

COGNITIVE ENHANCEMENT USING TDCS IN HIGH AND LOW RUMINATION INDIVIDUALS: THE ROLE OF COGNITIVE PROFILES AND PSYCHOLOGICAL TRAITS

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1. BACKGROUND

- Transcranial direct current stimulation (tDCS), a non-invasive brain stimulation technique, has been shown to modulate cognitive processes involved in executive functions, especially working memory and attention [1, 2].
- Negative cognitive styles, like ruminative thinking, also influence cognitive outcomes in healthy subjects [3].
- Other psychological traits, namely self-criticism, perfectionism, anxiety sensitivity, and stress reactivity, have been shown to negatively influence executive functioning, and to be associated with rumination [4].

2. OBJECTIVES

Investigate whether differences in trait rumination, while controlling for other psychological traits such as perfectionism, anxiety sensitivity, stress reactivity and self-criticism can influence the cognitive outcomes of tDCS, namely positive effects on working memory and attention.

4. IMPACT

The E-Brain project will significantly impact the current knowledge about the potential of tDCS as a biological cognitive enhancer, offering empirical evidence about the tDCS effect on specific cognitive processes in specific populations.

5. REFERENCES

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3. METHODS

- **Procedure:** A single-blind, placebo-controlled study design will be used, with the following order: (1) Exclusion criteria screening (online); (2) Application of self-report measures of rumination, perfectionism, anxiety sensitivity, and stress reactivity (online), (3) Completion of a baseline test of working memory and attention (online); (4) tDCS session (in-person); (5) Completion of the working memory and attention tests after stimulation (in-person)
- **tDCS parameters:** Either active or sham (placebo) stimulation to the left DLPFC (anode-F3) in a single session
- **Participants:** At least 106 healthy participants will be recruited, which will be allocated to one of four groups: high rumination-sham tDCS, low rumination-active tDCS, low rumination-active tDCS, and low rumination-sham tDCS.
- **Exclusion Criteria:**
 - prior history of neurological or psychiatric disorders and use of psychotropic medication;
 - left-handedness;
 - displaying COVID-19-related symptoms;
 - heavy tobacco consumption;
 - caffeine and/or alcohol consumption in the 24 hours prior;
 - intense physical exercise and/or consumed a heavy meal in the two hours prior;
 - being pregnant;
 - displaying non-corrected visual deficits;
 - tDCS-specific exclusion criteria.
- **Measures:**
 - **Working memory** - Verbal n-back task
 - **Attention** - d2 test
 - **Rumination** - Ruminative Response Scale - Short Form
 - **Perfectionism** - Multidimensional Perfectionism Scale
 - **Anxiety Sensitivity** - Anxiety Sensitivity Index-3-PT
 - **Stress Reactivity** - Perceived Stress Reactivity Scale; and Screening-Scale of Chronic Stress, the short form of the Trier Inventory for the Assessment of Chronic Stress