Emotional Regulation Competences but not Extraversion are Related to the Modulatory Impact of Transcranial Direct Current Stimulation (tDCS) on Emotional Regulation

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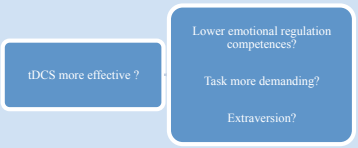
Background

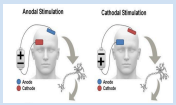
Emotional regulation constitutes an important area of research for reaching a comprehensive picture of human emotional experience, and several lines of evidence claim that poor emotional regulation skills are particularly deleterious in different aspects of life.
Previous transcranial direct current stimulation (tDCS) studies have suggested the beneficial role of dorsolateral prefrontal cortex (DLPFC) stimulation for improving emotional processing and regulation.
Interestingly, dispositional traits like extraversion have been reported to modulate the impact of tDCS on emotional regulation.

Objective



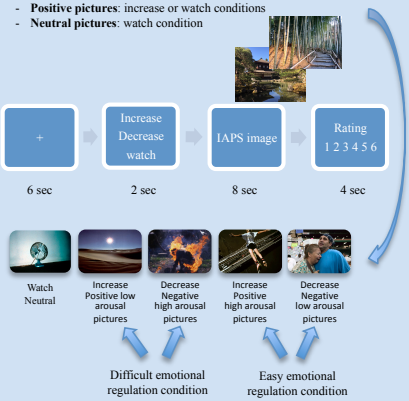
Methods

- Between-subject study
- **54 female participants** (mean age of 22.2 years, SD = 2.93)
- tDCS was applied through a pair of saline-soaked surface sponge electrodes (anodal surface = 9 cm^2, cathodal surface = 25 cm^2) connected to a battery-driven constant current stimulator
- **Anodal stimulation**: The anode electrode was placed over the left DLPFC (F3 localization according to the 10/20 EEG international system), and the cathode was placed above the right supraorbital region (Fp2)
- **Cathodal stimulation**: The cathode electrode was placed over the left DLPFC (F3), and the anode was placed above the right supraorbital region (Fp2)
- Active stimulation consisted of a constant current of 1.5 mA applied for 25 min, corresponding to the duration of the task
- Sham condition consisted of stimulation for 30 seconds, and then the stimulator was turned off
- Questionnaires: Cognitive Emotion Regulation Questionnaire (CERQ), Trait Emotional Intelligence Questionnaire (TEIQue), and Big Five Inventory (BFI)



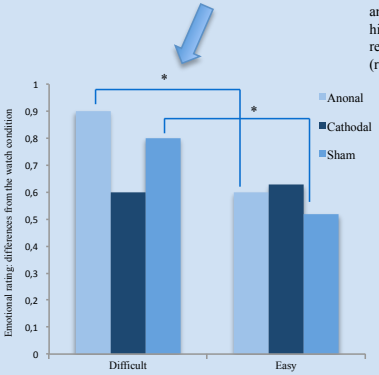
Procedure

- Participants were presented pictures that were proposed to elicit either a negative (e.g., accidents, natural catastrophes, disease, violence, crime), positive (e.g., domestic pets, lands, sunsets, romantic situations), or neutral (e.g., chairs, shoes) emotional responses.
- The stimuli consisted of 16 negative high arousal pictures,16 negative low arousal pictures, 16 positive high arousal pictures,16 positive low arousal pictures, and 8 neutral pictures from the International Affective Picture System
- **Task:** watch or regulate (increase or decrease)
- **Negative pictures**: decrease or watch conditions
- **Positive pictures**: increase or watch conditions
- **Neutral pictures**: watch condition

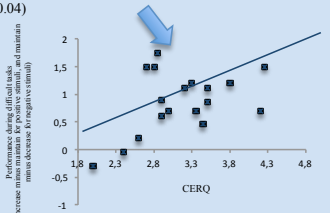


Results

The main result shows that cathodal tDCS impairs the ability to regulate emotion in difficult conditions (i.e., decrease emotion for high negative arousing stimuli and increase emotion for low positive arousing stimuli) (*=p<0.01)



Individual emotional regulation competences modulate the impact of anodal tDCS, meaning that the more the emotional competences are high, the more the individuals are able to regulate their emotional responses in difficult conditions after anodal tDCS stimulation (r^2=0.47, p=0.04)



Conclusion

This study provides additional data on the use of tDCS as a tool to increase emotional regulation, and suggests that the modulatory impact of tDCS would be more efficient in difficult emotional regulation conditions among individuals with higher emotional regulation competences