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Neurofeedback: An ADHD Treatment That Retrains the Brain?

Neurofeedback hasn't yet proved out and isn't cheap, but it dangles the prospect of a permanent cure

By Megan Johnson

A controversial treatment for overcoming attention deficit hyperactivity disorder is getting new respect. Called neurofeedback therapy, it supposedly retrains the brain to produce electrical patterns associated with calm and focus. While the technique is costly, time consuming, and far from proven, its promise is tantalizing. Advocates claim that neurofeedback brings permanent ADHD cures, a seemingly magical alternative to years of medication.

During a typical 45-minute session, the child is seated in front of a computer. Wires lead from different points on his head. A therapist starts up a videogame or movie on the child's screen—he can bring a favorite to the session if he wants—and monitors his brain waves on another screen. He locks his eyes on the action, concentrating on sending the kind of brain waves that will keep a virtual airplane flying or perhaps a Harry Potter movie rolling. If his attention wanders or he begins to fidget, the car slows or the movie screen darkens, and the therapist encourages him to regain focus using techniques such as slow, deep breathing. As he watches the effect of his own thoughts, "it's like looking in a mirror," says Leslie Sternberg, a neurotherapist and a psychologist in Acton, Mass.

Neurofeedback, also called EEG biofeedback, has been under investigation as a treatment for epilepsy and ADHD since the 1970s. Putting it to use on children with attention deficits has logical appeal. Studies suggest that in ADHD, the brain generates insufficient beta waves, which are associated with focus and attention, and an overabundance of lower-frequency theta waves, produced during periods of daydreaming or drowsiness. Praising and rewarding a child when he steps up production of beta waves by concentrating on the game or movie should therefore teach him how to focus at will in other settings, such as doing homework assignments or cleaning his room. And at least for some children, that seems to have happened.

One of them is Cameron Rose, 26, from Kingston, Ontario. Before receiving neurofeedback treatments when he was 11, says his mother, Joan, he could not be taught to read, although both she and her husband were teachers. She would try to coax her son at age 6 or 7 to read the simplest book she could find—like one about frogs. "Frog," she'd say, turning the page and pointing out where the word was repeated. It wouldn't register.

Diagnosed with ADHD just before he started sixth grade, after spending two years in a class for the severely learning disabled, Rose had 60 sessions of neurofeedback therapy at the ADD Centre and Biofeedback Institute of Toronto. His reading scores shot up from second- to fifth-grade level, and his IQ scores jumped from low average to high average. He never took ADHD medication and has never had additional neurofeedback therapy. Recently, Rose graduated from Queen's University in Canada with a degree in computer engineering. He recalls the treatments as "superfreaking boring" but they gave him a feeling of empowerment, and that, he says, was key. His dedication, says his mother, probably helped.

Lynda Thompson, psychologist and director of the Toronto center where Rose was treated 15 years ago, observes that many kids with ADHD are extremely good at "hyperfocusing" on something that interests them. Rose, for example, loved playing chess, a game known to test patience and concentration. The challenge, says Thompson, is to get them to concentrate on something they find boring—and the idea of neurofeedback is to teach kids how to do just that.

While neurofeedback works in theory and has had anecdotal successes, it was largely dismissed by ADHD experts until recently. They have noted that most studies showing benefits have been run by investigators with a financial stake; even a rigorously designed study "tends to find what it wants to find" under such conditions, says Peter Jensen, cochair of the division of child psychiatry and psychology at the Mayo Clinic in Rochester, Minn.

Nor have the studies met standards for rigorous design. Historically, most have been too small to be credible, with fewer than 50 patients, and have been sloppily done. Results have not been compared with results from medication or other forms of therapy, for example, nor has a control group received "sham treatment" that patients believed was neurofeedback but in fact did nothing, like a placebo sugar pill in a drug trial. A 2005 review coauthored by Russell Barkley, a leading expert on ADHD at the Medical University of South Carolina, raised some of these concerns. The first long-term results of neurofeedback, published in 2008, were similarly flawed. While positive, they reflected only 23 children who were followed for just two years.

But newer research has begun to build a promising foundation. A German study published earlier this year, which found that neurofeedback improved attention and reduced impulsivity and hyperactivity, was fairly large (94 children ages 8 to 12) and included a control group. Fifty-nine of the children received 36 sessions of neurofeedback over three to four weeks, while the other 35 children were trained in a different technique designed to improve attention. Observations by the children's parents and teachers indicated that most kinds of ADHD-related behavior improved much more in the neurofeedback group than in the control group.

The study and 14 others were analyzed in the July issue of the *Official Journal of the EEG and Clinical Neuroscience Society*. Ten of the studies, involving a total of nearly 500 children, used a

control group. "The clinical effects of neurofeedback in the treatment of ADHD can be regarded as clinically meaningful," the authors concluded. "I look at this article, and I'm persuaded that there's something here," says Mayo's Jensen, who also is president and CEO of the REACH Institute, a nonprofit group that trains pediatric health practitioners in the latest mental health therapies. "Previously, I was very skeptical that this treatment had much to offer," says Barkley. He says of the German study, "It looks like based on this study that there might be some promise to it," and he stresses "might" and "some." He is not ready to embrace the technique. "Should [neurofeedback] be offered to the public?" he says. "My answer would be no."

Still, as evidence of benefit accumulates, increasing numbers of parents will ask themselves whether neurofeedback may be worth trying. The question, says Jensen, is whether the expense is justifiable. Forty to 60 sessions, typically costing \$100 per session, are generally recommended; most health insurance plans consider neurofeedback an alternative treatment and will not cover the expense. Drug treatment can be more expensive over the long run—about \$180 a month for some stimulants—but generic medications can cost as little as \$10 a month. Kids might go five to eight years on medication before reaching the amount spent on neurofeedback, says Barkley. And if the family has health insurance, most plans cover much of the cost of drugs.

While many practitioners envision neurofeedback as a drug-free solution, others see it as a complement to drug therapy. Eugene Arnold, a professor emeritus of psychiatry at the Ohio State University, is conducting a study, funded by the National Institutes of Health, of how the neurofeedback sessions are spaced and how many are used. He says neurofeedback alone does not produce the immediate and dramatic results of medication. Anne Hollows of Sudbury, Mass., mother of 9-year-old Nicholas, feels that while medication has been vital in easing her son's symptoms, his 57 sessions of neurofeedback have helped, making him calmer and better able to control his actions.

The catch with drugs is that many children stop taking them. In one large study, more than 60 percent of the children on stimulants discontinued them within eight years. Parental concern may be a factor—side effects are not uncommon, and lately some of the drugs have been linked to stunted growth and, in rare cases, an increased risk of heart attack. By contrast, says Arnold, neurofeedback "by and large doesn't appear to be a risky treatment. Undoubtedly, it has less side effects than medicine."

That's why Kim Sanders of Aubrey, Texas, decided to try neurofeedback a few years ago with Macy, now 15, and Trent, 14. The stimulants they were taking for their attention disorders, says Sanders, inhibited their growth. She has seen a "night and day" difference in Trent's behavior and a "remarkable" improvement in Macy's performance in school. They no longer take medicine.