

[Abstracts of a few recent studies of Neurotherapy for ADHD \(most recent at the top\)](#)

Arns, M., S. de Ridder, et al. (2009). "Efficacy of Neurofeedback Treatment in ADHD: the Effects on Inattention, Impulsivity and Hyperactivity: a Meta-Analysis." [Clinical EEG and Neuroscience](#) 40(3): 180-189.

Since the first reports of neurofeedback treatment in Attention Deficit Hyperactivity Disorder (ADHD) in 1976, many studies have investigated the effects of neurofeedback on different symptoms of ADHD such as inattention, impulsivity and hyperactivity. This technique is also used by many practitioners, but the question as to the evidence-based level of this treatment is still unclear. In this study selected research on neurofeedback treatment for ADHD was collected and a meta-analysis was performed.

Both prospective controlled studies and studies employing a pre and post-design found large effect sizes (ES) for neurofeedback on impulsivity and inattention and a medium ES for hyperactivity. Randomized studies demonstrated a lower ES for hyperactivity suggesting that hyperactivity is probably most sensitive to nonspecific treatment factors.

Due to the inclusion of some very recent and sound methodological studies in this meta-analysis, potential confounding factors such as small studies, lack of randomization in previous studies and a lack of adequate control groups have been addressed, and the clinical effects of neurofeedback in the treatment of ADHD can be regarded as clinically meaningful. Three randomized studies have employed a semi-active control group which can be regarded as a credible sham control providing an equal level of cognitive training and client-therapist interaction. [Therefore, in line with the AAPB and ISNR guidelines for rating clinical efficacy, we conclude that neurofeedback treatment for ADHD can be considered "Efficacious and Specific" \(Level 5\) with a large ES for inattention and impulsivity and a medium ES for hyperactivity.](#)

Gevensleben, H., B. Holl, et al. (2009). "Is neurofeedback an efficacious treatment for ADHD? A randomised controlled clinical trial." [J Child Psychol Psychiatry](#).

Background: For children with attention deficit/hyperactivity disorder (ADHD), a reduction of inattention, impulsivity and hyperactivity by neurofeedback (NF) has been reported in several studies. But so far, unspecific training effects have not been adequately controlled for and/or studies do not provide sufficient statistical power. To overcome these methodological shortcomings we evaluated the clinical efficacy of neurofeedback in children with ADHD in a multisite randomised controlled study using a computerised attention skills training as a control condition. Methods: 102 children with ADHD, aged 8 to 12 years, participated in the study. Children performed either 36 sessions of NF training or a computerised attention skills training within two blocks of about four weeks each (randomised group assignment). The combined NF treatment consisted of one block of theta/beta training and one block of slow cortical potential (SCP) training. Pre-training, intermediate and post-training assessment encompassed several behaviour rating scales (e.g., the German ADHD rating scale, FBB-HKS) completed by parents and teachers. Evaluation ('placebo') scales were applied to control for parental expectations and satisfaction with the treatment. Results: For parent and teacher ratings, improvements in the NF group were superior to those of the control group. For the parent-rated FBB-HKS total score

(primary outcome measure), the effect size was .60. Comparable effects were obtained for the two NF protocols (theta/beta training, SCP training). Parental attitude towards the treatment did not differ between NF and control group. [Conclusions: Superiority of the combined NF training indicates clinical efficacy of NF in children with ADHD.](#) Future studies should further address the specificity of effects and how to optimise the benefit of NF as treatment module for ADHD.

Gruzelier, J., T. Egner, et al. (2006). "Validating the efficacy of neurofeedback for optimising performance." [Prog Brain Res 159: 421-31.](#)

The field of neurofeedback training has largely proceeded without validation. Here we review our studies directed at validating SMR, beta and alpha-theta protocols for improving attention, memory, mood and music and dance performance in healthy participants. Important benefits were demonstrable with cognitive and neurophysiological measures which were predicted on the basis of regression models of learning. These are initial steps in providing a much needed scientific basis to neurofeedback, but much remains to be done.

Monastra, V. J., S. Lynn, et al. (2006). "Electroencephalographic Biofeedback in the Treatment of Attention-Deficit/Hyperactivity Disorder." [Journal of Neurotherapy 9\(4\): 5-34.](#)

Historically, pharmacological treatments for attention-deficit/hyperactivity disorder (ADHD) have been considered to be the only type of interventions effective for reducing the core symptoms of this condition. However, during the past three decades, a series of case and controlled group studies examining the effects of EEG biofeedback have reported improved attention and behavioral control, increased cortical activation on quantitative electroencephalographic examination, and gains on tests of intelligence and academic achievement in response to this type of treatment. This review paper critically examines the empirical evidence, applying the efficacy guidelines jointly established by the Association for Applied Psychophysiology and Biofeedback (AAPB) and the International Society for Neuronal Regulation (ISNR). On the basis of these scientific principles, EEG biofeedback was determined to be "probably efficacious" for the treatment of ADHD. [Although significant clinical improvement was reported in approximately 75% of the patients in each of the published research studies, additional randomized, controlled group studies are needed in order to provide a better estimate of the percentage of patients with ADHD who will demonstrate such gains in clinical practice.](#)

Rossiter, T. (2004). "The effectiveness of neurofeedback and stimulant drugs in treating AD/HD: part II. Replication." [Appl Psychophysiol Biofeedback 29\(4\): 233-43.](#)

This study replicated T. R. Rossiter and T. J. La Vaque (1995) with a larger sample, expanded age range, and improved statistical analysis. Thirty-one AD/HD patients who chose stimulant drug (MED) treatment were matched with 31 patients who chose a neurofeedback (EEG) treatment program. EEG patients received either office (n = 14) or home (n = 17)

neurofeedback. Stimulants for MED patients were titrated using the Test of Variables of Attention (TOVA). EEG (effect size [ES] = 1.01-1.71) and MED (ES = 0.80-1.80) groups showed statistically and clinically significant improvement on TOVA measures of attention, impulse control, processing speed, and variability in attention. The EEG group demonstrated statistically and clinically significant improvement on behavioral measures (Behavior Assessment System for Children, ES = 1.16-1.78, and Brown Attention Deficit Disorder Scales, ES = 1.59). TOVA gain scores for the EEG and MED groups were not significantly different. [More importantly, confidence interval and nonequivalence null hypothesis testing confirmed that the neurofeedback program produced patient outcomes equivalent to those obtained with stimulant drugs. An effectiveness research design places some limitations on the conclusions that can be drawn.](#)

Fuchs, T., N. Birbaumer, et al. (2003). "Neurofeedback treatment for attention-deficit/hyperactivity disorder in children: a comparison with methylphenidate." [Appl Psychophysiol Biofeedback 28\(1\): 1-12.](#)

Clinical trials have suggested that neurofeedback may be efficient in treating attention-deficit/hyperactivity disorder (ADHD). We compared the effects of a 3-month electroencephalographic feedback program providing reinforcement contingent on the production of cortical sensorimotor rhythm (12-15 Hz) and beta activity (15-18 Hz) with stimulant medication. Participants were N = 34 children aged 8-12 years, 22 of which were assigned to the neurofeedback group and 12 to the methylphenidate group according to their parents' preference. Both neurofeedback and methylphenidate were associated with improvements on all subscales of the Test of Variables of Attention, and on the speed and accuracy measures of the d2 Attention Endurance Test. Furthermore, behaviors related to the disorder were rated as significantly reduced in both groups by both teachers and parents on the IOWA-Conners Behavior Rating Scale. These findings suggest that neurofeedback was efficient in improving some of the behavioral concomitants of ADHD in children whose parents favored a nonpharmacological treatment.

Moss, D. and J. Gunkelman (2002). "Task Force Report on methodology and empirically supported treatments: introduction." [Appl Psychophysiol Biofeedback 27\(4\): 271-2.](#)

Recent criticism of biofeedback has increased the importance of rating the efficacy of each biofeedback and neurofeedback therapy. A joint task force of the Association for Applied Psychophysiology and Biofeedback (AAPB) and the Society for Neuronal Regulation (SNR) has developed standards for efficacy research methodology and template for rating the level of efficacy of each application. [The Task Force Report has been approved as a policy guideline by both the AAPB and SNR Boards.](#)