

Benefits of neurofeedback for those with ADHD mainly due to unexpected factors

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The economic burden of providing special education and training for a child diagnosed with ADHD (attention-deficit/hyperactivity disorder) is estimated to cost the average American family five times as much as a child without ADHD. Such cost considerations force many families to focus on the remission of the condition through prescribed medications.

A study in the *Journal of the American Academy of Child and Adolescent Psychiatry (JAACAP)*, published by *Elsevier*, reports on a review of nonpharmacological treatments for ADHD, specifically electroencephalogram (EEG biofeedback, or neurofeedback), which shows a large improvement of inattention at the end of the trial, but without a significant difference between the two treatments.

Lead author, L. Eugene Arnold, MD, Professor Emeritus of Psychiatry and Behavioral Health at the Nisonger Center, Ohio State University, Columbus, OH, U.S., said that "ADHD is a common disorder usually first noticed in childhood that impairs attention and regulation of impulses and activity. There are many treatments, the best-established being FDA-approved medication and behavior modification, which are not completely satisfactory for many patients.

"Consequently, many other treatments have been proposed: one is [neurofeedback](#), which shows the EEG on a screen and rewards the patient for changing it. The most common form of neurofeedback for ADHD has been training down the theta-waves and training up beta-waves. Our study is the first large, well-blinded study of theta-beta neurofeedback designed to clarify this."

The findings are based on the International ADHD Neurofeedback (ICAN) study, which began recruiting in 2014 at two sites.

A sample of 142 children aged between 7 and 10 years of age, with ADHD and high inattention scores, as rated by both the children's parents and teachers, were randomly assigned 38 sessions of either a real theta-beta neurofeedback, or an identical-appearing control treatment that differed only in having screen display and rewards based on a pre-recorded EEG of another child. This resulted in the child, parent and trainers unable to guess the treatment assignment. To ensure the study remained blind, the child's own muscle artifacts were superimposed on

the pre-recorded EEG. Treatment at three times a week lasted 3 to 4 months. The primary outcome was the average of parent and teacher ratings of inattention.

At the end of treatment and following a 13-month follow-up, the experimental and control treatments both showed a very large and highly significant improvement in the composite inattention ratings initially made by the parents and teachers.

An additional outcome also showed that the group who received the real neurofeedback treatments needed less medication at the 13-month follow-up.

Principal investigator of the second clinical site, Roger deBeus, Ph.D., University of North Carolina at Asheville, NC, U.S., said: "These results show that the large benefit for ADHD symptoms reported by others and replicated in this study are not due to the neurofeedback itself, the training down of EEG theta-wave power and training up of beta-power, but to other, nonspecific effects.

"These included the EEG biofeedback incidentally provided by withholding rewards during muscle artifacts; the practice focusing on a screen; the supportive coaching; the improvement of the parent-child relationship from the parent supporting child progress; and of course a super-placebo effect from a novel treatment with wires attached to the head—a strong rationale for hope of improvement—and a feeling of accomplishment from the rewards."

The results also co-incidentally clarify that the tendency for teachers to observe less improvement than parents from neurofeedback is not due to teacher insensitivity to treatment effects as previously hypothesized. When parents are well-blinded, they reported no more advantage for neurofeedback over the control treatment than did teachers.

"The fact that those receiving [neurofeedback](#) needed less medicine than the controls did 10 months after treatment end is of interest, especially since it was an a priori hypothesis," explained Dr. Arnold. "This could have some value in cases of intolerable side effects; side effects are dose-dependent, and [neurofeedback](#) might allow optimal effects with a lower dose."

More information: L. Eugene Arnold et al, Double-Blind Placebo-Controlled Randomized Clinical Trial of Neurofeedback for Attention-Deficit/Hyperactivity Disorder With 13-Month Follow-up, *Journal of the American Academy of Child & Adolescent Psychiatry* (2020). [DOI: 10.1016/j.jaac.2020.07.906](#)

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