C.E.N.T. Computer Enabled Neuroplasticity Treatment

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University of Helsinki introduces Neurofeedback to Finland. Finland is heavily invested in cutting- edge brain science, yet it has never before had dealings with neurofeedback (NFB), either in research or clinical practice. However research on ADHD in Finland has developed strongly (e.g. Helenius et al., 2011, Gumenyuk et al., 2004) and thus provides a good ground for the introduction of neurofeedback into Finland.

The CENT project will conduct a study on the effects of NFB on adult ADHD within Finland. Research is being conducted by the Cognitive Science Unit at the Institute of Behavioural Sciences, University of Helsinki, with NFB conducted by trained technicians supervised by qualified psychotherapists. Software is custom-built for the project, with games sourced from local companies.

**STUDY DESIGN**

The experiment aims to test the efficacy of neurofeedback for adults with either ADHD or ADD by randomized controlled clinical trial (RCT). The persistence of the treatment effects will also be tested with a follow-up study. Additionally we will study the neurological symptoms of adult ADHD/ADD using laboratory-grade EEG to examine the Event-Related Potentials (ERP) of patients as they perform attentional tasks, and analyse the patterns of hemispheric activity that characterise them. Both latter studies will use control groups of healthy non-ADHD/ADD subjects.

**HARDWARE**

The study is using Neuroelectrics’ Enbio system to feedback patient’s EEG signals. Enbio is a wireless 4-channel active-electrode EEG amplifier, which can utilise wet or dry electrodes interchangeably. With dry electrodes, uncomfortable abrasive skin preparation and messy gel is not needed, so recording can start almost immediately after the subject is ready and electrochemical equilibrium is established.

- **Sampling rate:** 256Hz
- **Frequency range:** DC-125Hz
- **Common-Mode Rejection Ratio:** 92dB
- **Signal-to-Noise Ratio:** 83dB
- **Electrodes:** active wet/dry Ag/AgCl
- **Amplifier noise:** 0.5 µV
- **Driven-Right Leg Reference:**
- **Low-powered radio connection:**

**SOFTWARE**

A new software platform was developed by the Finnish company BLStream for the study, integrating OpenViBE platform’s signal analysis capabilities with a graphical user interface designed for the project. The platform gives the researcher or clinician the option to use different neurofeedback protocols and activities, for example different games or auditory content. The program records relevant background information on the patient’s state before each session and tracks the patient’s progress as the treatment proceeds.

The program is designed for a dual-monitor setup, with separate monitors for the therapist and the patient. In principle it is possible for the patient and the therapist to be in different locations while training, thus enabling tele-neurofeedback.

The training itself is based on thresholds calculated from baseline measurements. Currently two NFB protocols are supported, theta-beta (the default option) and SMR, one of these is chosen by the trainer at the beginning of a session.

**REFERENCES**


