Regulation of emotion networks in depression

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Since its invention 20 years ago, functional magnetic resonance imaging (fMRI) has become one of the most widely used and probably the publicly most visible non-invasive technique to measure brain activation. FMRI-based neurofeedback (fMRI-NF) has the potential to open up new paths to translation. During fMRI-NF training, participants receive feedback on their brain activity in real-time and are instructed to change this activation, for example by engaging in specific mental imagery. One attractive feature of neurofeedback is that it enables the patients themselves to control their brain activity and thus contributes to their experience of self-efficacy, which is an important therapeutic factor in many neuropsychiatric disorders.

In the first interventional application of fMRI-NF to a mental disorder, we demonstrated feasibility of upregulation of areas responsive to positive affective cues in patients with depression (Linden et al., 2012). Eight patients undergoing four weekly sessions of fMRI-NF improved significantly (by four points) on the Hamilton Depression Rating Scale (HDRS-17), whereas a control group undergoing a similar imagery protocol outside the scanner did not improve clinically. We are presently following up these first results in a larger clinical trial (clinicaltrials.gov: NCT01544205).

Central challenges for future clinical studies are identifying the symptoms and disorders that will respond to fMRI-NF; adapting the fMRI-NF treatment protocols to the neural networks involved in each of the disorders; evaluating the underlying neurophysiological mechanisms and lastly devising training strategies that enable sustainable long-term effects of fMRI-NF.

Lit.

Linden, D. E., Habes, I., Johnston, S. J., Linden, S., Tatineni, R., Subramanian, L., . . . Goebel, R. (2012). Real-time self-regulation of emotion networks in patients with depression. P*LoS One, 7(*6), e38115.