

## Biofeedback for ADHD

Neurofeedback is the primary modality for treating attention deficit hyperactivity disorder (ADHD) with regards to biofeedback. A large amount of studies can be found in review articles by Monastra (2005) and by Yucha and Montgomery (2008). The early term of EEG biofeedback has been updated to be called neurofeedback in most publications. A variety of protocols have been used over the last three decades, so it is hard to summarize them in a brief review. The overall trend is to train the patient to lower the slow waves (especially theta) and increase the fast waves (beta) in the frontal regions of the brain (i.e., the frontal lobes).

Joel Lubar and his colleagues did the earliest studies (Lubar & Shouse, 1976, 1977) and showed that in training down the slow activity and training up the beta or faster brain activity, behaviors improved in children with ADHD. Lubar followed 52 patients over 10 years, and the gains were maintained over time. In another study, Linden, Habib, and Radojevic (1996), found that children with attention deficit disorder who received neurofeedback showed better control over their attentiveness and a Full Scale IQ gain of 10 points, while the control groups showed no gains. In a large study by Kaiser and Othmer (2000), significant improvements were found on the TOVA continuous performance test, as well as gains of 10 points in Verbal and Performance IQs.

A randomized, placebo, control group study done by Levesque, Beauregard and Mensour (2006) showed that with neurofeedback training, the experimental group of children with ADHD improved on neuropsychological measures as well as pre- post- fMRI measures of the anterior cingulate cortex, indicating that functional neuroanatomical changes occur with neurofeedback training.

Neurofeedback as a treatment model has expanded into Asian countries. In a study by Zhang, Zhang and Jin (2006), children with ADHD were randomly assigned to either a medication group (methylphenidate) or EEG biofeedback. They were rated pre- and post treatment, and at one, three and six month intervals. The EEG group showed substantially improved scores on the Conners Parent Rating Scale and at 6 month follow-up. In a study by Zhong-Gui, Hai-Qing, Shu-Hua, (2006), those children who did EEG biofeedback training showed significant improvements on the TOVA continuous performance test after 40 sessions.

Many more studies of improved functioning in ADHD can be found in other references (Yucha & Montgomery, 2008; Monastra, 2003; Lubar, 2003), and it has been shown that the positive results remain long after treatment has been completed (Thompson & Thompson, 2004; Monastra, 2003; Yucha & Montgomery, 2008; Lubar, 2003). In Yucha and Montgomery (2008), they conclude that the use of neurofeedback is strongly supported in the treatment of ADHD. This is despite the fact that treatment protocols vary widely. In addition, several studies have shown that the treatment effects last over time.

Professional Literature of Neurofeedback with ADD/ADHD & Learning Disabilities

The list of references below was taken from the professional neurofeedback organization at [www.isnr.org](http://www.isnr.org). If you know of additions or corrections to this list, please e mail Dr. Larry Thomas, [nurosvcs@aol.com](mailto:nurosvcs@aol.com).

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### **ADD Evaluations**

### **Biofeedback Articles**