Neurofeedback in the treatment of chronic illness

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.

Chronic Illness

In general, every disease can be classified as “chronic”, when symptoms are lasting for more than one year - in some definitions, a progressive severity and increasing impairment in overall functioning are commonalities. Based on this definition, chronic illnesses can be of physiological and psychological nature. The World Health Organization focuses on the medical based chronic illnesses but also includes mental illness and chronic pain.

There is growing evidence for the use of neurofeedback in different chronic illnesses and in

the following more details will be given on some of them. What can be said is that neurofeedback is known to be effective for handling the co-occurring symptoms of chronic diseases as often being stress, anxiety, pain, mood instabilities, sleep problems or depression etc. in patients with the burden of chronic illness. A current research project is focussing exactly on this. Researchers are systematically reviewing studies regarding the effect of neurofeedback for anxiety and stress in adults living with a chronic disease [1].

Neurofeedback and Chronic Regional Pain Syndrome (CRPS)

Neurofeedback shows good effects especially in the treatment of complex regional pain syndrome (CRPS), which is often difficult to access for "conservative" therapies. Even a 30-minute neurofeedback session in CRPS patients may lead to a subsequent significant reduction in subjective pain perception[2]. From studies of other indication areas, it is known that such effects obtained with neurofeedback after a sufficient number of sessions (recommended: At least 30) remain stable over a period of at least 12 months even after the end of therapy[3].

Neurofeedback and Fibromyalgie

Alleviation of symptoms of fibromyalgia, especially pain, has been demonstrated in various studies. Patients report improvements in pain symptoms[4] and associated improvement in quality of life[5]. A recent controlled study also shows that neurofeedback training results in changes in somatic motor areas of the brain, which in turn lead to a significant improvement in pain problems compared to a control group[6] .

Neurofeedback and Neuropathy

Various publications investigate neurofeedback as a method for treating neuropathic pain in paraphlegic patients[7-8]. One study reports that pain decreases during neurofeedback sessions and that relief is continued to be reported in many cases even one month after end of therapy[9].

In patients with chemotherapy-induced neuropathy, the suffering pressure is high due to the already difficult situation. Especially in such cases mild therapies such as neurofeedback, which lead to relief of pain symptoms, may have a great advantage[10].

The therapy of 14 post-zoster neuralgia (PZN) patients with fMRI neurofeedback in a randomised double-blind study shows that they are able to regulate the activity of the anterior cingular cortex and thereby achieve an improved regulation of pain perception[11].

The treatment of trigeminal neuralgia was examined in a case study in which neurofeedback was used in combination with other treatment methods, and depending on the electrode position, it was found that a reduction in pain could be achieved[12].

Neurofeedback and Epilepsy

Epilepsy was one of the first clinical conditions treated with neurofeedback back in the 1970s[13]. The existing research regarding the use of neurofeedback in the treatment of epilepsy provides strong evidence that neurofeedback training might be an effective treatment for pediatric epilepsy[14]. Even in reviews comparing neurofeedback to anticonvulsant pharmacotherapy, neurofeedback is asserted as a viable alternative treatment[15].

Neurofeedback and Multiple Sclerosis (MS)

There is growing evidence that neurofeedback might be beneficial for accompanying symptoms of multiple sclerosis. One recent interventional study found that MS patients showed cognitive improvements in long-term memory and executive functions after neurofeedback training and learned to self-regulate their own brain activity by means of neurofeedback training[16].

Depression and fatigue are common symptoms of multiple sclerosis (MS) and are the primary determinants of impaired quality of life in this demyelinating neurological disease. In a randomized trial with 24 MS patients with primary fatigue and depression, neurofeedback could significantly reduce symptoms of depression and fatigue compared to usual treatment and these effects maintained the 2-month follow-up[17].

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