

GUEST EDITORIAL

Is there an Anti-Neurofeedback Conspiracy?

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As we all well know, addictions are very difficult to treat and relapse rates are very high. Furthermore the individuals with the best outcomes are likely to be white, of high socioeconomic status (SES) better educated, addicted to a single drug, or in a socially stable living situation. However over the past two decades a new kind of adjunct therapy for addictions has emerged that is ideally suited for delivery within treatment settings by mid-level licensed professionals such as nurses, social workers, counselors, or physical therapists. This is a treatment approach that has shown strong, positive results in long term follow-ups but the spread has been glacially slow. Given the strong positive findings it almost seems as though there is a sort of a conspiracy keeping this treatment from being used.

Neurofeedback (also known as Neurotherapy, EEG biofeedback or brainwave training) has been found to be highly effective in maintaining remission status in some of the most intractable populations when used in combination with typical treatment ap-

proaches (Trudeau, 2005). Neurofeedback is a form of biofeedback where a therapist trains a person to increase or decrease certain brainwave frequencies using electroencephalographic measures taken from electrodes attached to specific sites on the scalp. It has been used for substance abuse, attention deficit disorder (ADD), seizure disorders, traumatic brain injuries (TBI), and many other conditions marked by EEG abnormalities. The main professional organization for neurofeedback, the International Society for Neuronal Regulation, keeps an up-to-date bibliography of published studies on their web site (www.isnr.org).

Most commonly, neurofeedback is administered by using a combination of hardware, software, and computer connections. Information is transmitted from the electrode sites to an encoder device, which in turn transmits it to the computer to give the person feedback (a sound and/or a visual signal) indicating whether they are accomplishing the goals of the task. For instance, for the standard Peniston/Kulkosky protocol (more about this later) an electrode might be placed at a specific occipital lobe site (O1 using the 10-20 system) and the individual is trained to increase alpha and theta brainwaves to induce a profound relaxation effect that occurs when the theta amplitude crosses over (or becomes higher) than the alpha amplitude. There are protocols other than alpha-theta and many different neurofeedback devices. These devices use a range of different feedback techniques such as photic stimulation (light feedback), electromagnetic stimulation, or the measure of blood oxygenation (HEG); but their intent is the same: to modify and restore healthy brain functioning. However, since none of these other techniques have any published studies on substance dependent or abusing populations, they will not be addressed here.

One of the first published studies of substance abuse treatment and neurofeedback was presented in 1989 in the journal, *Alcoholism: Clinical and Experimental Research* (Peniston & Kulkosky, 1989). This was a study done at a Veteran's Administration hospital in Colorado after Peniston had been trained in neurofeedback and biofeedback at the Menninger Institute. The study included 30 men, 20 of them severe alcoholics who had a minimum of four prior admissions for treatment and an average of more than 20 years of dependence. Ten men constituted a non-alcoholic control. Details of the specific protocol can be found in the article.

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In the short-term follow-up immediately at the end of the training it was found that the experimental group could significantly increase alpha and theta relative to the control groups and was significantly lower on depression scores as measured by the Beck Depression Inventory (Peniston & Kulkosky, 1989). A separate analysis of the same data (Peniston & Kulkosky, 1990) for the experimental and control groups showed significant positive changes on the Millon Clinical Multiaxial Inventory (MCMI) and the Sixteen Personality Factor questionnaire (16PF). In a follow-up done 13 months later it was found that eight of the ten men in the experimental group were still in remission compared to only two in the control group. The results were so startling that the investigators as well as a staff member of the Menninger Institute personally validated the outcomes by speaking with the subjects and their family members. Follow-ups have been periodically conducted with the experimental group and remission rates continue to be high.

Since that time there have been a number of other published studies and still more presented at conferences. Saxby and Peniston (1995) did an alpha-theta intervention with 14 alcoholics (both men and women with an average of 17 years alcohol dependence combined with depressive symptoms). At the 21-month follow-up point, 13 of these 14 individuals remained in remission according to self-report and the report of collaterals. Kelley (1997) treated a group of 19 Navaho Indians with a program based on alpha-theta which incorporated culturally specific aspects such as a "singer" medicine man/therapist who provided encouragement, blessings, purification and other guidance. Three years later the follow-up found 21% in full remission and 63% in partial remission (e.g., had experienced some infrequent, problem-free relapses and a few who had gone to normal drinking with no binges).

Taub et al. (1994) did a study with three different intervention arms compared to a regular treatment group. The added interventions included transcendental meditation, EMG (muscle) biofeedback, and "neurotherapy." The first two groups had the best outcomes at the one year point. However, what Taub called "neurotherapy" was really a form of cranial electrostimulation (CES) and not neurofeedback.

Recently two larger studies were done within residential treatment programs with populations of severe poly-drug users, most of whom were minorities and/or homeless. Scott et al. (2005) conducted a study on a polydrug population in long-term residential treatment at Cri-Help in Los Angeles. The investigators used a modified version of the Peniston/Kulkosky protocol that included a preliminary series of SMR (sensory motor rhythm 13-15 Hz) and beta training (15-18 Hz) instead of temperature training. These sessions were included because many people with substance abuse are comorbid for ADD and these frequency ranges tend to have lower amplitude than they should. They used the Test of Variables of Attention (TOVA; Greenberg, 1992) to assess whether attention parameters had normalized (it took an average of 13 sessions) and this was then followed by 30 alpha-theta sessions. The follow-up found that 77% of the experimental

group were in remission a year later compared to only 44% of the controls. A non-published follow-up at three years showed that the rates of remission had been sustained whereas the control group had more relapses. Burkett and colleagues (Burkett, 2006; Burkett, Cummins, Dickson, & Skolnick, 2005) used a similar training protocol for a crack/cocaine abusing population, the majority of whom were homeless and unemployed on treatment entry. At the 12-month point following treatment 49% were in complete remission and an additional 30% had used cocaine fewer than four times. Ninety-two percent had maintained a regular residence (compared to 40% at entry) and 91% were employed (compared to 17% prior to entry). There was no control group.

In addition to reviewing published studies for this article, personal interviews were done with numerous neurofeedback practitioners who have worked with substance abusers. For instance the head of the Texas Commission on Alcohol and Drug Abuse was dismayed at the cost of traditional treatment services that still resulted in high relapse rates. He became interested in neurofeedback and funded several programs that were successful but only one of them has been published (Burkett et al., 2005). Most individual clinicians with private pay patients or those in private institutions report successes equal to the published reports, particularly when the therapy is an adjunct to a formal treatment program or AA/NA.

There have been some negative findings or failures to replicate but none of them published. For instance Grapp et al. (1998) found that depression rates decreased in a PTSD sample but other outcomes were no where near as dramatic as Peniston's. Graap also critiqued Peniston's published reports as having reporting flaws to which Peniston replied (Graap & Freides, 1998; Peniston, 1998). The most notable failure was presented by Fahrion (2002) about a study where alpha-theta training was used with a large population of prisoners. The two-year follow-up of over 500 showed only small differences between the experimental and control groups. However the Fahrion protocol differed substantially from the original Peniston/Kulkosky one because it was done in groups of up to ten participants plugged into the same, somewhat primitive, instrument. Subgroup analysis revealed that the stimulant user group was particularly resistant to change.

In addition, the published studies have weaknesses relative to NIH-funded research. Notably, most of the studies have problems with follow-up since the treatment entities have self-funded the research and have tried to track highly mobile and dysfunctional populations with inadequate resources (from my personal experience follow-up for a difficult population usually costs about \$500 per case per interview point). In particular it is hard to track controls and early drop-outs since they are more likely to have higher severity levels. Thus the success rates often are based on the clients the researchers are able to find. This creates problems when the researchers attempt to get their work published in prestigious and high impact journals. Still, the success rates are remarkable and would stand against other treatment

approaches even if one were to factor in the lost-to-follow-up groups.

Thus published studies, conference presentations, and anecdotal reports have shown neurofeedback to be efficacious for substance abuse as well as co-occurrence of depression, ADD, changes in personality profile, and the maintenance of a stable lifestyle. Yet the approach is not widely used nor has NIH or foundation funding been available to examine the mechanisms that might explain, further validate, and refine this therapeutic approach. There are only a few dozen treatment programs, at most, in the country that include neurofeedback among their services.

The contrast between the strong efficacy of neurofeedback and the lack of adoption of the technique has led some people in the field to think that medical associations or pharmaceutical companies are trying to deliberately undermine it. The techniques do not fall neatly into either the medical or behavioral realm and thus both sides reject it. The cost of the therapy is also front-loaded so that it appears that counseling or pharmaceutical approaches are cheaper although medical visits, prescription co-pays, side-effects, and failure to have any impact can become a costly alternative when a person continues to have symptoms or a disrupted life for decades.

One barrier to acceptance is the difficulty in explaining exactly what it is that neurofeedback does and how it works. This is particularly true for alpha-theta training, which is typically explained in terms of the relief from life-long traumas in a very psychodynamic paradigm. People talk about attaining higher states of consciousness, or having spiritual awakenings and deep personal insights. It is hard to wrap one's mind around the fact that there may be a connection between electrical activity in the brain and states of consciousness. In addition, the alpha-theta protocol is actually a mixed bag of techniques including not only neurofeedback but hand temperature training, relaxation, counseling, visualization, relapse prevention, refusal skills, hypnotic suggestion, and considerable one-on-one attention from a therapist. Although there have been attempts to explain what happens to cognition, brainwaves, and the soul, the why and how of the approach are still subject to speculation. The original alpha-theta approach has evolved over time and researchers in some of the published work have substantially modified parts of the original protocol. For instance the Houston study (Burkett, 2006; Burkett et al., 2005) found overall positive results but few changes on personality profiles; however they had discarded the temperature training since they did not have the necessary equipment.

Another notable barrier to acceptance has been the high-tech nature of the therapy. Instead of counseling, group therapy, or pharmaceutical interventions this therapy requires a fairly sophisticated level of technological savvy. The therapist needs to have high-level computer skills as well as education in how to attach electrodes, measure impedance levels, and interpret whether the client understands what to do. Ideally the therapist is not just a technician but also should have high level counseling

skills since a strong therapeutic alliance may be key. Technical skills and a warm counseling manner are not always present in the same person. It takes a motivated and enthusiastic counselor/clinician to learn this approach. Given that many people do not know how to use the record function on their VCRs, the need for technological know-how could be a significant drawback. However, while neurofeedback has not reached the point of being completely turnkey, there has been considerable improvement since the 1980s when buggy software and primitive instruments were the norm.

Another barrier has been the cost and intensive one-on-one nature of the therapy. A substance abuse treatment program has to take into account the cost of equipment and training a practitioner but also the cost of doing 25 to 50 individual sessions for each client. The added cost of this therapy could range from \$2,500 to \$10,000 depending on the qualifications of the therapist and whether it is done by a private practitioner or a salaried clinician in a treatment program. On the other hand, the cost-benefit ratio is high particularly in cases where there have been multiple relapses and the person has become a significant burden to society because of incarceration or health problems that fall on the tax-paying public. Cri-Help in Los Angeles continues to have a neurofeedback program but the intake and program counselors have become adept at picking and choosing clients who might most benefit from this technique since it is a limited resource.

Further research (preferably funded through NIH or other sources) could determine how many sessions are needed as well as how best to individualize treatment and thus reduce costs. Increasingly clinicians use quantitative electroencephalograph (QEEG) brain maps when beginning to work with clients. This can reveal comorbid disorders such as traumatic head injuries, attention deficit disorder, and mood disorders. Systematic research involving designs that include or exclude certain elements would help to determine how each aspect contributes to the whole and thus allow some parts to be discarded or selectively used. In addition, the proliferation of personal computers has led to the development of home training machines which might be used by individuals for interim sessions but under the general care and direction of a practitioner.

There has been a lack of NIH funding in this field, but discussions with leaders and practitioners suggests that this may be due more to inexperience in how one constructs a grant application. Most neurofeedback therapists are clinicians and do not have university resources to help them when establishing a research program. While some grants are working their way through the system with positive encouragement from NIH project monitors and peer reviewers, other have been submitted, gotten positive peer reviews but then the project lost momentum or people moved on to something else. The NIH grant submission process is difficult, but most reviewers applaud innovation especially when it has a potential for high impact.

Siegfried Othmer (personal communication, September 2006) suggests that a reason for the lack of widespread

acceptance is premature discovery. He thinks that if neurofeedback had been discovered last year it might have gotten more acceptance in light of emerging research on the brain. Instead, it is a technique that has been around for nearly 30 years. It has been occasionally trashed by researchers in related fields (Kline, Brann, & Loney, 2002) most often with the complaint that there have been too few controlled studies with random assignment to groups. Techniques such as Eye Movement Desensitization and Reprocessing (Levin, Lazrove, & van der Kolk, 1999) and "journaling," (Pennebaker, 2003; Pennebaker & Graybeal, 2001; Pennebaker & Seagal, 1999) have had an easier time being accepted, perhaps because they are simple techniques.

Neurofeedback for substance abuse is a promising approach with potential for treating difficult and resistant addicts who have gone through the revolving door of treatment many times. Beyond that, it has the potential for helping us learn about fundamental mind/body interactions and connections and even understand some of the mysteries connecting traumatic life events and substance abuse.

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