

Abstract

The overarching goal of the study was to characterize the neural activity using quantitative Electroencephalography (qEEG) during a verbal working memory task before and after non-invasive electrical stimulation above the prefrontal cortex. The electrical stimulation was performed using tDCS (sham stimulation versus active stimulation) in young adults diagnosed with ADHD as part of a broad research that was done in collaboration and tested both improvement in working memory performance after vs before brain stimulation and the brain waves measurements before and after the brain stimulation. This study focused on theta and alpha frequencies under two left prefrontal-parietal electrodes (F7 and P7) and two right prefrontal-parietal electrodes (F8 and P8). We chose these target electrodes because they were found to be associated with predicting memory functions based on theta and alpha wave activity in humans. The goals of this study were to examine the following possibilities: 1. To find differences in the average amplitude intensity in the theta and alpha wave ranges between the groups (sham stimulation vs active stimulation) and before vs after stimulation. 2. To find differences in the average difference in amplitude in frontal versus parietal theta waves before versus after brain stimulation. 3. To find differences in the average difference in amplitude in alpha waves between a resting state and a state of performing the working memory task before versus after the brain stimulation. The findings in the study demonstrated that there were no significant differences in the average intensity of the amplitudes between the study groups before versus after brain stimulation in both theta waves and alpha waves. Similarly, there were no significant differences in frontal versus parietal differences in theta waves and differences between resting state and working memory performance in alpha waves. Explanations for the obtained findings include the size of the sample and a large difference in the ages of the subjects. There are previous evidences to suggest that quantitative EEG (qEEG) varies with age. Another explanation for the differences in electrical brain activity stems from parameters of the electrical stimulation that varies from study to study. Parameters such as: location, current strength and polarity. It should also be emphasized that the measurement of brain electrical activity is greatly influenced by a variety of methodological and technical factors such as the distance between electrodes, the size of the electrodes or the location of the electrodes and by more specific factors such as age, developmental background, general attentional arousal and specific cognitive demands during task execution.