World Academy of Science, Engineering and Technology
International Journal of Biomedical and Biological Engineering
Vol:16, No:09, 2022

The Application of Transcranial Direct Current Stimulation (tDCS) Combined with Traditional Physical Therapy to Address Upper Limb Function in Chronic Stroke: A Case Study

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Abstract : Strokerecovery happens through neuroplasticity, which is highly influenced by the environment, including neuro-rehabilitation. Transcranial direct current stimulation (tDCS) may enhance recovery by modulating neuroplasticity. With tDCS, weak direct currents are applied noninvasively to modify excitability in the cortical areas under its electrodes. Combined with functional activities, this may facilitate motor recovery in neurologic disorders such as stroke. The purpose of this case study was to examine the effect of tDCS combined with 30 minutes of traditional physical therapy (PT)on arm function following a stroke. A 29-year-old male with chronic stroke involving the left middle cerebral artery territory went through the treatment protocol. Design The design included 5 weeks of treatment: 1 week of traditional PT, 2 weeks of sham tDCS combined with traditional PT, and 2 weeks of tDCS combined with traditional PT. PT included functional electrical stimulation (FES) of wrist extensors followed by task-specific functional training. Dual hemispheric tDCS with 1 mA intensity was applied on the sensorimotor cortices for the first 20 min of the treatment combined with FES. Assessments before and after each treatment block included Modified Ashworth Scale, ChedokeMcmaster Arm and Hand inventory, Action Research Arm Test (ARAT), and the Box and Blocks Test. Results showed reduced spasticity in elbow and wrist flexors only after tDCS combination weeks (+1 to 0). The patient demonstrated clinically meaningful improvements in gross motor and fine motor control over the duration of the study; however, components of the ARAT that require fine motor control improved the greatest during the experimental block. Average time improvement compared to baseline was26.29 s for tDCS combination weeks, 18.48 s for sham tDCS, and 6.83 for PT standard of care weeks. Combining dual hemispheric tDCS with the standard of care PT demonstrated improvements in hand dexterity greater than PT alone in this patient case.

Keywords : tDCS, stroke, case study, physical therapy
Conference Title : ICPPN 2022 : International Conference on Physiological Psychology and Neuroscience
Conference Location : Prague, Czechia
Conference Dates : September 08-09, 2022

Open Science Index, Biomedical and Biological Engineering Vol:16, No:09, 2022 publications.waset.org/abstracts/155097.pdf