SIMPOSIO XI - Non Invasive Brain Stimulation to alleviate cognitive and behavioral deficits in Neurodevelopmental disorders

Combining tDCS with a rhythm-based intervention to improve reading in adults with developmental dyslexia

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Abstract

Recent evidence showed that reading performance can be modulated using noninvasive brain stimulation by inducing excitability alterations in the brain regions involved in reading (e.g., Costanzo et al., 2016a). The aim of the present study was to test the efficacy of an intervention combining transcranial direct current stimulation (tDCS) with a behavioural training for improving reading in undergraduates with dyslexia. More precisely, a novel rhythm-based intervention for dyslexia, called Rhythmic Reading Training (RRT), of proven efficacy – as tested in younger populations – was employed. Twenty undergraduate students with a diagnosis of dyslexia aged 19-26 took part in an intervention comprising RRT and tDCS for 10 30-min daily sessions. Participants' left temporoparietal region was stimulated at a constant current of 1.5mA for 20 minutes. Participants were assigned to either an active or sham tDCS condition, so as to create two groups matched for gender, age, school grade, music expertise, level of intellectual functioning, and reading impairment. Reading measures, along with other reading-related cognitive functions, were collected pre, post, and four weeks after the end of the intervention. Significant reading improvements after 4 weeks of training yielded from both RRT combined with tDCS and RRT combined with sham stimulation. Further, reading gains persisted after the end of the intervention. Within-group comparisons showed that the combination of RRT with tDCS over the left temporoparietal region maximizes training efficacy, specifically on reading speed. Moreover, tDCS assured better medium-term outcomes in terms of reading improvements consolidation, presumably thanks to the brain plasticity induced by neuromodulation.