

fMRI-based Neurofeedback Modulation of Visual Attention: Implication for Hemi-spatial Neglect Syndrome Rehabilitation

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Hemi-spatial Neglect is a syndrome which usually occurs following right parietal lesion and it is characterized by failures in orienting attention towards the contralateral (left) visual field. Real-time neurofeedback (rt-NFB) modulation of preserved visual areas activity appears as a promising rehabilitative tool to train restore top-down attention to contralateral inputs. Indeed, early visual areas are normally modulated during attentional processes from several higher-level (frontal, parietal) regions. Following lesion and therefore disconnection in such intricate attentional networks, visual areas activity enhancement through training may allow improving attentional processes (see Robineau et al., 2017).

Following this hypothesis, we trained healthy subjects to regulate activity in either left or right occipital cortex via functional MRI (fMRI) rt-NFB and assessed behavioral improvements pre and post-treatment using several attentional tasks. At the same time, concomitant EEG-fMRI multimodal imaging during neurofeedback allows us to underpin neural signatures of successful brain activity regulation at high spatial and temporal resolution.

Preliminary results show that participants are able to correctly modulate their brain activity in the scanner and such changes could relate to several behavioral/EEG components. Subsequent phases of this project will allow us to validate these results in a clinical cohort, as well as to develop an informed EEG-based neurofeedback novel protocol for rehabilitation from Neglect.

Bibliography

Robineau F, Saj A, Neveu R, Van De Ville D, Scharnowski F, Vuilleumier P. Using real-time fMRI neurofeedback to restore right occipital cortex activity in patients with left visuo-spatial neglect: proof-of-principle and preliminary results. *Neuropsychol Rehabil.* 2019 Apr;29(3):339-360.