

EEG Biofeedback (FNS or Flexyx) & Neurofeedback (Brainwave Training)

EEG Neurofeedback is a noninvasive procedure that involves monitoring and analyzing EEG signals read through surface sensors on the scalp, and uses the EEG itself to guide the feedback.

EEG slowing is present in people who are symptomatic with problems such as post-concussion syndrome, PTSD, depression, learning disabilities, fibromyalgia and autism. A recording of an EEG that has slowing present shows an excess, or imbalance, of energy measured in microvolts in the slowest waves, the delta and theta bands. (1-8 Hertz) "An adult should not have theta or delta patterns in the waking record and if they appear, they are called slow wave abnormalities. The slower the frequency and the more often it appears, the greater the degree of abnormality. Abnormal slow waves appear when the brain cells are damaged regardless of the cause of the damage." "One other form of abnormality in EEG is the depression (decreased amplitude) of any normal rhythms. These depressions can be seen during wake or sleep." (Hughes J.R., 1994. EEG in Clinical Practice, 2nd Ed. Butterworth-Heinemann, Newton, MA.)

EEG abnormalities are associated with mild to severe brain trauma, and can be the result of a variety of causes such as blunt force, whiplash, emotional trauma such as PTSD, toxic exposure, or infection. With regard to TBI, "Major lesions tend to occur predominantly in the frontal and temporal poles, the brain stem, and the corpus callosum, that thick band of neural tissue that maintains the most efficient and the fastest connections between the brain hemispheres." "Diffuse damage to these areas causes attentional deficits, slow thought processing and diminished bilateral integration." (Lezak, M., 1988. "The walking wounded of head injury: When subtle deficits can be disabling." Trends in Rehabilitation, Vol. III, #3.) Pain and headache are also common results of brain dysfunction.

Quantitative data from treatment document reduction of EEG slowing in response to treatment. Dr. Ayub Ommaya, George Washington University neurosurgeon and TBI researcher, supports this treatment for the problems of TBI. He concurs with current thinking about treatment effects: the feedback disrupts the EEG activity and this interruption of the brainwave state leads to behavioral and symptomatic changes. Because the feedback speed is offset from the dominant brainwave frequency, the imbalanced EEG amplitude begins to normalize. The result is lower amplitude slow waves and more comfortable and flexible functioning.

Clinically what is observed is that the shift in amplitude reflects a reduction of symptoms such as headaches, depression, as well as cognitive, mood, and fatigue problems. When pain is also present, the diagnosis may be fibromyalgia. Stroke patients recover movement and clarity to various degrees, depending on the areas damaged. The more severe the problem, the longer the treatment needed. Traumatic brain injury patients have been seen to easily recover their ability to take in information and improve their short-term memory, organization, sequencing, prioritizing, sensory discrimination, initiation, confidence, assertiveness, and sense of humor. Depression, irritability, and explosiveness usually respond within a few sessions. Our experience has been that mild brain injury in formerly high-functioning patients has been treated with 10 or fewer sessions, returning people to their pre-accident baseline level of functioning.

Barring a new trauma there have not been reports of relapses or regressions after treatment. Three instances occurred in which patients were very near the end of treatment and new traumas caused a return of symptoms. These were more easily treated than when treatment began and, unless structural injuries were present, they usually regained their former level of good functioning.

Studies of Neurofeedback

A study of neurofeedback on treating EEG slowing in fibromyalgia was published in 1998. (Canadian Journal of Clinical Medicine, June 1998). An NIH-funded study of neurofeedback treatment for mild/moderate brain injury appears in the June 2001 issue of the Journal of Head Trauma Rehabilitation. Co-principal investigators are Dr. Nancy Schoenberger, of the Kessler Rehabilitation Institute, West Orange, NJ and Dr. Mary Lee Esty of the Neurotherapy Center of Washington, Chevy Chase, MD. Dr. Len Ochs, developer of the treatment, was consultant to the study. Results of this study have been presented at numerous professional conferences, including the New York Academy of Traumatic Brain Injury, the 26th Annual Williamsburg Traumatic Brain Injury Rehabilitation Conference, The Brain Injury Association of Maryland's Annual Conference, the Association of Applied Psychophysiology and Biofeedback, the Biofeedback Society of DC, Maryland and Virginia, the Brain Injury Association of Northern Virginia, the First Federally-Funded Interagency Conference on Brain Injury, Bethesda, MD, and the Brain Injury Association of Texas. The Dana Foundation included a segment with Dr. Esty and one of the TBI study people on National Public Television. (To read about this study participant, click on TT on the Client Stories page under the section on Adult TBI.)

A double-blind, placebo-controlled study of the effects of EEG neurofeedback on EEG slowing associated with fibromyalgia was done by Dr. Esty and associates in Chevy Chase, and at Rush-Presbyterian-St. Luke's Medical Center, Chicago, IL. ("Treatment of Fibromyalgia Syndrome using Low-Intensity Neurofeedback with the Flexyx Neurotherapy System: A Randomized Controlled Clinical Trial." Kravitz, H.M., Esty, M.L., Katz, R.S. & Fawcett, J. The Journal of Neurotherapy. Vol.10, #2/3. pp. 41 - 58. 2006.)

Several studies demonstrate the effects of EEG neurofeedback on fibromyalgia. The Brain Wellness and Biofeedback Center of Washington treatment protocol includes the treatment elements included in the Mueller and Donaldson articles described here.

The Donaldson series (2001) on neural plasticity and fibromyalgia demonstrates the link between CNS dysfunction and the ability of the brain to change (neural plasticity), and it discusses what that means in terms of practical applications for successful treatment for fibromyalgia. In addition. [Donaldson CCS, Sella GE, Mueller HH: The Neural Plasticity Model of Fibromyalgia, Theory Assessment and Treatment. Part I, II & III. Practical Pain Management 2001; May/June. (12-17), July/Aug, (18-25), and Sept/Oct., (25-31)] Mueller (2001) presents treatment outcomes showing the promise of currently available brain neurofeedback technology for fibromyalgia. (Mueller H, Donaldson CC, Nelson D, and Layman M: Treatment of Fibromyalgia Incorporating EEG-Driven Stimulation: A Clinical Outcomes Study. J Clinical Psychology 2001; 57(7), 933-952.)

Different Types of Neurofeedback

There are two major types of neurofeedback, often differentiated with the terms active and passive. Passive neurofeedback (a.k.a. EEG Biofeedback, FNS or Flexyx) does not require any conscious effort on the part of the client. The brain receives feedback directly from the computer through the sensors attached to the scalp while the client relaxes in a comfortable chair. Active neurofeedback (a.k.a. Brainwave Training) requires more direct participation on the part of the client. The client watches a computer screen and controls the activity on the screen with their brain waves. Following the rules of operant conditioning, the client receives an audio or visual reward for keeping their brainwaves in the desired state. Both types of neurofeedback are offered at the Brain Wellness and Biofeedback Center of Washington.

Flexyx Neurotherapy System (FNS) neurofeedback is a noninvasive brainwave biofeedback procedure that involves monitoring and analyzing EEG signals read through surface sensors on the scalp. It uses the EEG itself to guide the feedback. FNS is one form of relatively new ultra-low energy signal devices that deliver neurotherapy and is one type of biofeedback. The most recent name for this type of neurofeedback is Low Energy Neurofeedback System (LENS). This is a form of brainwave biofeedback in which brain electrical activity (EEG) is measured from several of the 10-20 standard sites on the scalp. One of more of these areas is then treated with a brief, weak electromagnetic (or radio wave) stimulus, which may alter the EEG readings in one of more of those areas. The EEG is then measured again (a feedback loop). Several such brief cycles of electrical measurement, electromagnetic treatment, and re-recording of the EEG may be done, resulting in an improvement in EEG activity, which is often persistent for long periods of time, resulting in a decrease of symptoms.

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