

Abstract

Individuals diagnosed with ADHD exhibit deficits in several cognitive functions versus healthy controls, primarily in working memory. Previous research indicates that anodal transcranial direct current stimulation (tDCS) applied to the left dorsolateral prefrontal cortex (DLPFC) region improves specific cognitive functions in individuals diagnosed with attention deficit hyperactivity disorder (ADHD) and also reports enhancements in verbal working memory functions in individuals with typical development. However, the impact of tDCS on verbal working memory in adults with ADHD remains unknown and has not been thoroughly explored. Therefore, in the current study, we aimed to investigate whether anodal tDCS to the left DLPFC region might enhance verbal working memory functions in adults with ADHD by comparing between active versus sham tDCS ADHD groups before and after one tDCS session (with participants unaware of the stimulation condition). The current study is part of a broader research conducted in collaboration, which also investigates the neural electrical activity using quantitative EEG (qEEG) during the performance of a verbal working memory task, both before and after electrical stimulation.

In this study, 46 participants (27 males and 19 females) diagnosed with ADHD without learning disabilities were randomly assigned to two groups. Twenty-three of them received anodal tDCS to the left DLPFC region at an intensity of 1.5 mA for 20 minutes, while the other 23 participants received sham stimulation (SHAM) serving as the control group. Participants completed an n-back task assessing verbal working memory functions before and after the tDCS session. In this task, participants were presented with a sequence of word pairs, with the stimuli consisting of two to five pairs of words spaced by the presentation of a fixation point (+ sign). Participants were instructed to quickly press the spacebar only if they identified that the single word had appeared within the two-word pairs presented two steps back (2-back). The current study did not reveal a significant improvement in WM performance following anodal tDCS, as measured across all task parameters (accuracy, response time, errors, clicked correctly, clicked incorrectly, avoided correctly, avoided incorrectly). Although no clear differences between active and sham groups in WM performance were noted in the current study, we suggest that further research with larger sample sizes, more stimulation sessions, and the assessments of various tDCS montages may be

needed to confirm the beneficial effects of tDCS interventions in adults with ADHD, and particularly its effectiveness in improving verbal WM performance.