

Scientific and clinical applications of EEG and fMRI neurofeedback

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In contrast to conventional neuroimaging experiments where behavioral task or sensory stimulation is the independent variable and brain activity the dependent variable, in neurofeedback (NFB) experiments brain activity is the independent variable. Similar to other interventional techniques (e.g. transcranial magnetic stimulation, deep brain stimulation, or psychopharmacology), NFB allows for establishing a causal link between brain activity and behavior. Neuroplasticity and behavioral effects following NFB training have been demonstrated in multiple modalities, meanwhile fMRI and EEG have experienced parallel technical advances. For example, reports have shown that homologous cortical regions (e.g. anterior cingulate, visual cortex) may be modulated via complementary NFB modalities such as real-time fMRI or EEG. Further advances include neurofeedback using magnetoencephalography and new applications using functional near-infrared spectroscopy. Hitherto, these fields have largely been developing without input from each other, yet we have now reached a point where modalities are beginning to fuse and complement each other. This symposium will present a state-of-the-art selection of multimodal NFB approaches (ultra-high field fMRI, EEG-fMRI, fNIRS, robotics) that share intersecting mechanisms of action and illustrate the diverse applications of NFB in scientific and clinical domains, including psychiatry and neurorehabilitation.

Methodological advances in real-time fMRI for high-speed, high-resolution clinical neurofeedback and brain-computer interface applications

Rainer Göbel, Maastricht University, Maastricht, Netherlands

fMRI- and EEG-Assisted Neurofeedback Training of Amygdala in Posttraumatic Stress and Major Depressive Disorder

Jerzy Bodurka, Laureate Institute for Brain Research, Tulsa, OK, United States

From fMRI to EEG and Back: validating a novel limbic-neurofeedback approach to emotional regulation

Talma Hendler, Faculty of Medicine, Sagol School of Neuroscience Tel-Aviv University, Tel-Aviv, Israel

EEG and Real Time fMRI Neurofeedback Recruits Emotion Regulation Regions in PTSD

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