



Neurofeedback for AD/HD

By Linda C. Neumann

Neurofeedback: A Form of Biofeedback

Neurofeedback is known by several names, including neurotherapy and EEG biofeedback. As the latter name implies, it's a type of biofeedback.

Biofeedback is described by the National Institute of Mental Health as "a treatment technique in which people are trained to improve their health by using signals from their own bodies." The signals are detected by electrodes attached to the body to measure heart rate, blood pressure, muscle tension, skin temperature, or other functions. A biofeedback machine monitors these signals and displays the results for both the trained practitioner and the patient to see. With this information, the practitioner can teach a patient to alter these bodily functions by relaxing or by bringing pleasant images to mind.

Medical and mental health professionals use biofeedback in a variety of ways, for example to help stroke victims regain movement in paralyzed muscles, to help tense and anxious individuals learn to relax, and to help patients cope with pain. While scientists are unable to explain how biofeedback works, research has proven its effectiveness in treating many disorders. Most researchers agree that relaxation is a key component in biofeedback's success.

Neurofeedback: Controlled Brain Waves

Neurofeedback, on the other hand, focuses solely on gaining control over brain waves, the electrical activity of the brain. There are four main patterns of brain waves in the human brain, set apart from one another by their frequency. Although our brains constantly emit different frequencies of brain waves simultaneously, certain frequencies predominate, depending on our mental state. The four brain-wave patterns are listed below from highest frequency to lowest.

Type of Wave	Mental State
Beta	Attentive: actively thinking, problem-solving, etc.
Alpha	Calm and relaxed; right after waking and just before sleeping
Theta	Daydreaming, meditating, lightly sleeping
Delta	In deep sleep

Neurofeedback treatment may begin with a quantitative electroencephalogram (qEEG), a process of using sensors placed on the scalp to record brain waves and produce a brain map. This brain map shows where an individual's brain wave patterns differ from "the norm." According to an article by David Rabiner, Ph.D., a Duke University psychologist who publishes the online newsletter *Attention Research Update*, several studies have indicated that children with AD/HD have different brain wave patterns than children without. The studies showed that those with the disorder exhibit an excess of low-frequency wave activity (theta and alpha) and a reduced amount of high-frequency (beta) brain waves. (Rabiner cautioned that an association between particular patterns of brain activity and AD/HD symptoms does not mean that one causes the other.)

The thinking behind using neurofeedback for AD/HD is that the treatments can enable patients to learn to control their brain activity, decreasing the low-frequency waves and increasing high-frequency waves. During a typical neurofeedback session, a patient sits in front of a computer screen watching and responding to video displays — much like a computer game — designed to train the patient to produce the desired change in brain activity. Sensors attached to the head monitor the patient's brain waves during what is usually a 30- to 45-minute session. During the course of treatment, patients typically undergo 25 to 50 sessions over a period of several months, at a cost somewhere in the area of \$100 per session. Most health insurance plans do not cover treatment.

Does It Work?

The answer to this question depends on who you ask. Ari Goldstein holds a Master's degree in learning disabilities and a Ph.D. in educational psychology from the University of Illinois. He has conducted research in the areas of learning disabilities, cognitive development, executive functioning, and meta-cognition; and he has completed post-graduate training in psychological and educational assessment. At his Cognitive Solutions Learning Centers in Chicago and Highland Park, Illinois, he works with parents to design non-medicinal treatment approaches for helping both gifted and non-gifted children with learning and attention problems. According to Goldstein, treatment approaches can include any combination of





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diet/supplementation, executive functions training, and neurofeedback. When asked about the results of neurofeedback treatment for these children, his reply was:

We have seen tremendous benefit in a host of disabilities, including learning disabilities, autism, anxiety, depression, seizure disorders, and AD/HD – both inattentive and hyperactive typologies. Parents and teachers report changes in behavior and learning, often including better sleep patterns, better focus and behavior at home and in school, and reduced anxiety about school, which we track regularly. We regularly track the changes using quantitative measures such as follow-up qEEG's and administration of standardized measures such as the Conner's rating scales and Conner's Continuous Performance Test.

In the book *Buzz* (reviewed elsewhere in this issue), author Katherine Ellison explored neurofeedback for treating AD/HD. In the book's epilogue she described the conclusions she reached based on the experiences that both she and her son had with receiving treatments:

...[M]y research and personal experience has made me a particular fan of neurofeedback, which under ideal circumstances is much safer than medication, and may be more long-lasting, despite the drawbacks of how much time and money it requires....[A] growing amount of anecdotal evidence – including my own – is encouraging.

On the opposite side are those who feel that anecdotal evidence is not enough to warrant the use of this form of treatment for AD/HD. The March, 2010, issue of the *Harvard Mental Health Letter* stated:

About two dozen studies have been published about neurofeedback for AD/HD, and many have reported promising results. But most of them involved only small numbers of patients, were not randomized, and lacked a placebo intervention. As such, they lacked controls for confounding mechanisms such as attention training or bias on the part of investigators or participants.

When asked his opinion of neurofeedback treatments, neuropsychologist R. Patrick Savage, Jr., Ph.D., of Silver Spring, Maryland, responded, "I think you will find

people who swear by neurofeedback and others who think it is pure quackery. I am a skeptic but optimistic that at some point neurofeedback will offer us some effective treatments for cognitive issues."

Savage explained that there have been many claims made for neurofeedback that have not been substantiated. Furthermore, he feels that much of the current research was poorly designed so that the results were problematic. He expressed concern that we may be, in part, looking at a placebo effect.

Savage explained that with neurofeedback, as with other treatments, the placebo effect can be very strong. "The power of belief and positive thinking is quite impressive," said Savage. The problem with much of the neurofeedback research, he explained, is that there were no control groups. Having control groups makes it possible to compare the gains that children who received treatment made with the performance or behavior of children who did not receive treatment.

Further complicating the situation, Savage pointed out, is the fact that children's brains continue to develop and change more rapidly than those of adults. "Hence," he stated, "kids are acquiring and developing new skills independent of the treatments they might experience."

Nevertheless, Savage looks forward to progress in the area of neurofeedback research. He anticipates research that will enable us to gain a better understanding of "what this procedure actually has to offer, to whom it has to offer it, and what it takes to get the effect one wants."

Pediatric neuropsychologist Nadia Webb, Psy.D., of New Orleans, Louisiana, expressed greater reservations about using neurofeedback as a treatment for AD/HD. "I've never recommended neurofeedback," she stated, "and I'm unlikely to any time soon."

Webb explained that biofeedback using temperature, heart rate, muscle tension, and so forth has "great data for working with anxiety, pain, and health problems aggravated by anxiety or stress, such as GI upset or headaches." At this point, however, Webb said that "neurofeedback is experimental and has little support, except research by people who use it clinically and aren't neutral."

She went on to remind parents that "everything has an opportunity cost, and it often means foregoing approaches that have much better research and better outcomes data. Good psychotherapy, tutoring, medication (if appropriate and thoughtfully selected), parenting





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skills training, family therapy, social skills training, mentoring, or Outward Bound — all of these have better support and tend to be a better option for the money.”

Conclusion

Since 2009, the National Institute of Mental Health has been sponsoring the first government-funded, peer-reviewed study of neurofeedback for AD/HD. The study's results were due out in fall of 2010 but are so far unavailable. Perhaps, once they are published, these results will put some of this controversy to rest; but until then, parents of children with attention issues are left to do their own research and use their own best judgment.

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