

The Effect of Transcranial Direct Current Stimulation on Attention and Electroencephalographic Pattern in Children with Attention Deficit Disorder

Naeemeh Sayafan *

Alireza Hajiyakhchali **

Manijeh Shehniyailagh ***

Introduction

Attention can be described as the choice of a thing or thought from several thoughts or several things by the mind so clearly that it seems to have happened at the same time. The ability to pay attention allows a person to control the entry of different stimuli into the consciousness stage of the mind and choose only a limited number of them from different stimuli. Research shows that attention deficit disorder is one of the main educational problems.

Method

The statistical population was all the children with attention deficit disorder who were referred to a counseling center, in Shiraz in 2019. The statistical sample consisted of 36 children between 8 to 11 years old, who were selected from the counseling center using a targeted sampling method. Then they were assigned into three groups of control (12 persons) and an experimental group (12 samples). In the experimental group, the anode electrode was placed on the FP1 region, and the cathode electrode was placed on the right shoulder blade and fastened to the head with a clamp. In each session, transcranial direct current stimulation was applied at an intensity of 1 mA for 30 minutes for each subject. Research tools were the Demographic Characteristics

* M.A. of Cognitive Sciences, Department of Psychology, Faculty of Education and Psychology, Shahid Chamran University of Ahvaz, Ahvaz, Iran.

** Associate professor, Department of Psychology, Faculty of Education and Psychology, Shahid Chamran University of Ahvaz, Ahvaz, Iran. *Corresponding author:* a.haji@scu.ac.ir

*** Professor, Department of Psychology, Faculty of Education and Psychology, Shahid Chamran University of Ahvaz, Ahvaz, Iran.

Questionnaire, Stroop Effect Test, and Electroencephalograph recorder. 10 transcranial Direct Current Stimulation sessions for each subject in the experimental group were done over three weeks. During the interventions, the control group was under the passage of time. In the post-test, both groups were compared in terms of attention and Electroencephalographic patterns. The statistical data analysis was performed using the analysis of covariance at $p < 0.05$. SPSS software was used for data analysis.

Results

The results of the pre-test and post-test comparison showed that the effect of transcranial Direct Current Stimulation (tDCS) was significant in the experimental group. Therefore, it seems that transcranial Direct Current Stimulation affects the attention and electroencephalographic pattern of children with attention deficit disorder. As a result, transcranial Direct Current Stimulation can be used to treat children with attention deficit disorder. Since the level of students' attention to the subject of the lesson is one of the main factors of education and learning, therefore, according to the results of the mentioned studies and the present research, it can be concluded that Transcranial Direct Current Stimulation increases the excitability of the children's brain.

Conclusion

Transcranial Direct Current Stimulation is effective in improving selective attention and reducing the theta/beta ratio in the CZ region of children with attention deficit disorder. Therefore, it is suggested that extracranial Transcranial Direct Current Stimulation in the fp1 region be used as an adjunct to accelerate the treatment of children with ADD

Keywords: Attention deficit disorder, Electroencephalography, Stroop effect, tDCS

Author Contributions: Author 1 was responsible for leading the overall research process. Research plan design, data collection and analysis, Author 2 discussed the results, reviewed and Author 3 approved the final version of the manuscript.

Acknowledgments: The authors thank all dear teachers who have helped us in this research.

Conflicts of interest: The authors declare there is no conflict of interest in this article.

Funding: This research is not sponsored by any institution and all costs have been borne by the authors
