Effects of working memory training on neural correlates of Go/Nogo response control in adults with ADHD: A randomized controlled trial

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Abstract

Working memory and response control are conceptualized as functions that are part of a closely connected and integrated executive function system mediated by the prefrontal cortex and other related brain structures. In the present paper, we asked whether effects of intensive and adaptive computerized working memory training (CWMT) would generalize to enhancements in response control at behavioral and neural levels. A total of 135 postsecondary students with Attention-Deficit/Hyperactivity Disorder (ADHD), a condition associated with executive function impairments, were randomized into a Standard-length CWMT (45-min/session, 25 sessions), Shortened-length CWMT (15 min/session, 25 sessions), and a waitlist group. Both training groups received CWMT for 5 days a week for 5 weeks long. All participants completed a Go-Nogo task while neural activity was measured using Electroencephalography (EEG), before and after CWMT. Behavioral results showed trend level evidence (p = .061) for benefits of CWMT on response control (i.e., improved accuracy of Go responses). Among several neural measures results showed statistically significant changes after CWMT only for the Go trial ERP N2 and P3 in frontal electrodes (p = .039 and .001, respectively). However, given the lack of relationship between behavioural and neural changes and especially the clear lack of predicted Does effects (i.e., standard length > short length > control), we conclude that there is no convincing evidence that the working memory training per se changes neural activation patterns in untrained executive functions. The positive finding of general training related changes in this study should have no clinical implications, but may contribute to the literature in better understanding the relationship between neural plasticity and transfer.