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Evaluation of the effects of transcranial direct current stimulation on the effectiveness of cognitive function rehabilitation using the RehaCom system in patients with paranoid schizophrenia

INTRODUCTION

- Schizophrenia is a chronic illness affecting at least 1% of the population, with the onset of symptoms in most cases occurring between 20 and 30 years of age.
- In patients suffering from schizophrenia we observe reduced activity of the prefrontal cortex, which is responsible for executive functions such as broad planning and problem-solving skills.
- At present, we have a small number of drugs that improve cognitive functions in patients, and they are also characterised by low efficacy.
- To improve cognitive functioning in patients, we have used transcranial direct current stimulation (tDCS) in combination with RehaCom system.
- The tDCS is a method of modulating neuronal excitability manifested by altering the neuronal membrane potential.
- The indirect effect of these mechanisms is the release of neurotransmitters (e.g. dopamine, serotonin, norepinephrine, substance P), causing modulation of the activity of downstream neuronal circuits.
- In addition, tDCS also influences neuroplasticity by increasing the production of neurotrophic factors, mainly brain derived neurotrophic factor (BDNF). This increases the brain susceptibility to various neurorehabilitation procedures, which is why our patients undergo half-hourly cognitive function exercises following stimulation.

MATERIALS AND METHODS

- The study group consists of 60 people with paranoid schizophrenia, aged between 18 and 65 years.
- The study is being conducted using a double-blind method.
- Each patient is randomly allocated to one of two groups: with real or sham transcranial direct current stimulation (tDCS).
- The stimulations are carried out using a DC-Stimulator PLUS (Neurocare, Germany).
- We use 5×7 cm rubber electrodes placed in saline-soaked sponge pads for all treatments.
- A current of 2.0 mA is used for all real stimulations.
- The location of the anode electrode is F3 (corresponding to the left DLPFC) and the cathode electrode is F4 (right DLPFC).
- For each patient, we perform 15 stimulation treatments, each lasting 20 minutes.
- Each stimulation is followed by 30 minutes of cognitive function training using the RehaCom computer system.
- Before and after completing the stimulation course and again after 8 weeks, we perform an objective assessment of the patient's cognitive functioning using the CANTAB computerized battery, which is a collection of standardised neurocognitive tests.
- At identical time points, we perform an EEG study to assess the impact of tDCS and rehabilitation on electrophysiological recordings.

AIM OF THE STUDY

- At the end of the study two groups of patients will be compared: with real and sham (placebo-like) transcranial direct current stimulation. We will then analyse whether patients receiving real tDCS and subsequent cognitive rehabilitation with RehaCom will score better on the CANTAB test than patients with sham stimulation and cognitive training.

RESULTS

- To date, 50 patients have completed the study protocol. So far, we are observing a clinical improvement in cognitive functioning in patients from our centre, which is also confirmed by the investigators themselves. Further results will be developed after the study is completed, at which time an objective analysis of the collected data will take place.

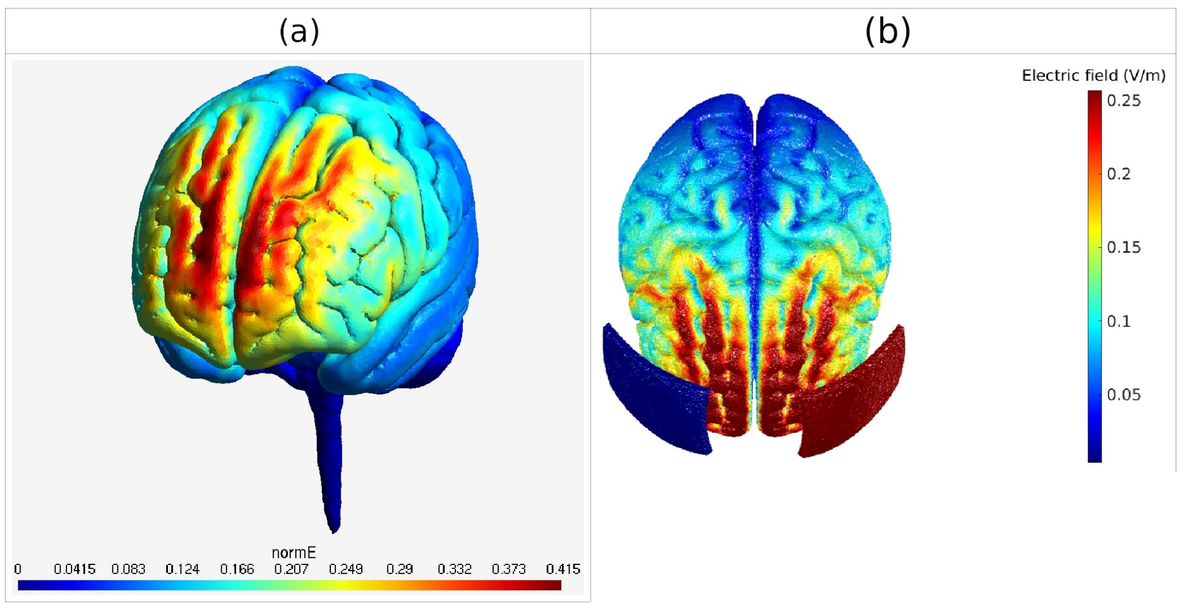

Figure 1 The distribution of the electric fields over the brain surfaces. The location of the red electrode (anode) is left DLPFC and the blue electrode (cathode) is right DLPFC.

Figure 2 RehaCom
https://hasomed.de/en/