
The effects of transcranial Direct Current Stimulation (tDCS) to the prefrontal cortex on the neuro-circuitry of emotional control

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Abstract

Transcranial Direct Current Stimulation (tDCS) is the application of weak electrical currents (1-2 mA) to modulate the activity of cortico-subcortical circuitries in the brain. Given the effects of tDCS on the neuro-circuitry of emotion and emotional control, we were interested in the effects of the stimulation on cognitive control for emotional information. Hence, using a placebo controlled cross over design, anodal tDCS to the left DLPFC was administered in healthy volunteers. During each stimulation session (placebo or real), participants completed the Internal Shift Task (IST) to measure the ability to switch attention between emotional items in working memory. This process of cognitive control for emotional material is thought to be a crucial information-processing factor related to the tendency to ruminate, which is a maladaptive strategy to control over our emotions. Moreover, 128 resting state EEG was compared between real and placebo stimulation. Prefrontal EEG asymmetry is associated with poor emotion regulation. Results demonstrate an effect of tDCS on cognitive control for emotional information. More specifically, tDCS increased the ability to switch between emotionally negative information in working memory, and influenced resting frontal EEG asymmetry associated with affective responses of approach. Based on this study, we propose a beneficial effect of anodal tDCS to the left DLPFC on the ability to control over emotions, possibly through its influence on cognitive control over emotional material.

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