

EXCERPT: WIRED FOR MIRACLES?

By Jim Robbins

Appeared in Psychology Today, June 1998.

Music of the Brain

Neurofeedback is part hero, and part orphan these days. Despite some powerful research that testifies to its impact, it is only peripherally concerned with what has become the hot topic in neuroscience: neurotransmitters. Far less fashionable than Prozac or Paxil, neurofeedback seems to work by intervening in the realm of frequency. Frequency is the rate at which electrical charges move through brain cells. The human brain is measured by four basic frequency ranges. In delta, the sleep state, signals are moving through clusters of neurons very slowly, just 4 cycles per second, or hertz (Hz). Just above that is theta, around 4 to 8 Hz, a deeply relaxed state. Next is alpha, a slightly less relaxed state, at 8 to 13 Hz. The most rapid brain waves are beta, and they reflect normal waking consciousness. However, there's a range of beta, from low beta, which is a relaxed but alert state of 12 to 15 Hz, to mid-range beta, around 15 to 19 Hz, up to an excited, hyper state of high-beta--as high as 35 Hz.

Even though our measures of frequency (through EEG) are relatively crude, they seem to provide a window into excitability within the brain. Researchers believe that problems crop up when the operating speed of someone's brain is either too low (underarousal) or too high (overarousal). As Siegfried Othmer, President of EEG Spectrum, puts it, "some people can't find the gas pedal while some people can't take their foot off it." There is speculation that arousal levels may be a major component in a whole host of disorders -- and their prevalence may be the key to neurofeedback's sometimes miraculous effect. The goal? To stabilize the brain, to render it more robust, so that it does not tip easily into overarousal or underarousal.

Viewing the human mind this way, through the prism of neurofeedback, harkens back to a theory of arousal that was popular in the 1950s. This approach essentially cuts across the spectrum of psychological diagnostic categories with just two physiological measures: stability and arousal. According to this theory, optimal idling speed for the human brain is about 14 Hz. If the brain's major activity is a speed lower than that--8 to 13 Hz--a person can feel tired and might seek stimulation through coffee or stimulating behavior. They might suffer from depression, ADD, and mild dissociative disorder. Overarousal, on the other hand, means a person has trouble unwinding and might seek out several glasses of wine at the end of the day to modulate their arousal level. Or they might need Valium. Anxiety attacks, hypervigilance, stress, and obsessive behavior are all symptoms of overarousal.

Hooked up to Happiness

Neurofeedback sessions are surprisingly fun and simple: they're like playing computer games where every move is made by the mind. The

technology utilized in neurofeedback, however, is fairly sophisticated, and unit prices can run from \$3,000 to \$9,000. Brain waves must be mapped and analyzed for deviations from the norm. If there is, for instance, too much theta--which often occurs in brain trauma, as well as in depression--and not enough beta, the practitioner will set parameters for a slightly healthier brain wave map. A session may consist of playing some kind of computer game -- in which a smiling Pacman gobbles up enemy blobs or a balloon tries to float up to the sky-- while the patient's brain waves are continuously monitored. Each time the brain waves find their way into the optimal state set by the practitioner, the patient is rewarded with positive feedback: Pacman eats his enemy or a pleasant tone sounds. After anywhere from five to fifty sessions, the brain seems able to find the optimal state on its own.

One of the ingenious aspects of neurofeedback is that it is perfectly tailored to each individual. Training is always set to be challenging and exciting but not too difficult, so that patients can move slowly and steadily into their optimal brain states.

Wired in the Schools

One place where the treatment of ADD has been put to the test is the Enrico Fermi Center for the Performing Arts in Yonkers, New York. Three years ago, Linda Vergara, an assistant at the school, was faced with taking her son from a private school because he was hyperactive. Within several sessions, she says, her son began to change. Profoundly. "He started sitting through dinner," she says, "and finishing his homework."

Her experience convinced her to bring an EEG neurofeedback machine into the inner-city school of about one thousand minority students. Three years and sixty kids later, the program has worked. "It has turned people's lives around," says Vergara. The program is being expanded to two other schools in Yonkers, and eventually, school board members say, to all twenty-two schools in the district. So far, neurofeedback has kept twenty students out of expensive special-education classrooms and thereby saved the district an estimated \$500,000. When I visited the school recently, parents, teachers, and children raved about this alternative to Ritalin. "If it works here," says psychologist Mary Jo Sabo, Ph.D., who helped Vergara bring the technique to Fermi, "it will work anywhere."

And here's fascinating news: even when treating ADD, therapists and teachers see other positive changes in behavior.

Feeding My Head

Beta training was where I started my journey with neurofeedback. I was curious about the technology, especially after I heard talk of the Clean Windshield Effect. Bernadette Pedersen, an EEG technician from the local hospital, came and helped me hook up the first few times. Though the equipment--two computers, a neuroamplifier, and some EEG electrodes--is

relatively easy to use, one does need training, and, for therapeutic uses, a trained doctor or psychologist is necessary. For a half hour or so, I watched a game: white lines formed in the middle of the highway and a beep sounded when I produced the right brain waves. About an hour after that, it was as if someone had flipped a switch. The world looked sharp and crystalline, its colors richer. My thinking was sharper and I had a quiet kind of energy. It lasted a couple of hours.

After five or six sessions, the God-just-painted-the-world effect dissipated, but I noticed other changes. I felt calmer and more centered. I felt more secure in social situations. Particularly important to me was that my mornings were much more productive. I always drink coffee and drag my tail until late morning. Lately I've been getting up, ready to go. By the fifteenth session, the change was unmistakable. As of this writing, it has lasted about a month.

Feeding the Future

Neurofeedback may be of help in the treatment of a host of problems besides epilepsy, ADD, closed head injuries, and addiction. Its applications are being explored, but all of them have yet to be subjected to controlled studies. EEG Spectrum has treated more than two thousand people clinically in the past ten years--some for such problems as Tourette's syndrome, PMS, depression, teeth grinding, migraines, insomnia, strokes, menopause, and chronic pain. The claims that some practitioners make about neurofeedback do alarm certain researchers, but Susan and Siegfried Othmer are unrepentant. Fifteen years ago, their son Brian was one of the first to be treated for severe epileptic seizures and behavioral disorders. They saw dramatic positive changes in his personality as well as in his physiological problems, and, says Susan, "we knew right away this was something we had to be involved with. We found out that it's not considered scientific to be enthusiastic. We're sorry, but we're parents. We need to get this out there." The Othmers now have three hundred or so affiliates who have built a common body of knowledge, sharing information at conferences and over the Internet.

If neurofeedback works so well, why is it virtually unknown? One reason may be that neurofeedback fits no prevailing medical model. Nearly all research on the brain is in the language of neurotransmitters and psychotropic drugs, and not in that of frequency or of mental exercise. Science likes its medicine to fit within the governing conceptual framework. ..(Siegfried) Othmer blames "panacea paranoia." Something that works so well can't possibly be real. There are also some real drawbacks: it's expensive, it's time-consuming, and it must be conducted by trained personnel.

The word about EEG has spread. Othmer estimates the handful of practitioners ten years ago has grown to fifteen hundred worldwide. Perhaps for good reason. Barry Sterman believes there is no doubt that physiological changes take place, and claims there are several careful studies to prove it. According to Joel Lubar, neurofeedback "increases the blood flow into the brain. Blood flow, metabolism, and high frequency electrical activity all work together."

Increased blood flow may help the brain reset itself in a normal range. And Don Wight, (a) pediatric neurologist, says the impact of neurofeedback is not a placebo effect. "You would know," he says. "If the kids come off medicine, and stay off it, and can function, you would know. It's real."

THIS IS AN EXCERPT OF A MUCH LONGER ARTICLE. WE RECOMMEND
YOU READ THE FULL ARTICLE.