

Neurofeedback and Addiction

Neurofeedback is a computer-supported therapy procedure for clinical use, in which selected parameters of the patient's own brain activity are made perceptible. For this purpose, brain waves are measured in real time on the surface of the head (neuro), which influences an audiovisual animation (feedback). Since all signals, recorded by the sensory organs of the central nervous system, are constantly analyzed for their relevance, the audiovisual neurofeedback signals represent kind of mirror for the brain of its own activities. Such a direct feedback, based on proven treatment protocols and electrode positions, aims to improve the brains' ability to regulate itself. Since self-regulation is an essential and fundamental function of the brain, the clinical spectrum of treatment is very broad, in which neurofeedback can be used as a lead therapy or therapy component to alleviate the symptoms of mental disorders and illnesses, for attention and concentration problems and in rehabilitation.

There are various neurofeedback methods, which all follow the principle of EEG measurement and frequency component dependent feedback outlined above, but differ in their implementation, EEG feature extraction and feedback control. So-called "frequency band" methods follow the rules of standardized frequency ranges within the "classic" EEG spectrum (1-40 Hz) for feature extraction and aim at the brain reducing certain activities and increasing others. In contrast, during neurofeedback training of slow cortical potentials (SCP) aim to control those activities in the very low frequency ranges below 0.1 Hz. The so-called Infra-low Frequency-Neurofeedback (ILF) has proven to be particularly effective and represent a combination of frequency band and SCP training with regard to the frequencies of the extracted brain activities, but beyond that also follows a stand-alone, individualized and symptom-based approach. In ILF neurofeedback the training frequency of the slow SCP activities is individually optimized and the course of therapy is dynamically adapted to changes in clinical symptoms.

In order to represent the research results as broadly as possible, the following studies are methodologically based on various neurofeedback methods – hence, they all have in common to aim-for an improved regulation of-the brain.

Neurofeedback in the treatment of patients with addiction

Alcohol abuse has a significant impact on the human population. Alone in Germany there are about 2 million people who are addicted to alcohol. Alcohol has a big impact on nearly all organs in the body and is said to be cancerogenic. The costs caused by alcohol addiction and all the side effects it causes, are immense to the healthcare services. The standard treatment includes detoxification, withdrawal and rehabilitation. Sobriety is required all life long, however the craving is often high,

so in many cases, there is a relapse¹. EEG studies have shown that in EEG of alcoholics or people with a predisposition, there is decrease in alpha activity when they are sober. This leads to a higher vulnerability to the effects of alcohol, since the amount of alpha waves increases after alcohol consumption. Also for drug abuse, it was shown that in many cases there are changes in alpha, beta and theta activity². With Neurofeedback the brain can be trained to control specific brain-waves. In addition, Neurofeedback promotes neuroplasticity of the brain, which helps to resolve maladaptive behavior and increase self-regulation³. For drug abuse, the traditional methodologies include counseling, group therapy and medication. Same as for alcohol abuse, those methods work, but the relapse rates are high^{4,5}. So training the patients to change brainwave patterns can be beneficial in the treatment of substance use disorders.

There are several reports about the use of Neurofeedback as an additional treatment for patients with addiction. The path of patients is long and craving is in some cases and in some moments immense. It was shown that Neurofeedback can help in these cases to reduce the craving or at least helps to overcome it quicker⁶. Two important protocols are used for many years - the Peniston Protocol and the Scott-Kaiser modified Peniston Protocol. Both protocols have shown a success in treating patients with substance abuse disorders^{2,7-9}. Patients with alcohol abuse who underwent 15 sessions of eyes closed alpha-theta Neurofeedback training showed reduced depressions and craving was reduced. Relapse was prevented in a 13-months follow up³. Another follow-up study after 74-98 months after Neurofeedback training, also indicated that there was reduced depression and a very low relapse rate¹⁰. Hanlon et al. reported about a study that has shown that clients were able to reduce their craving by decreasing activity in specific brain regions, so addressing specific brain regions using Neurofeedback can help to decrease craving¹¹. Same results were shown in a different study, where the craving due to cue-activation of the clients was reduced in comparison to a control group¹². Kirsch et al. report about the downregulation of striatal activation when exposing clients to alcohol cues using Neurofeedback in comparison with two control groups¹³. A study with clients with mixed substance abuse receiving 40-50 sessions of Neurofeedback (Beta and SMR (sensomotoric rhythm) followed by alpha and theta training) showed that clients are more likely to continue their treatments and abstinence times were longer in comparison to a control group¹⁴.

Summary and outlook

There are already several studies available on how to reduce cravings in clients with substance use addiction. The results are quite promising, however there is still room left for more, for studies on different substances, higher number of patients and so on. Many researchers including BEE

Medic GmbH are currently working or supporting on very expensive studies. For further information on neurofeedback as well as on scientific work, please do not hesitate to contact us.

Please also contact us if you are interested in participating in research on neurofeedback, for example, by submitting a case study in your practice. You can reach us at medwiss@beemedic.de.

We are also happy to put you in touch with practices or clinics that already use our system in therapy and/or research.

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