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THE INTERACTION OF TRANSCRANIAL DIRECT CURRENT STIMULATION (tDCS) AND PACED BREATHING ON ACOUSTIC AND LEXICAL SPEECH FEATURES IN THE CONTEXT OF STRESS

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Speech features are increasing in popularity as potential biomarkers for stress and have shown promising results in the context of psychosocial stressors (1). Speech is actively influenced by numerous bottom-up physiological processes, such as cardiac activity and breathing (2). Whereas slow-paced breathing quickly and directly affects the afferent vagus nerve, transcranial direct current stimulation (tDCS) has been shown to modulate stress regulatory processes. In this between-subjects study, we aim to investigate whether combining slow-paced breathing and tDCS stimulation could beneficially interact in modulating affective and stress processes. As such, we collected high-quality free speech recordings in 160 healthy subjects at (1) baseline, (2) after a controlled breathing baseline (slow/fast), (3) after a combination block where tDCS (active/sham) is added to the breathing condition (slow/fast), and (4) after subsequent stress induction (TSST; Trier Social Stress Test arithmetic task; Figure 1).

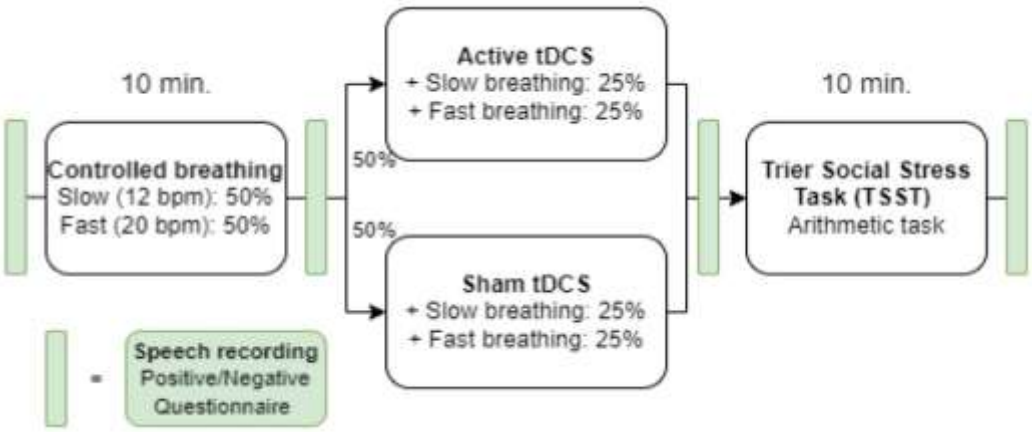

Figure 1. Study flow. Green blocks: speech and self-reported positive/negative affect collection. Participants were randomly assigned to one of four combined tDCS (active/sham) + controlled breathing (slow/fast) interventions; 4 groups. Abbreviations: bpm, breaths per minute; tDCS, transcranial direct current stimulation.

Interactive effects of controlled breathing and tDCS will be investigated on key acoustic features including F0, Jitter, and Shimmer, and lexical features including vocabulary size and use of personal pronouns. Specifically, we will compare the four groups in a 2 (active/sham tDCS) x 2 (slow/fast breathing) design using mixed models and ANOVA testing. These results will further unveil the complex dynamics of speech production and its relation to bottom-up (i.e., physiological activity) and top-down (i.e., tDCS) interventions. Moreover, due to the presence of a validated stressor post- manipulation, we can position these results in the context of stress and add to its potential as a novel biomarker for stress.

Keywords: *paced breathing – tDCS – stress – speech - biomarker*

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BI-FRONTAL tDCS CAN IMPROVE FACIAL EMOTION RECOGNITION IN MAJOR DEPRESSIVE DISORDER: AN EXPLORATORY PILOT STUDY

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The dorsolateral prefrontal cortex (DLPFC) plays a pivotal role in both depressive symptoms and emotional processing. Recently, transcranial Direct Current Stimulation (tDCS) applied over the DLPFC hold promises to alleviate clinical symptoms in patients with MDD. However, only a few studies investigated the effect of tDCS on emotional processing whereas antidepressant drugs are known to improve such deficits in patients with MDD. Here, we investigated the effect of DLPFC-tDCS a facial emotion recognition task (FER) in patients with MDD.

In a randomized sham-controlled study, 40 patients with treatment-resistant MDD received a single session (30 min) of either active (2 mA, n=18) or sham tDCS (n=17). The anode was placed over the left and the cathode over the right DLPFC, respectively. FER was assessed before and after the stimulation session.

After active tDCS, we observed an overall improvement in FER performance as compared with sham tDCS. The beneficial effect seemed mainly drive by an improved recognition of Sad faces. No significant effect of the sham stimulation was observed. The session was well tolerated.

Although exploratory, these results suggest that a single session of tDCS may improve social cognition in patients with MDD. Further studies are needed to replicate these results and investigate whether this acute improvement of FER in response to tDCS could translate into clinical benefits as observed with antidepressant drugs.

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REAL WORLD TRANSCRANIAL MAGNETIC STIMULATION FOR MAJOR DEPRESSION IN FRANCE: A MULTISITE, NATURALISTIC, RETROSPECTIVE STUDY

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Background: Repetitive Transcranial Magnetic Stimulation (TMS) was approved in 2008 by the US FDA. Meta-analyses of randomized controlled trials have confirmed its efficacy in the treatment of depression. However, real-world outcomes of rTMS remain understudied. We aimed to study how TMS therapy used to treat depression is delivered in routine clinical practice in France, and to measure its effectiveness and potential moderators of this effectiveness.