



## NEUROFEEDBACK: EEG BIOFEEDBACK

### What is Neurofeedback?

Neurofeedback is brain wave training that can improve self regulation of attention and learning. The brain is the only organ in the human system that learns. This learning takes place through trillions of connections that communicate through electrical signals and can be measured using electroencephalography (EEG). When these signals are inefficient the brain cannot function at its optimal level. This deregulation can manifest itself in various ways, affecting functions of development and learning: attention, perception, memory, executive function, speech/language, sensory/motor, and mood functions.





The mind/body connection is incredibly powerful. We have the ability to regulate our development and learning. We respond to multisensory stimuli from the environment through our sense organs (i.e. eyes, ears...). As we respond to sensory stimuli brain wave activity is excited and inhibited. Optimal learning requires relaxed alertness: regulated states of excitation/inhibition. Neurofeedback is a technique in which the brain learns to regulate mind/body functions. The brain performs at optimal levels for certain tasks when electrical signals fire at optimal frequencies. Frequencies vary with alertness/activity. Neurofeedback measures these signals and is a training process to facilitate optimal rhythms – the frequencies that regulate alertness, attention and learning.

## How Does Neurofeedback Training Work?

### Nothing Invasive

During Neurofeedback training there are generally a few electrodes placed on the scalp and reference electrodes placed on the earlobes. This process is quick and painless. The electrodes measure brain wave activity. Neurofeedback training positively reinforces alert EEG frequencies and inhibits slower frequencies.

EEG and States of Arousal

Delta Less than 4 cps	Theta 4-8 cps	Alpha 8-13 cps	Beta More than 13 cps
Asleep	Drowsy	Relaxed	Alert
			

An Illustration of Four Rhythms Commonly Seen in the EEG

Two computers are used. Representations of brain wave activity are visualized on one computer screen. The child views another computer screen that displays simple to complex learning related games. The child plays a game on the computer and when optimal brain frequencies are produced, the child earns points in the game. When alert frequencies are not being produced, points are not earned. Over time, the child learns how to regulate his/her focus and ability to attend, earning points in the game. With training, the brain LEARNS to produce relaxed-alert frequencies on its own, developing learning.

### What Are Some Conditions in Which Neurofeedback is Useful?

Neurofeedback training has been used to treat multiple conditions, including Attention Deficit Disorder, learning difficulties, behavior problems, autism spectrum disorders, anxiety, depression, traumatic brain injury, seizures, and sleep disorders to name a few. Neurofeedback training has been shown to improve scores on intelligence and cognitive challenge tests and improve response times.

Neurofeedback training does not cure disorders, but organizes the brain to function better in the context of whatever condition exists. The brain regulates behaviors of the human system. A better functioning brain can improve the functions of development: attention, perception, executive function, memory, speech/language, sensory/motor, and mood functions.

**NEUROFEEDBACK TRAINING DOES NOT INTRODUCE ANYTHING CHEMICAL OR FOREIGN INTO THE BRAIN – IT USES THE BRAIN TO IMPROVE ITSELF.**

### How Long Does Neurofeedback Training Take?

Ideally, Neurofeedback training at this office begins with 30 minute sessions, usually 2x's per week, over 20 sessions. At that time, the child's progress determines if a continued schedule is needed. Generally, the Neurofeedback process involves 20 – 40 sessions. The brain is being trained to functions better, and as with any training program, time improves performance. Once the brain learns to produce optimal rhythms on its own, training is no longer necessary. Booster sessions can aide in sustaining optimal effects.

### Advances in Neuroscience

Advances in neuroscience and technology have increased the clinical use and research of Neurofeedback, especially over the past 25 years. Neurofeedback offers evidence-based technology regarding brain training, health, learning, and development.

The brain regulates overall health and performance. We can train ourselves to relax and we can train ourselves to function better physically and mentally. We can also train ourselves to function better cognitively and emotionally. Training the brain to work better develops relaxed alertness and optimal learning.

Frank H. Duffy (2000), a professor and pediatric neurologist at Harvard Medical School, has said that scholarly literature now suggests that Neurofeedback “should play a major therapeutic role in many difficulty areas, ...if any medication had demonstrated such a wide spectrum of efficacy it would be universally accepted and widely used”, (p.v), “It is a field to be taken seriously by all” (vii).

Duffy, FH., Editorial: The state of EEG biofeedback therapy (EEG operant conditioning) in 2000: An editor’s opinion. *Clinical electroencephalography*. 31 (1): v-viii, 2000.

International Society for Neuronal Regulation [www.isnr.org](http://www.isnr.org)

Association for Applied Psychophysiology and Biofeedback [www.aapb.org](http://www.aapb.org)

EEG info [www.eeginfo.com](http://www.eeginfo.com)