

psychosocial stress task. Interestingly, taVNS significantly reduced cognitive rigidity, reflected by reduced subjective perseverative thinking after psychosocial stress. Although there were no direct effects on autonomic correlates of perseverative cognition, stimulation intensity significantly moderated the effects of taVNS on HRV, with higher taVNS intensities being associated with higher levels of HRV. Contrarily, the results indicated that individuals who engaged more in perseverative thinking showed more autonomic flexibility during stress recovery following taVNS, suggesting a possible dissociation between the physiological and psychological changes following taVNS. Again, this effect was moderated by stimulation intensity. Overall, the study findings endorse the causal link between perseverative cognitions and the vagus nerve and, although replication is pivotal, hint towards a linear relationship between taVNS intensity and HRV.

**Key words:** *transcutaneous auricular vagus nerve stimulation (taVNS) - perseverative cognition - heart rate variability - cognitive rigidity - psychosocial stress*

## **REDUCING DISGUST AND MORAL RIGIDITY THROUGH TRANSCRANIAL DIRECT CURRENT STIMULATION (tDCS): CLINICAL IMPLICATIONS FOR OBSESSIVE-COMPULSIVE DISORDER**

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The experience of deontological guilt has been found to selectively activate the brain region of the insula, a well-known structure implicated in the processing of disgust. Moreover, previous studies showed a hyperactivity of the insula in persons with obsessive-compulsive disorder (OCD), in which deontological guilt and disgust play a pivotal role in pathogenesis and maintenance of symptoms. The present study tested the hypothesis that indirect inhibition of the insula via cathodal transcranial direct current stimulation (tDCS) would decrease disgust and moral rigidity. By using a randomized, sham-controlled, within-subject design, 36 healthy individuals (18 women) underwent 15-min anodal, cathodal, and sham tDCS over T3 in three different days. Levels of OC tendencies as well as pre and post-stimulation momentary emotional states were assessed. Subjects' heart rate (HR) was recorded to derive measures of parasympathetic nervous system activity (Heart Rate Variability, HRV). After the first 10 minutes of tDCS stimulation, participants were asked to complete a computerized moral task and a word-stem completion task with either disgust-related words or neutral alternatives. Compared to sham condition, anodal and cathodal stimulation of T3 respectively enhanced and decreased self-reported disgust, severity of moral judgements in the deontological domain, and HRV. A positive correlation emerged in the anodal condition between scores on the Obsessive-Compulsive Inventory-Revised (OCI-R) and self-reported disgust, between deontological guilt and the Fear-of-Sin (FoS) subscale of the Pennsylvania Inventory of Scrupolosity (PIOS), and between deontological guilt and the washing and obsessing subscales of the OCI-R; in the cathodal condition, disgust inversely correlated with the FoS and the washing and obsessing subscales of the OCI-R. To conclude, results showed a decrease in self-reported and physiological disgust, and deontological moral rigidity following cathodal tDCS on T3, with stronger effects in individuals with higher levels of OC traits, thereby suggesting potential implications for OCD treatment.

**Key words:** *transcranial direct current stimulation (tDCS) – disgust - moral rigidity - heart rate variability - obsessive-compulsive disorder (OCD)*

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## DOUBLE-DOSED NON-INVASIVE BRAIN STIMULATION: IS MORE BETTER?

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Since the FDA-approved once-daily intermittent theta-burst stimulation (iTBS) treatment for depression rapidly extends to six weeks, patients and caregivers face a considerable logistic burden. Therefore, twice-daily stimulation has gained popularity as a therapeutic tool for stress-related psychiatric disorders. However, the neuro-endocrinological effect of one or two (double-dosed) iTBS sessions remains unclear. Considering that the most frequently stimulated target of non-invasive brain stimulation in psychiatry, the dorsolateral prefrontal cortex (DLPFC), is involved in regulating the hypothalamic-pituitary-adrenal (HPA) system, stress regulation responses, such as cortisol secretion, are of interest. Using a two-period cross-over design, this study looked at the effect of double-dosed iTBS over the left DLPFC on salivary cortisol in 38 healthy volunteers after being stressed with the Trier Social Stress Test (TSST). After the first active iTBS session, no differential effects on salivary output were observed as contrasted to sham. However, after the second active session, there was a significantly smaller decrease in salivary cortisol concentrations in the active iTBS condition than in the sham condition. Our results suggest that double-dosed iTBS after being stressed might affect stress recovery differently than a single session of iTBS.

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## BRAIN DERIVED NEUROTROPHIC FACTOR NEGATIVELY RESPONDED TO TRANSCRANIAL DIRECT CURRENT STIMULATION: RANDOMIZED CONTROLLED TRIAL

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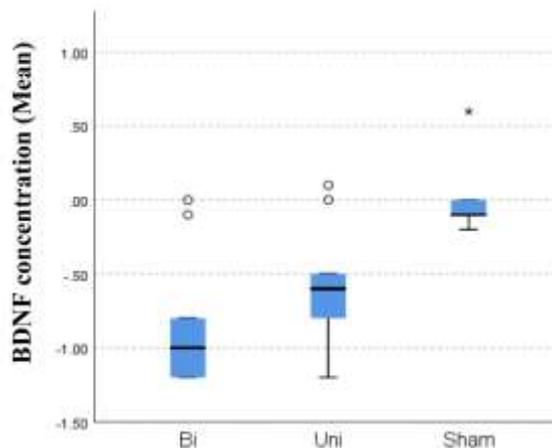
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**Background:** Brain-derived neurotrophic factor (BDNF) levels could objectively indicate the synaptic plasticity; it has also been suggested that modulation of the (BDNF) might be a part of the mechanisms involved in transcranial direct current stimulation tDCS effects on synaptic connectivity. The aim of this study is to investigate associated change within BDNF level in response to brain stimulation in subacute stroke patients. The trial registration in the clinical trial ID is NCT04770363.



**Figure 1.** Mean negative change in BDNF concentration between unihemispheric, bihemispheric, and sham groups, as represented in the Box-plot of the Kruskal-Wallis rank-sum test