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Article 48

Neurofeedback: A Third Option When Counseling and Medication Are Not Sufficient

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The field of neurobiology and neuropsychology is rapidly growing. Forty years ago, researchers discovered that the brains of mice and cats could be trained with operant conditioning (Doidge, 2007). Neuroscientists now understand that the human brain has the capability to adapt and develop new living neurons by engaging new tasks and challenges throughout our lives (Doidge, 2007; Amen, 2006). This process of neuroplasticity “can result in the wholesale remodeling of neural networks... a brain can rewire itself” (Schwartz & Begley, 2003). Even more exciting is the growing body of research demonstrating that the brain can be taught to self-regulate and become more efficient through neurofeedback (NF), a type of biofeedback for the brain (Demos, 2005). Very few practitioners now doubt that humans are capable of intentionally controlling neural functioning when trained properly (Hirshberg, 2007).

Electroencephalographic neurofeedback (EEG NF) or neurotherapy may be prescribed for persons with different types of brain dysregulation (Jensen, Grierson, Tracy-Smith, Bacigalupi, & Othmer, 2007; Romero, Manly, & Grafman, 2002). According to Chapin

Neurological dysregulation results when the brain is using the wrong brainwave, at the wrong time for the wrong task. This causes a state of neurological over-arousal, under-arousal or instable-arousal. Some examples of over-arousal are: anxiety, anger, obsessive compulsive disorder, insomnia, impulsiveness and distractibility. Examples of under-arousal include: depression, lack of concentration and difficulty waking. Examples of instability may be: migraine headaches, seizures, bipolar disorders, fibromyalgia and post traumatic stress disorders. (2010)

Brain Dysregulation

There are many unique and different causes of brain dysregulation. The most well known source is genetic inheritance. All human beings are born with a set of predispositions that can influence behavior. Prenatal developmental and birth complications may also cause dysregulation. Certain dietary deficiencies and environmental toxins can also affect dysregulation. Throughout our lifetime there are other possible causes of dysregulation such as suppressive psychosocial environments, head injuries, and alcohol and/or drug abuse. Other conditions such as seizures, strokes, and chronic ailments also influence the brain's efficiency. Even extended medication use and cognitive decline associated with aging are additional sources of dysregulation (Budzynski, Budzynski, Evans, & Abarbanel, 2009; Hill & Castro, 2009).

Since the 1970s, neurofeedback has been applied to many physiological and psychological problems, but because of difficulty and expense of double blind controlled research studies, its efficacy has not been thoroughly demonstrated. In the area of Attention Deficit Hyperactivity Disorder (ADHD), however, the research has consistently shown the effects of NF training to be profound and long lasting. (Leins et al., 2007; Othmer, 2007; Sherlin, Arns, Lubar, & Sokhadze, 2010).

One of the major ADHD researchers is Dr. Joel Lubar (1991). He found that over 80-90% of people with ADHD improved significantly from protocols of neurofeedback/EEG (Robbins, 1997). A recent position paper on neurofeedback and the treatment of ADHD cited meta-analyses, large multisite randomized controlled trials, historical studies, and studies demonstrating efficacy levels as support for using neurofeedback as an evidence-based treatment for children with ADHD (Sherlin et al., 2010). In 2009, Arns, de Ridder, Strehl, Breteler, and Coenen published a meta-analysis of 15 studies involving 1,195 clients with ADHD. Six of the studies had randomized controlled trials. The findings raise the clinical efficacy levels for neurofeedback from a level 3 to a level 5 (Sherlin et al., 2010). The efficacy guidelines and levels were developed by the American Psychological Association (APA), Association for Applied Psychophysiology and Biofeedback (AAPB), and the International Society for Neurofeedback and Research (ISNR) as reported by La Vaque et al. (2002; see Table 1). Arns et al. (2009) also found there was a large effect size on the symptoms of impulsivity and inattention and a medium clinically relevant effect size on hyperactivity.

Table 1 Clinical Efficacy Levels

Level 1: Not Empirically Supported	Supported only through anecdotal evidence or non-peer-reviewed case studies
Level 2: Possibly Efficacious	Shown to have a significant impact in at least one study but the study lacked a randomized assignment between controls

Level 3: Probably Efficacious	Shown to produce positive effects in more than one clinical, observational wait list or within-subject or between subject study
Level 4: Efficacious	Shown to be more effective than a no treatment or placebo control group; the study must contain valid and clearly specified outcome measures, and it must be replicable by at least two independent researchers demonstrating the same degree of efficacy
Level 5: Efficacious and Specific	Shown to be statistically superior to credible placebo therapies or to actual treatments, and it must be shown as such in two or more independent studies

Lubar's research (2003) found a 75% reduction in ADHD symptoms. Monastra (2005) noted that even after medications were discontinued, ADHD patients showed statistical gains three years after EEG NF treatment. He also found that 80% of patients with ADHD who were treated with NF were able to decrease daily stimulant medication by 50%.

In other research, working on veterans with post traumatic stress disorder (PTSD), Peniston and Kulkosky (1991) had only a 20% relapse of panic attacks. Sterman and Egner's (2006) work had a 70% reduction in epileptic seizures, and Hammond (2005) discussed major improvements in depression after a one year follow-up. Thompson and Thompson's (1998) work had an increase of over twelve IQ points for children with learning disabilities. Saxby and Peniston's (1995) work showed an 80% sobriety rate after a four-year follow-up for alcoholics in a treatment program who also received NF training.

Neurofeedback

Electroencephalographic neurofeedback (EEG NF) is a noninvasive intervention measuring brain wave frequencies over time. Four brain waves are typically observed during neurofeedback. These include: delta, theta, alpha, and beta. Delta waves (0-4 Hertz [Hz]) and theta (5-8 Hz) are observed when a person is sleeping, daydreaming, or meditating respectively. Alpha waves (9-13 Hz) typically are seen when a person is relaxed, idling, and not focusing on a task. Beta waves (13-18 Hz) are needed to solve a problem or complete a task (Budzynski et. al, 2009; Linden, Habib, & Radojevic, 1996).

Neurofeedback is a therapeutic intervention that utilizes EEG biofeedback and computer technology. The hardware and software have audio/video capabilities to change irregular brainwave patterns and regional cerebral blood flow associated with physiological and psychological problems. NF trainees receive no electrical input, only

feedback of bandwidth activity relating to individual neuronal needs and goals (Demos, 2005). Individual treatment sessions last approximately 20 to 40 minutes. To gain the largest overall treatment effect, NF users need to experience about 20 to 30, and sometimes, 40 sessions.

This noninvasive intervention reregulates neuronal activity through operant conditioning. The client's current brain wave function is first established under several conditions and tasks by attaching electrode sensors to the scalp with conductive paste and having the client read, listen, and complete mathematical problems, eyes opened and eyes closed. Based on the evaluation, a NF protocol is determined. The NF clinician then reinforces and inhibits specified brain waves as the client is observing or listening to a programmed game, video, or music on a computer monitor, correcting irregular brainwave patterns and regional cerebral blood flow associated with mental health and cognitive functioning. It is a painless treatment with very few contraindications. Some clients have mild headaches, but these often dissipate over time.

The EEG NF goal is to teach the trainee to have the right brain wave for the right task at the right time, allowing the response preparation to become automatic. To obtain the correct treatment effect, continuous, repeated sessions are required (Swingle, 2010). There are three main NF goals: normalize brain functioning, restore brain efficiency, and optimize daily brain performance. Depending on the trainee's needs, the NF practitioner can utilize standard, preset protocols or custom designed, individualized NF treatment. For example, in the case of chronic pain and some attention and learning problems, the NF clinician can design a treatment protocol that will work to decrease high delta. For sleep problems, increasing theta may be important. For problems of addiction and trauma, decreasing theta and increasing alpha will be necessary. Increasing alpha also helps with peak performance and improved cognitive efficiency. Increasing low beta waves, using a sensory motor response protocol, can help reduce migraines and some seizure symptoms. Finally for ADHD and some anxiety concerns, decreasing high beta is often the goal (Hill & Castro, 2009).

Conclusion

Frank Duffy, M.D., a Professor and Pediatric Neurologist at Harvard Medical School, wrote about brain biofeedback. He stated, "Neurofeedback should play a major therapeutic role in many difficult areas. In my opinion, if any medication had demonstrated such a wide spectrum of efficacy it would be universally accepted and widely used" (2000).

The major benefit of NF is that it can be applied to the treatment of many different physical and psychological problems, and it resolves these problems at the source, the brain. Neurofeedback has very few, if any, side effects, and the treatment can be completed in 20 to 40 sessions. Neurofeedback relies on established principles of operant conditioning and learning, and the results can be objectively documented. The results tend to be long lasting and allow clients to sometimes reduce or even eliminate medications and certain symptoms. Learning to rely on internal not external methods for staying healthy is a plus. Neurofeedback is not a panacea, but as more and more is learned about the brain and its functioning and reregulation, neurofeedback offers a

counseling intervention that provides a third option to those clients who do not get sufficient relief from counseling and medication alone.

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