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INVESTIGATING THE ROLE OF PARIETAL AND PREFRONTAL CORTICES IN SPATIAL WORKING MEMORY USING TDCS

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Introduction

Previous studies have suggested that the posterior parietal cortex (PPC), and dorsolateral prefrontal cortex (DLPFC) are involved in spatial working memory, as well as spatial and object working memory, respectively^{1,2}. The aim of this pilot study was to investigate whether modulation of the activity of the left PPC and the left DLPFC changes spatial

and object working memory performance. Transcranial direct current stimulation (tDCS) was used for this purpose. Based on past literature, we expected to see improvements in both spatial and object working memory after tDCS of the left DLPFC, as well as an improvement in spatial working memory after tDCS of the left PPC.

Methods

Participants (n = 12) attended three experimental sessions with different stimulation conditions. Fifteen minutes of 1.5 mA anodal tDCS was applied over either the left PPC, left DLPFC or occipital lobe as control condition, beginning five minutes before the task. Participants were required to perform a 2-back spatial and object working memory task; i.e., they were

required to pay attention to both objects and their location. Performance in three different conditions was measured for analysis: (1) 2-back working memory task for the cases in which both cue and target objects were presented in the same location (OWM-same), (2) in different location (OWM-different) and (3) spatial working memory (SWM) (Figure 1).

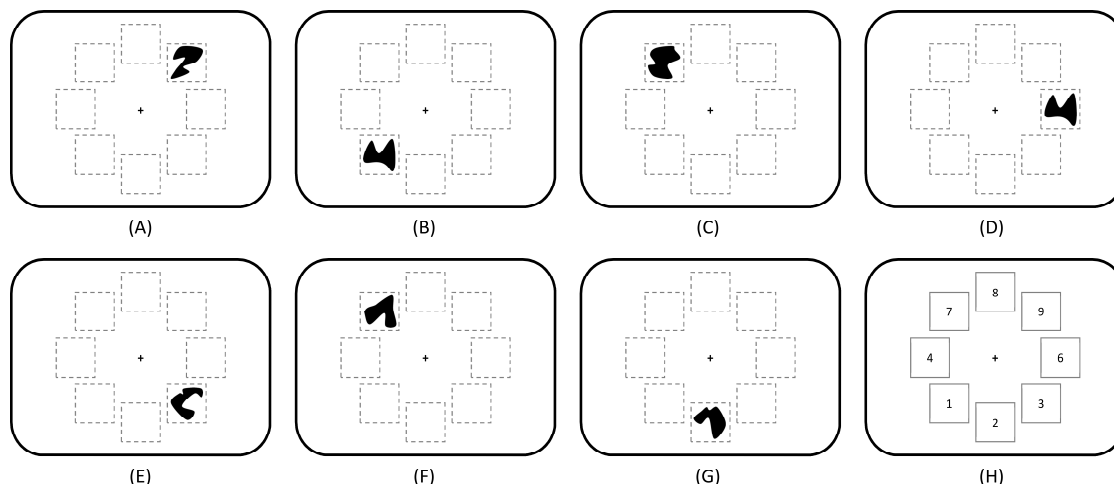


Figure 1. Procedure of the task. panel D is a 2-back hit. This is an OWM-different condition. Panel H refers to the location of the object in panel F. This is a SWM condition. Squares with dashed border were not visible.

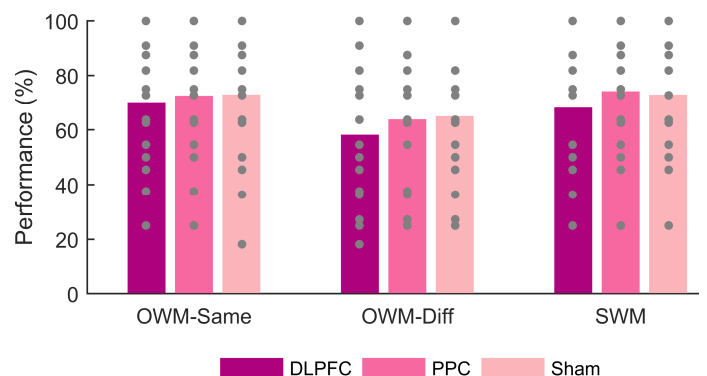
Figure 2. Performance of the participants in different conditions

Results

Results showed that performance in the OWM-different condition was lower than OWM-same. However, there was no significant difference between different stimulation conditions, which is contrary to past literature^{3,4} (Figure 2).

Conclusions

- These results suggest that anodal tDCS on the left PPC and left DLPFC might not be able to modulate spatial and object working memory performance.
- Further studies are needed to investigate the differential role(s) of the DLPFC and PPC in spatial and working memory.



References

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