A randomized controlled trial of fMRI-neurofeedback in depression - Pilot

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With real-time functional MRI Neurofeedback (NF) someone can learn to self-regulate specific brain areas or networks of interest[1]. Previous studies have shown that both healthy participants and patients with depression are able to gain control over emotional brain networks[2,3,4]. Mehler and colleagues (2018) studied the clinical benefits of NF for depression patients. The experimental group was trained to activate brain areas involved in processing positive emotions. The control group was trained to activate the parahippocampal place area. Because both the experimental and the control group in the study from Mehler and colleagues (2018) showed substantial clinical improvements, we cannot discern whether this improvement was due to the NF training, or whether the patients would have shown the same improvement with their standard care alone. Therefore, the current single-blind randomized control trial (RCT) will compare clinical improvements of patients receiving NF training (on top of their usual care) with patients receiving standard care alone. Patients of both groups

will be assessed on their depression status at baseline, 10 weeks and 6-months after the baseline assessment. After the baseline assessment, half of the patients will receive 5 fMRI-NF training sessions. During each of those sessions, first, a functional localizer will be used to select an individualized region, responsive to positive emotions. Next, the patient is asked to upregulate the activity in this selected target region, by for example activating positive memories. While doing so, the patient receives feedback of the level of activity in the target area, in the form of a thermometer. The level of this thermometer is in turn updated in real-time based on the neural activity.

Current pilot data of two patients indicate the current protocol has a good practical feasibility. Both patients were to some extent able to upregulate activity in the selected target regions. An optimization of the current protocol regarding the duration of the scanning sessions, and regarding the approach to select the NF target region will be piloted.

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