Transcranial alternating current stimulation in chronic neglect patients: effective as add-on to functional treatment?

Marij Middag-van Spanje
Faculty of Psychology and Neuroscience, Cognition, Maastricht University, Netherlands

Oscillatory activity in the alpha range (8-12 Hz) in posterior parietal cortices has been linked to spatial attention bias and orienting shifts of attention to either hemifield in healthy subjects. In our recent study, we showed that transcranial alternating current stimulation (tACS), applied at alpha frequency, influences lateralization of alpha power and visuospatial attention performance (Kemmerer et al., 2022). Our results suggest a causal functional role of alpha oscillations in visuospatial attention and show that tACS can be used to modulate alpha power in healthy subjects. We then put this oscillation-based NIBS intervention to the test in sub-acute stroke patients suffering from visuospatial neglect (Schuhmann et al., 2022). In sixteen stroke patients, we applied 10 Hz tACS (and sham) targeting the contralesional posterior parietal cortex. We were able to show a shift of attentional resources to the contralesional hemifield in a novel computerized visual detection task and a widely used standard cancellation task, thus ameliorating neglect symptoms. Based on this proof-of-concept study, we went one step further and combined applying 10 Hz tACS (or sham) stimulation 3 times a week together with a computerized cognitive training (visual scanning training) for 6 weeks in chronic neglect patients (Middag-van Spanje et al., 2022). We tested 22 patients on several (novel and conventional) neuropsychological neglect tasks as well as on measures that assess effects on daily life activities at six time points, namely at baseline, after one training session, after 3 weeks of training, after 6 weeks of training, and at 1-week and 3-months follow-up. Preliminary data will be presented in the workshop.

Bibliography

Kemmerer SK, Sack AT, De Graaf TA, Ten Oever S, De Weerd P, & Schuhmann T. (2022). Frequency-specific transcranial neuromodulation of alpha power alters visuospatial attention performance. Brain Research, 1782, 147834.

Middag-van Spanje M, Schuhmann T, Nijboer T, Van der Werf O, Sack AT, & Van Heugten C. (2022). Study protocol of transcranial electrical stimulation at alpha frequency applied during rehabilitation: A randomized controlled trial in chronic stroke patients with visuospatial neglect. BMC Neurology, 22:402.

Schuhmann T, Duecker F, Middag-van Spanje M, Gallotto S, Van Heugten C, Schrijnemaekers AC, Van Oostenbrugge R, & Sack AT (2022). Transcranial alternating brain stimulation at alpha frequency reduces hemispatial neglect symptoms in stroke patients. International Journal of Clinical and Health Psychology, 22, 100326.