

PSYCHOTHERAPEUTICS COLUMN

Treatments for Childhood ADHD Part II: Non-Pharmacological and Novel Treatments

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In last month's column, new pharmacologic formulations for the treatment of Childhood Attention Deficit Hyperactivity Disorder (ADHD) were discussed. This month we turn our attention to non-pharmacologic treatments for ADHD. The research literature is nearly unanimous regarding the robust effects of medication. Nevertheless, psychological and social treatments, as well as a novel neurotherapy, are important components of the ADHD toolbox.

THE EVIDENCE BASE FOR PSYCHOSOCIAL AND BEHAVIORAL INTERVENTIONS

Non-pharmacologic interventions include: Parent Training Skills, Cognitive Behavioral Therapy, and Behavioral Training, as well as Cognitive Rehabilitation and Relaxation therapies (National Institutes of Health [NIH], 2008). A well-executed review of the literature was published in *Pediatrics*, in 2005 (Brown, 2005). Findings were extracted from evidentiary reviews of studies of the highest rigor, such as the Multimodal Treatment for ADHD comparative clinical trial sponsored by the National Institute of Mental Health; a study sponsored by the Agency for Healthcare Research and Quality; and a large meta-analysis conducted by the Canadian Coordinating Office for Health Technology Assessment. The conclusions from these reviews concurred: Pharmacologic (stimulant) treatments are most effective in treating the "core" symptoms of ADHD. Behavioral approaches alone offer limited value for core symptoms, although they can improve functioning (operationalized as decreased disruptive behavior and improved parent-child relations and social skills). The multimodal treatment approach, which combines parental and school-based behavioral educa-

tion and intervention along with medication, seems to improve social functioning of children, when compared to that of comparison groups, based upon ratings by both teachers and parents (Brown et al., 2005). Cognitive behavioral therapy (CBT), frequently utilized with adults with Attention Deficit, has had less success in children. Relaxation and cognitive retraining seem to address concomitant problems of ADHD versus core symptoms. Psychosocial therapies alone, without pharmacotherapy, have been reported to help up to 30% of the recipients, while pharmacotherapy alone is effective in nearly twice as many.

NEUROFEEDBACK

Neurofeedback is a novel treatment utilizing neuroplasticity to improve attention. First studied in the 1970s, neurofeedback, also referred to as encephalographic biofeedback or neurotherapy (Monastra, 2005), was decried for decades as a fringe or hippie phenomenon. However, in the past decade, neurofeedback has been garnering credibility through high quality, efficacy research; a large portion of the published research has been conducted in Germany, but published in US journals, including *Pediatrics* (Striehl et al., 2006). Past studies have been limited by methodological weaknesses, such as small sample size or no control groups. These shortcomings have been overcome within the past five years (Hirshberg, 2007). The research team on Striehl and colleagues' (2006) publication included a biophysicist from NIH. This paper included actual electroencephalographic (EEG) data, providing hard evidence to support the hypothesis that neuroplastic changes co-occur with behavioral changes (Striehl et al., 2006).

There is evidence from both neuroimaging and EEG studies that children with ADHD have atypical patterns of cortical activation (Monastra, 2005). Specifically, under-arousal is associated with slower cortical potentials or too many delta or theta waves (Leins et al., 2007). EEG biofeedback therapies address one or both of these altered patterns, through "rewards for scalp EEG frequencies that are associated with relaxed attention. . . [while it] suppresses frequencies associated with under- or

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over-arousal" (Friel, 2007, p. 146). In neurotherapy, these waves are converted into visuals on a computer screen, and the patient performs a series of exercises to develop a training effect. With repeated trials, the child trains his brain to be more responsive; when the affected wave is altered through concentration, visual feedback—a positive change in the picture—reinforces the newer wave patterns. The number of treatments recommended by clinicians is approximately 30, with three phases of treatment, each having ten iterations with an increasing level of attention or focus. Studies have sometimes used up to 40 treatments.

Short term behavioral improvements have been found to be at least comparable to pharmacotherapy (Fuchs, Birbaumer, Lutzenberger, Gruzelier, & Kaiser, 2003). The body of evidence has been deemed to be at the Level 2 category "probably efficacious" as based in guidelines established by the two professional bodies in the field, The Association for Applied Psychophysiology and Biofeedback and the International Society for Neuronal Regulation (Monastera, 2005).

Two studies from a major research site in Germany have tested longer term outcomes, with follow-up assessments from six months to several years after cessation of treatments. Importantly, good performance in self-regulation, defined as the ability to produce negative potential shifts in trials without feedback, predicts clinical outcome. Indicators have included real life changes, including behavioral ratings measured by parents and teachers and DSM-IV (American Psychiatric Association, 2000) symptom checklists, to name two.

Indeed it is in longer term effects that this treatment appears to excel. "Feedback-guided learning" to achieve control over neural activation (Hirschberg, 2007, p. 315) facilitates self-regulation of one's own wave activity through training; volitional control of the mental state can become a well-utilized pathway in the circuitry of the young malleable brain. With neurophysiological plasticity such a strong possibility, why is the treatment still underutilized?

Lack of formalized regulation, certification, and few champions in the conventional treatment venues are all factors for neurofeedback's underuse, as well as lag time for translation to practice. Neurofeedback continues to carry the hocus-pocus hippie anti-science connotation. For example, The National Alliance for Mental Illness' website (<http://www.nami.org/Content/Contentgroups/helpline1/Attention-Deficit-Hyperactivity-Disorder.htm>) lists biofeedback among the "unscientific ... rather dubious" treatments for ADHD (although, admittedly, the site has not been updated since 2003).

At this time, more than 20 studies of neurofeedback therapy for ADHD have been conducted involving over 700 participants. Nine have been controlled trials, which account for over 400 participants. These controlled trials have compared neurofeedback to sham treatment, non-treatment (waiting list), and stimulant medication only. Five of the nine studies used randomized controlled trials (Hirschberg, 2007). (For reference lists

and particulars of all studies, please see Hirschberg, 2007, or Vernon, Frick, and Gruzelier, 2004.)

Limitations, Strengths, and Future Research

Functional MRI studies have been suggested to increase knowledge of the specific mechanisms involved in the attention-disordered brain. Additional randomized controlled trials are needed to supplement initial studies, using larger samples. Confounds in all studies have included a Hawthorne effect (an improved performance in an experiment in response to special attention) because of the extensive amount of time spent with therapists who are also providing reinforcement. However, this effect has been equalized in new designs (Gevensleben et al., 2009), and the two studies that looked at very long term outcomes have provided evidence of a significant maintenance of the treatment effect. The role of parental support cannot be removed as a variable. Parents who self-select for special treatments and who consent to trials and research are very involved and invested in the success of the child and the treatment; this is not unique to this area and is another reason that very large studies that draw from a wide catchment area are needed.

Nevertheless, the potential for this therapy has taken a large step forward in the scientific community in the past several years. Major strengths of the evidence base for encephalographic biofeedback (EBF, the newly preferred term) are that efficacy rates have met or exceeded those of medication, with no lasting adverse effects having been reported in the research literature. Finally, unlike pre-marketing experimental trials of medications, EBF is already available and being utilized today in real world settings, garnering a large pool of real world data, as if Class II and Class III trials were being run concurrently. To consider neurofeedback, that is, EBF, for ADHD unproven is true; to refer to the evidence as unscientific is no longer an accurate statement.

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