



Changes in neuronal oscillations account for working memory dynamics: EEG-tACS study



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The ability to focus on a task is supported by a global inhibition of irrelevant information. Evidence showed that alpha oscillations play a key role in protecting relevant information from irrelevant information during a working memory (WM) task. Specifically, the occipito-parietal alpha power increases and aligns in phase prior to the anticipation of "distractor" stimuli as a signature of suppression of irrelevant information during WM processing.

We investigated the role of inhibitory alpha during a Sternberg-like WM paradigm by adopting an Electroencephalography (EEG) – Transcranial Alternating Current Stimulation (tACS) approach. Firstly, 25 subjects were submitted to a behavioral task in order to test the reliability of the match-to-sample paradigm. Results showed that inhibition of strong distractors affected the WM performance with respect to weak-distractors and to no

distractors. In a subsequent experiment, 15 subjects were submitted to the EEG-tACS paradigm. In the first part of the experiment, subjects performed the WM task during EEG recording. Afterwards, EEG analysis was performed inside one-hour break in order to detect the individual alpha frequency (IAF) responsible of the distractor inhibition process. In a second part of the experiment, online tACS was applied over the right occipito-parietal cortex (PO8, 10–20 system) while subjects were again performing the WM task. The stimulation frequency was set based on the previous EEG analysis at the IAF in order to test a potential entrainment effect. Control stimulation condition were set at IAF + 3Hz and sham (placebo). Preliminary results showed that stimulation at IAF and IAF + 3Hz, led to an improvement of performance compared to sham stimulation. However, this effect was present only during the first session of the experiment, which might be an indicator of an interference effect between the randomized stimulation conditions.

This abstract was originally intended to be published as part of the 3rd International Brain Stimulation Meeting abstracts, published in Brain Stimulation issue 12/2.

Funding

This work is supported by Russian Science Foundation grant (contract number: 17-11-01273).