light and noise-I'd say, "Got that, got that, got that." It turned out I was among the walking wounded.

As an infant, I fell off the changing table, head first. That later became a family joke whenever I did something weird. But no one ever made the connection between the fall and my restlessness and disruptive behavior in school.

"In my perfect world," said Esty, "the minute a child shows attention disorder or disruptive behavior in a school, he or she would get neurofeedback therapy."

My head injuries didn't stop with my early fall. As an equestrian, I've had four significant knocks to me head, one requiring ten stitches and another rendering me amnesic for a half hour. There have been several falls that, at the time, didn't seem serious enough to seek medical help.

Muriel Lezak, professor of neurology, psychiatry, and neurological surgery at Oregon Health & Science University, compares the brain to a computer. Imagine, she says, if someone took a hammer and knocked off a few connections here and a few connections there. The programs would run, but some would have a few small errors, slowing down the processing time. The more hits from the hammer, the slower the processing. The destruction of any connection creates a short circuit that has to be bypassed, and as a result, compensatory programs have to be developed, further slowing down processing time. That's your brain after each injury.

I figured I'd had enough blows to the head to cause some kind of damage. But I'd chalked up all the symptoms-forgetfulness, fatigue, inertia, chronic head and neck aches, sensitivity to bright light and cold, brain fog-to me accumulating decades.

I DECIDED to give EEG stimulation a try. The only thing I had to lose was some money. Although EEG stimulation is covered by some insurance companies (for example, Kaiser Permanente), it is not covered by mine. The initial consult for the brain map costs $500. Each session is $90.

I've now had two brain maps-one by Stokes and the other by Esty. Both were revelatory. I was tempted to call my ex-husband and say,"See, I wasn't losing all those library books on purpose like you thought."

No wonder I was tired all the time and it took me forever to get things done assuming they got done. My theta, delta, and alpha waves had invaded my waking hours, bullying my beta and SMR waves practically off the map. Delta and theta are supposed to be high during sleep or rest. Beta and SMR are the ones that get things done.

Back to the orchestra metaphor: My drums were banging so loud, my violinists had packed up and gone home. My conductor had thrown up his baton in despair and stomped off.

"You're going through life underwater," Esty said. "It's like the heat's on in the house, but it's all escaping through the roof."

She attached two electrodes and hit me with a picowatt of power. I felt nothing.

For three days, I felt nothing. Still losing things, still inert, still procrastinating. Then on Sunday, I found myself cleaning
my car. I'd been thinking about doing that for about a year. After that, I moved all the houseplants back inside for the winter. I'd been thinking about doing that for more than a month. Then came my saddle, bridle, boots, chaps, and anything else leather I could find that hadn't been cleaned in months. I chewed through my entire list of chores that had been rolling around in my head. And come 3 PM, when I'm usually ready for a nap, I was searching for more things to do.

"Wow," was all my husband could say. "You got to keep this brain stuff up."

After my second treatment, when I lectured to my journalism class at Georgetown, I found every word I was looking for. Prior to that, I'd be in the middle of a sentence and forget the word for something as rudimentary as "deadline." I also stopped losing my keys, a minor miracle in my house.

Before EEG stimulation, I'd stop the car, take out the keys, walk in the house, and, without thinking about it, put the keys
down someplace. Later, when I went to look for them, I couldn't remember anything after stopping the car.

Now, I'm fully aware of what I'm doing with the keys. Fully aware are the operative words. This may sound like a so-what to anyone who doesn't have this problem. But it was life-changing for me.

I haven't lost my keys in months, and I'm more productive than I've been in years. Most surprisingly, I'm not cold anymore. I actually enjoy winter.

Will it last? Esty says yes. But if I start to slip, I know where I'm heading. Back to the brain-zapper machine.

As for Jeff, things keep getting better for him. In the past, he wrote poems about wanting to die. He recently wrote this:

The boy you hate is finally gone.
He has gone to experience what life never offered
Comfort, love, pleasure without pain and a stress free environment.
Without a rustle of leaves
Or a flutter of wings
He is gone forever.
He is forgotten in the blink of an eye,
Never to be thought of again,
For he is gone.

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Mind and Body

By Jody Jaffe

Pumping Neurons

Two painless therapies claim to retrain brain waves and help people who have memory problems, depression, insomnia, headaches, even a bad golf game

WHEN Lori told Jeff, her 15-year-old son, to write up his *Odyssey* notes for English class, he ran to the kitchen and grabbed a knife. He pointed it at himself, then turned it on his mother.

"If you won't let me kill myself," he screamed, "I'll kill you."

He fell to the floor and cradled his head between his hands. "I can't stop it! My head, my head," he said as he rocked back and forth.

That was in the spring of 2003. Lori couldn't remember a time when her younger son had been happy. Prone to violent behavior, he'd been in psychotherapy since age 11. He'd been on three types of medications and tried individual and group therapy. Nothing was working.

"I know what hell looks like," says the 48-year-old Springfield mother of three. "It's your child .... " She struggles to finish the sentence. "This time two years ago, I would have sworn to you 1was going to bury my child. He wanted out, and he was planning it."

Then Dr. Michael Anderson, a McLean psychiatrist, suggested Jeff try neurofeedback training. It had helped Anderson's daughter with her attention deficit disorder as well as many of his patients who hadn't responded to medication for other problems.

On Anderson's recommendation, Lori took Jeff to Deborah Stokes, an Alexandria neurofeedback therapist.

I was skeptical of it because I'd tried a lot of things and nothing seemed to work," says Jeff. "Every day was a battle, emotional and physical.

After 15 sessions, he noticed a difference: "I wasn't as stressed out and depressed."

After 45 sessions, his mother noticed big changes. "He's happy; he smiles," Lori says. "He's off antidepressants for the first time since fourth grade."

"He's got a life ahead of him, where I didn't think he had one before."

JEFF'S STORY was one of many I heard while researching neurofeedback training and another brain therapy, EEG (electroencephalogram) stimulation. A Northern Virginia boy with Tourette's syndrome saw his tics almost disappear; a man with
Lyme disease can now sleep through the night; a musician with debilitating headaches is not only pain-free but hears the bass notes better; several Montgomery County golfers are playing better; and 30 students at London's Royal College of Music scored a full grade higher on performance exams during a study of neurofeedback training, which is now part of tlle college's curriculum.

I have a story of my own, though it is not as dramatic as Jeff's. I can find my keys.

NEUROFEEDBACK training is a kind of biofeedback therapy. But instead of learning to control body temperature or muscle tension, as with traditional biofeedback, you learn to control your brain waves.

It started in the late 1960s with cats and rocket fuel. M. Barry Sterman, a UCLA sleep researcher, discovered that a kind of brain wave, SMR, or sensorimotor response, was associated with a reduction of muscle tension in cats. He taught some cats to increase the frequency of this brain wave.

Right after that study, NASA asked him to research the toxic effects of the rocket fuel monomethyl hydrazine. Among the test cats were some who'd been trained to increase

their SMR waves. After being exposed to the fuel, those cats didn't have seizures.

Sterman then tested people with epilepsy who weren't responding to medication. He found a 60-percent reduction in seizures for those who were taught to increase the SMR brain-wave frequency. Researchers soon found that controlling brain waves worked in all sorts of situations.

Though neurofeedback therapy has been available for more than 25 years, it's only recently started to attract mainstream attention. Advocates say it helps everything from epilepsy to a bad game of tennis, with stops along the way at headaches, insomnia, diminished memory, chronic fatigue syndrome, fibromyalgia, depression, anxiety, chronic pain, obsessive-compulsive disorder, attention deficit disorder, lackluster job performance, and head injury. Although it
cannot halt degenerative conditions such as Alzheimer's and Parkinson's, it has been used to alleviate symptoms such as tremors.

MICHAEL SITAR, a Friendship Heights psychologist, describes neurofeedback training as similar to physical therapy. "If you've got a weak muscle," he says, "you work to strengthen it. If your brain is under- or overproducing, you work to fix that." Neurofeedback training is, in Sitar's words, "going to the gym to pump neurons."

Consider neurofeedback training a kind of brain gym, except there's no going for the burn. It's not only painless but fun -- you play a video game without a joystick or keyboard. You move the images around by thinking.

"What the client is looking at on the computer screen is their brain-wave activity translated into a video game," says Stokes, the Alexandria neurotherapist who treated Jeff.

The closest anyone comes to you during treatment is to stick electrodes on your head with a white paste. These electrodes read the electrical output of your brain's neurons, which form patterns called brain waves. Generally speaking, the slow waves-delta, theta, and alpha-are associated with daydreaming, sleep, or distraction. They're fine if you're meditating or meandering through the woods but can be debilitating if you're trying to finish a task or concentrate.

You need the fast ones, the worker-bee waves-beta and SMR-to get things done. But too many can lead to agitation. It all comes down to balance. Imbalances can be the result of everything from genetics to brain injury to illnesses such as Lyme disease.

A TREATMENT session goes like this: You sit in front of a computer screen with the electrodes pasted to your head reading your brain waves. The brain-training software translates them into video-game images for you to manipulate. In my case it was three rockets chasing an asteroid.

Treatment takes anywhere from 20 to 100 sessions; the average is 50. Over its course, the therapist usually ratchets up the difficulty of the game. That forces your brain to work harder, much like your quadriceps would have to work harder if you added weight to the quad press.

"Neurofeedback mirrors the client's own brain activity back to them in the form of a video game," says Stokes. "The client is asked to change a part of the video game for instance, to make one rocket ship go faster and one slower. This enables the client to decrease brain-wave amplitudes that may be too strong and increase others that are too weak. Flexing brain waves is ike weightlifting and seems to have an overall strengthening effect on mental and emotional processes such as mood, anxiety, and cognitive processing."

While you're playing the video game, the therapist monitors another screen, adjusting the game to make it harder or easier for you to move things around, depending on which brain wave she's trying to adjust.

"Make it go faster," Stokes said to me when I tried it.

"How?" I said.

"Only adults ask that question," she said. "Kids can figure it out."

I channeled my thoughts to the rocket ships, and suddenly they were going faster. When my mind wandered, they went backward. I channeled my concentration and they zoomed forward. When I was finished, I was relaxed and could remember the feeling of zooming myself into concentration.

But my life didn't change dramatically. I went home and promptly lost my keys.

Neurofeedback training is nicknamed brain gym for a reason. You can't do one set of 1eg lifts and expect toned thighs. It took Jeff l5 sessions to notice a difference.

IN THE JANUARY 2000 editorial in the journal Clinical Electroencephalography, Frank H. Dufty, a Harvard University professor and pediatric neurologist, wrote of neurofeedback therapy: "In my opinion, if any medication had demonstrated such a wide spectrum of efficacy it would be universally accepted and widely used."

An article in the January 2005 issue of Child and Adolescent Psychiatric Clinics of North America said that neurotherapy should be considered "probably efficacious" for the treatment of attention deficit disorder: "Research findings published to date indicate positive clinical response in approximately 75 percent of patients treated in controlled group studies."

Critics say the research is thin and inconclusive. Russell Barkley, a psychiatry professor at the Medical University of South Carolina and founder of the newsletter The ADHD Report, remains skeptical about neurofeedback and attributes gains to a placebo effect.

"Sandra Loo and I reviewed all of the published studies and our conclusion was that the two controlled studies out there found no significant results," he wrote in an e-mail to me. "All other published 'studies' are just uncontrolled presentations of information that lack sufficient scientific rigor to draw any conclusions."

No one, including Barkley, says neurofeedback therapy is harmful. Stokes says she has treated children as young as four years old.

"I generally have been in the closet about neurofeedback with other psychiatrists," says Anderson, the McLean psychiatrist. "Occasionally I'll bring it up and get polite attention, and then the subject quickly changes. They think it's quackery. But I've seen the research, and it's very rewarding because people are getting better."

Anderson has recommended neurofeedback to 40 patients. He says 35 have improved significantly.

EEG STIMULATION is another form of therapy under the neurotherapy umbrella. Mary Lee Esty, a Chevy Chase neurotherapist, likes EEG because, she says, it works faster than neurofeedback.

"I like to see results quickly," says Esty, who's been using EEG stimulation in her practice since 1994. A colleague told her about it, and she flew to California to observe Len Ochs, the neurotherapist who developed the EEG-stimulation software she uses. She watched him work with patients suffering from brain injury, autism, and fibromyalgia.

"I was blown away by the results," she says. "I knew people like this tend not to get better so quickly. I came back with his software and treated myself. I had no idea how much it would change my ability to remember what I read."

Unlike neurofeedback training, which is noninvasive, EEG stimulation sends a hint of electricity into your brain. One picowatt of power--that's one-trillionth of a watt --pulses through your brain anywhere from two to 30 times a second.

Eight hospital boards have deemed EEG stimulation safe, according to Esty. "A biomedical engineer said that a comparative scale would be powering the lights of Las Vegas on a AAA battery," Esty says. "The stim is so small that most doctors, until they see the effects, believe that it cannot possibly have a therapeutic effect."

The setup is the same as with neurofeedback training: electrodes, white paste, computer. But you don't watch it. You lean back in a recliner, close your eyes, and feel nothing while the computer sends the picowatt of energy your way. It's painless and quick, sometimes lasting less than a minute.

If there were a nanocamera inside your head, it might show this pulsing picowatt of power ticklng your brain into producing more endorphins, the body's natural painkillers, and boosting other neurotransmitters like serotonin, which affect mood, body temperature, and sleep, among other things. At least that's the theory.

"It remains to be researched at the cellular level," Esty says. Some doctors, she says,also think that electrical brain stimulation increases blood flow and may stimulate the regrowth of damaged neurons so function can return. But nothing is known for sure yet.

"How many decades did it take to figure out why aspirin worked?" Esty says. "This is a field that needs a lot of research."

That's something everyone-both opponents and proponents-can agree on. The 1998 National Institutes of Health report on ADHD stated that neurotherapy merited further research on the basis of several promising trials.

Esty herself conducted an NIH -funded study, published in the 2001 Journal of Head Trauma Rehabilitation, that showed dramatic improvements among brain-injured patients using EEG stimulation.

"None of those people were expected to ever get better," she says. "And we got a bunch of them back to work, not in volunteer jobs but working in their fields."

FOR BOTH THERAPIES, the first step is to get what's called a brain map. It's like going to the cardiologist for an electrocardiogram (EKG), except the electrodes are stuck to your head instead of your chest. Like an EKG, the EEG reads electrical output. The therapist can see how your brain is-or is not-working and determine which waves need to be suppressed or increased.

A weil-functioning, uninjured brain works "with all the waves playing together in concert," says Angelo Bolea, a neuropsychologist and neurofeedback therapist in Bethesda and Annapolis. Imagine an orchestra in which the string instruments drown out the wind section. That's a brain out of whack. Depending on your brain's discord, the consequences range from forgetfulness to cloudy thinking, headaches, depression, even autism.

Brain injury can be caused by a difficult birth, a chronic infection, chemomerapy, or a blow to the head.

Pair an injured brain with the wrong family history and you've got a very troubled kid-like Jeff, the Virginia teen who, according to his mother, inherited mental health problems on both sides of his family. Plus, when he was four, he ran his bike into a parked car, leaving an egg-shaped bump on his forehead.

Neurofeedback and EEG stimulation are sometimes used together.

"Neurofeedback therapy is the only thing I know of that brings executive functioning back online," says Anderson, the psychiatrist who treated Jeff. By executive functioning, he means prioritizing, sequencing, and shifting thoughts, the necessary tools to navigate through school, work, and life.

Anderson added the therapy to his practice five years ago after a psychologist friend told him about it. "I thought it was a little weird," he says. Then he read the bible of neurofeedback therapy, *A Symphony in the Brain*, by Jim Robbins, went to a neurofeedback conference, and became a believer.

"It all made sense," Anderson says. "There was comprehensive research that overwhelmingly demonstrated the effectiveness of neurofeedback therapy. I thought, this is science. This is not made-up crystal stuff"

He sent his teenage daughter to Stokes, the Alexandria neurofeedback therapist who later treated Jeff, and to Esty, the Chevy Chase neurotherapist who uses EEG stimulation. The results, he says, were remarkable.

"She said it was like her brain suddenly woke up," Anderson says.

I KNOW THE FEELING. When the therapists I interviewed for this story would tick off the symptoms of brain injury-fatigue, memory loss, dizziness, intolerance to cold, sensitivity to bright