Neurofeedback for Addictions:The State of the Science

by Al Collins, Ph.D. 2009
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Alcohol and drugs are psychoactive substances. They act in the brain, and their effects represent changes in neurological functioning. It is possible to learn to control one's brain states from within, without drugs and alcohol. In this way, addictions can be overcome without a lifetime of struggle and craving. Neurofeedback (also called EEG biofeedback) trains the brain to modulate its level of activity, to become more or less activated according to the needs of the individual. Some addictions, such as alcoholism, often involve brain over-activation. In these cases it can be helpful to teach the brain to quiet down, become less activated. In other cases, for example in people with ADHD who abuse amphetamines, the brain is under-activated and needs to learn to speed up.

Neurofeedback can improve addictions treatment outcomes and lead to better results than the best mainstream approaches now available. The evidence for this is good and likely will be better when the results of some on-going studies reach peer-reviewed journals. Treatment often begins with a quantitative EEG and is individualized, but in most cases it involves slowing down or speeding up the cortex. One widely used process for slowing is called the "alpha-theta protocol" or the Peniston protocol, after the researcher Eugene Peniston who refined and researched it. The technique actually goes back to the Menninger Clinic and work by Elmer Green, Dale Walters, and Steve Fahrion over thirty years ago.

It has been found that many alcoholics, and some other addicts, are deficient in alpha and theta waves. These types of brainwaves are associated, respectively, with a relaxed, alert state and a state of reverie and intense imagery. These alcoholics are cortically hyper-aroused and find it hard to relax and imagine.

Evidence shows pretty clearly that this pattern of hyper-arousal is present before a person becomes alcoholic, although alcoholism itself eventually exacerbates it, reducing alpha and theta even more. This is a condition of anxiety, inability to relax; a chronic state of excess tension. Drinking alcohol temporarily increases the amount of alpha and theta waves and

reduces cortical arousal. This is associated with alcohol-produced euphoria. It can even look as if these alcoholics are made more normal when they drink! After a few hours, of course, the good feeling wears off as the basic pattern of low alpha/theta and increased fast beta comes back. The person is more anxious and tense than before.

Research has shown that success in alcohol treatment is worse for those alcoholics who have the least alpha and theta activity, and the most beta. This finding supplements the discovery that alcoholics as a group have less alpha and theta and relatively more beta than non-alcoholics. That is, alcoholics form a continuum, with the most cortically hyper aroused (those with less alpha and theta) showing worse outcomes than others who are less hyper aroused.

Neurofeedback for alcoholism, and some other addictions, is a process of teaching the client first to increase the amount of alpha waves, and then to increase theta. The person progresses into a relaxed, then dreamy and hypnogogic state. Eyes are closed, and they receive feedback via sounds presented through headphones. Usually a reclining chair is used, a blanket is offered to increase comfort and the sense of security and the room is darkened or a light-preventing mask is used.

While in the hypnogogic theta state the client is asked to do visualizations picturing refusal to drink (or to do drugs) and abstinence from alcohol and other substances. In the many clients who also suffer from post-traumatic conditions the hypnogogic state facilitates the re-experiencing of traumatic memories in a setting that allows them finally to be processed and remembered in normal ways and places in the brain. Spiritual experiences often accompany the reprocessing of old memories.

A second subset of addicts is cortically under-aroused and need to activate their brains. Cocaine and methamphetamine users, for example, are different from most alcoholics - in some ways 180 degrees apart. Those who prefer speed often show high amounts of theta to start, and so need a different protocol, at least at the beginning.

Although this is a different pattern from alcoholism, we see the same effort at self medication here: amphetamines reduce slow wave activity

(theta and low alpha waves) and increase beta. This is rewarding for the sluggish, under activated brains of the cocaine and amphetamine users.

Steve Fahrion describes the alpha/theta experience as one of "exploration and discovery" in contrast to a process of "active coping." The latter focuses on increasing faster brainwaves called "SMR" and "beta" that characterize quiet focus and concentration.

William Scott and David Kaiser, in California, are currently engaged in three-year follow-up as part of a large study comparing state-of-the-art addictions treatment with the same program augmented by neurofeedback. A clinical vignette will help to understand the experience:

"About halfway through his process, a Vietnam veteran experienced a vision of hovering over himself while replaying every tour and battle he remembered and some he had forgotten. He states that he felt safe because he was only witnessing the experience rather than reliving it. It appears that he processed the events under a low-arousal state where they could be re-stored as past memories, rather than current ongoing trauma."

Research on Neurofeedback for Addictions

Eugene Peniston, with his collaborator Paul Kulkosky, did their first study in 1989, with a small group of hard-core VA alcoholics. The results were hard to believe, and Steve Fahrion and others took it upon themselves to verify them by calling relatives of the 10 addicts. They did confirm what Peniston and Kulkosky found: after thirteen months, 8 of the 10 were sober. They have since followed these same 10 clients for 10 years and 7 remain abstinent (one has died). They also found that the clients treated with hand-warming and neurofeedback showed lower levels of beta-endorphin, a neuropeptide that indexes stress. A follow-up study in 1990 found that a number of personality variables improved in the neurofeedback group relative to a control group. These included scales from the MMPI, the Beck Depression Inventory, and the Millon (MCMI).

In 1992 Fahrion and colleagues studied one client intensively during alpha-theta neurofeedback. This man was an alcoholic - sober for 18 months but experiencing stress-related craving for alcohol and fears of

relapse. They found that after neurofeedback the client showed markedly lower response to stress. Both during relaxed states and during stress, the client was much more relaxed after neurofeedback than he had been before. The patient, his wife, and colleagues reported that he functioned in a much more relaxed way and was no longer experiencing a craving for alcohol.

William Scott's and David Kaiser's study was mentioned earlier. They studied 43 controls and 48 experimental subjects in a residential inpatient treatment setting. This facility, CRI-Help, based its treatment on the "Minnesota model, a 12-step oriented program supported by group, family, and individual counseling." In addition, the experimental group received 40 to 50 neurofeedback sessions. The experimenters began with 10 to 20 sessions of SMR-beta training aimed at increasing cognitive control before beginning alpha-theta work. As mentioned before, this was because of the high initial theta found in stimulant and cocaine abusers. The SMR frequency is found in the motor cortex and signifies a state of physical stillness and mental concentration. Beta (just slightly higher in frequency) may measure a state of somewhat greater cognitive focus.

Like Peniston, Scott and Kaiser used the MMPI to track progress, and found that the experimental group showed much more personality change than the controls. Follow-up at 24 months showed that the differences between the groups were even greater.

The Scott-Kaiser study was initiated by the Chairman of the Board of CRI-Help. He stated, "It must be recognized that we are dealing here not only with typical research subjects but rather with the most difficult type of addict currently in rehabilitation. Most were assigned to CRI-Help by the courts or their care was otherwise mandated. To have observed this kind of improvement over what we consider to be a model, state-of-the-art program already is simply remarkable." He concluded that when these results are confirmed in other studies "they will change the standard of care in the field."

Such confirmations already exist. In the Kansas prison system, at least as hard-core a group of addicts as those in Los Angeles, Steve Fahrion has gotten excellent results using essentially the original alpha-theta protocol.

His clients were over 500 criminals who were also addicts (about equal numbers of alcoholics, marijuana and cocaine users). The alpha-theta group was significantly less likely to fail than the controls. This was especially clear among those who had the worst record initially and among African-Americans particularly.

Two large studies in Texas are also very impressive in demonstrating the effectiveness of alpha-theta neurofeedback. One was done within the state corrections system by Alphonso Bermea, and three-year follow-up data was strongly indicative of success using the neurofeedback treatment. The second is a study with addicted street people (95% are crack cocaine addicts). Sixty-nine (69) people have completed treatment and have been followed for from six months to one and one-half years. Success is defined very stringently, through four criteria, all of which must be met:

1. Not on drugs (verified though random UA)
2. Not homeless
3. Not unemployed (at work or in school)
4. Not arrested.

Note that when they enter treatment none of these men were employed or had a home. All were on drugs or alcohol and most had lengthy police records. The results have been overwhelming positive. Preliminary results show that 83% of clients are successful in meeting all four criteria. The project received a $3 million grant from the Houston Endowment to fund it for three more years.

About the Author:
Al Collins, PhD, is a clinical psychologist in Anchorage, Alaska. He has been doing neurofeedback for seven years. In addition, he performs quantitative EEGs. Besides applied neurophysiology, Dr. Collins specializes in cross-cultural psychology, especially the psychological ideas of India and Buddhism. His website is www.BrainDance.us.