ultra-high 7 Tesla whole-body MR scanner (Siemens Magnetom 7T). The Euclidean distances to seven commonly used DLPFC targets were calculated for each patients EDT activation peak within the group-level DLPFC activation cluster.

Results: DLPFC activation maxima were successfully derived in all subjects. Group-averaged distances of the different targeting approaches to the EDT maxima ranged from 16 mm to 40.5 mm. Targeting approaches that are generally considered less effective (e.g. 5 cm method and EEG-F3 targeting) showed the highest spatial distances to individual functional activation peaks. The spatial reproducibility of the EDT was stable for most subjects, however, in some subjects the spatial variability was quite high (Figure 1). The variability could be improved by performing multiple runs to achieve reliable DLPFC localisation (Geissberger et al. 2020).

Conclusion: We conclude that the EDT may be used to obtain single-subject activation clusters within the DLPFC in a clinical sample. Based on this, individually localized DLPFC with fMRI show considerable inter-subject variability and therefore using the same target for all subjects is suboptimal. We therefore suggest future usage of functional localisers for determining stimulation targets as we showed they can be reliable and reproducible in patients.

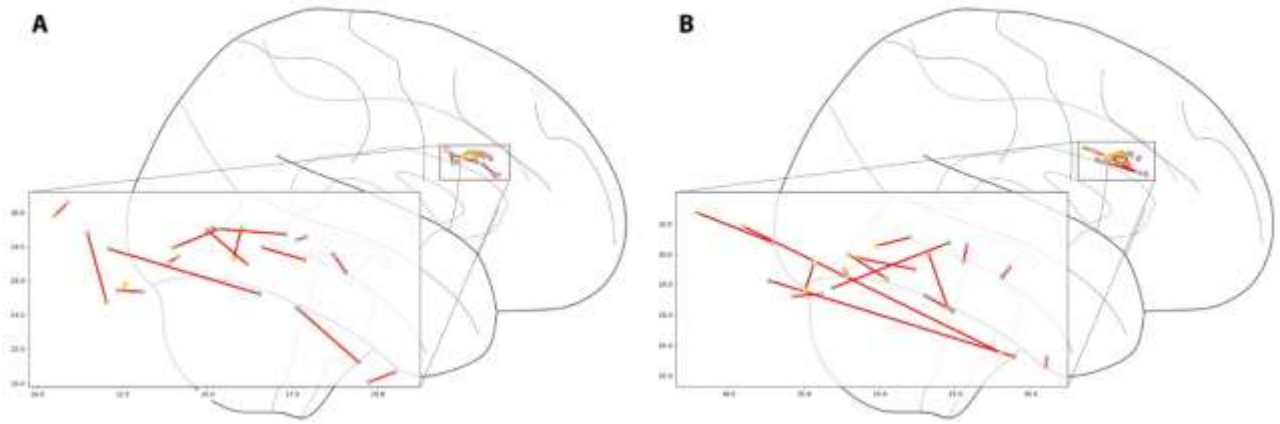

Figure 1. (a) Intra-session distances of single-subject activation maxima in l-DLPFC cluster between two runs. Dots are marking runs, while red lines represent each subject. (b) Inter-session distances of single-subject activation maxima in l-DLPFC cluster. Dots are marking sessions, while red lines represent each subject. Data is represented in a lateral view of the right hemisphere glass brain

References:

1. *Geissberger N, Tik M, Sladky R, Woletz M, Schuler A, Willinger D & Windischberger C: Reproducibility of amygdala activation in facial emotion processing at 7T. NeuroImage 2020; 211:116585*

NO EVIDENCE FOR CHANGES IN PREFRONTAL AND TEMPORO-PARIETAL AREAS BY tDCS TREATMENT OF AUDITORY HALLUCINATIONS

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According to a prominent theory, transcranial direct current stimulation (tDCS) reduces auditory hallucinations in individuals with schizophrenia by inhibiting neural activity in hyperactive language areas in the temporo-parietal cortex (TPC), while simultaneously boosting neural activity in hypoactive attentional control areas in the dorsolateral prefrontal cortex (DLPFC). In a series of studies, we tested the effects of tDCS over TPC and DLPFC regions in healthy participants but also a small sample of patients with medication resistant, auditory-verbal hallucinations that received tDCS treatment. Anatomical, neurotransmitter, brain activity, and network connectivity changes in both patients and healthy individuals were examined.

The results revealed a small reduction of auditory hallucinations in patients as compared to sham with d=0.14 to 0.47, consistent with previous findings. However, tDCS did not lead to measurable effects in the neuroimaging data of the patients. In healthy participants, single session tDCS did not lead to robust changes in GABA, glutamate or in functional activity measures in the TPC or DLPFC. In line with previous reports, modelling of the tDCS electrical currents suggested that with the DLPFC/TPC montage that is used in most tDCS treatment studies, the activation is strongest in Broca's area, not the DLPFC or the TPC itself.

In conclusion, our findings call into question the currently leading theory behind tDCS treatment of AVH. New avenues, including Broca's area will be discussed.

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ACCELERATED ITBS rTMS PROTOCOL IN A CLINICAL ROUTINE SETTING: ONE YEAR EXPERIENCE

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Background: Williams reported results of Stanford Accelerated intelligent Neuromodulation Therapy: they found striking 78/90% remission rates from depression in severely treatment-resistant patients in a short 5-days duration of treatment (depending on the open label or sham-controlled, double blinded clinical trials). Neverthless, high-dose, accelerated and spaced protocol is challenging for implementation in clinical routine setting.

Method: We report here one year experience of 10 daily neuronavigated spaced rTMS sessions regimen (intermittent theta burst protocol of 1800 pulses at 90% motor threshold) for 5 consecutive days, MRI individually targeting of L-DLPFC (using Broadmann area 46) with 75 patients suffering from treatment-resistant depression, in our neuromodulation unit. Clinical screening included BDI, QIDS, SHAPS, STAI A, Pichot fatigue, EPWORTH, WEMWBS, PDQ-D and automated neurocognitive battery (CogniFit).

Results: no serious adverse effect were reported and all but 3 patients completed the protocol. Response and remission rate was of only 18/14% on QIDS-SR16 and 23/15% on BDI-SF 13 items.