

PSYCHOLOGIST ELSA TELSER BAEHR TREATS DEPRESSION  
BY TRAINING PATIENTS' BRAINS TO CHANGE THEIR MOODS.

# ON A DIFFERENT WAVELENGTH

IN A TALL, ANONYMOUS SKOKIE, ILL., OFFICE BUILDING, THE 19TH CENTURY MEETS THE 21ST AT NEUROQUEST LTD. THIS CUTTING-EDGE CLINIC STATES ITS PURPOSE ON AN OLD-FASHIONED SAMPLER EMBROIDERED WITH THE WORDS OF EMILY DICKINSON:

*If I can stop one heart from breaking,  
I shall not live in vain;  
If I can ease one life the aching,  
Or cool one pain,  
Or help one fainting robin  
Unto his nest again,  
I shall not live in vain.*

As director of the NeuroQuest Ltd. clinic, psychologist Elsa Telser Baehr has helped more than “one fainting robin” to beat depression with treatment that also works for a wide variety of disorders such as attention-deficit hyperactivity disorder, hypertension, head injuries and anxiety disorders. Using neurofeedback methods based on a protocol developed by J. Peter Rosenfeld, a psychology professor at Northwestern, Baehr (GC71) trains patients to alter their own moods by manipulating their brain waves, much as a physical therapist helps people exercise and strengthen their muscles.

Baehr's success with hundreds of patients holds promise for the treatment of depression, which strikes one in five Americans at some time in their lives, often to devastating effect. Twice as many women as men become depressed, and suicide linked to depression is the third-leading cause of death among U.S. teenagers, says Patricia Ainsworth, assistant professor of psychiatry and human behavior at the University of Mississippi Medical Center and author of *Understanding Depression* (University Press of Mississippi, 2000).

The staggering emotional toll of depression is matched by its financial cost. Treatment and loss of work time attributable to depression cost an estimated \$44 billion per year, according to the National Institute of Mental Health. Studies show that only 25 percent of depressed patients are helped by the

traditional treatments of medication and psychotherapy, says Rosenfeld.

Baehr's neurofeedback, in contrast, helps at least 75 to 80 percent of patients, generally within a year, without medication or any invasive techniques. Many feel immediate improvement, though most patients receive between 30 and 100 treatments.

New treatments for depression, such as Baehr's, are emerging from the relatively recent understanding that the brain never stops changing. Until about 20 years ago neurologists believed brain structure developed during childhood and, once mature, remained the same over a lifetime. In recent years, however, aided by imaging technology and increasingly sophisticated analytical tools, neurologists have seen how the nervous system adjusts to changing circumstances. It's now clear that the brain creates new pathways and connections as needed throughout life: to master a new job, improve a golf stroke or, most dramatically, to engineer recovery from a stroke or other injury to the brain itself.



**Psychologist Elsa Baehr's pioneering work in neurofeedback has helped her patients overcome the debilitating effects of depression.**

by Fern Schumer Chapman

Neurofeedback offers a window through which to view these changes by measuring levels of electrical charge on various areas of the scalp. This translates to detecting and observing brain waves — so named for their wavelike patterns evident in the printed readouts Baehr uses to chart each patient's mental map. The readouts show that brain waves shift constantly with every change in emotions. At the most fundamental level, a sleeping person's brain waves differ vastly from those of a wide-awake subject. More subtly, the brain waves of a depressed person differ from those of a contented person with a healthy sense of well-being.

Neurofeedback involves reading an individual's brain waves, which change based on circumstances or mood. With help from Baehr and her colleagues, the patient can then train his or her brain to change thought processes. Over a period of repeated sessions, this change in thinking brings about lasting changes in the person's mood and outlook.

“We can actually identify a genetic signature for depression in the brain waves,” says Baehr, a soft-spoken, gentle woman who earned her doctorate at Northwestern and has served as a contributed service faculty member in psychology at the Feinberg School of Medicine's Department of Psychiatry and Behavioral Sciences for the last 25 years. “Through neurofeedback we can retrain the brain so that these patients aren't depressed anymore. We have data on patients for years after treatment. The condition is holding.”

Baehr's treatment works to balance brain waves on the left and right sides of the brain, as measured by alpha brain wave frequency. Slow brain waves on the left side indicate a patient likely to be withdrawn and depressed. People with slower brain activity in the left frontal cortex tend to be more negative, Baehr explains, even to the point of considering suicide.

A teacher who had persistent thoughts of killing himself stopped ruminating about his death shortly after he began treatment. “He came to us after medication and therapy didn't prevent him from having obsessive suicidal thoughts,” says Baehr. “After a couple of weeks of training, his thoughts of suicide stopped and his depression eased.”

The right and left sides' waves can be brought into balance through neurofeedback — the core of Baehr's treatment for depression. Baehr's own multiple studies have examined how brain wave activity affects vulnerability to depression. One experiment measured an ability to change brain wave asymmetry when subjects were asked to think happy or sad thoughts. Seventy percent of the subjects showed changes in the brain waves — evidence that brain activity can be controlled by thought and that this can alter emotion and mood.

The basis for Baehr's work goes back to 1966, when Russian neuropsychologist A.R. Luria observed that the left frontal lobe is a kind of regulator, helping to stop an unpleasant emotion once it begins. He reported that damage to certain parts of this area left patients with a tendency to obsess about troubling ideas. Animal research at the University of Connecticut confirmed this observation by showing that severing the connection between animals' left and right frontal regions makes them more prone to fear and aggression.

Examining the link between brain waves and emotion, Richard Davidson, professor of psychiatry and psychology at the University of Wisconsin-Madison, identified a brain wave “signature” for depression. Davidson based his work on data that compared stroke patients who had lesions on either the left or right side of their brains. Patients with right-frontal lesions tended to have a greater sense of well-being than those with left-frontal lesions, which lowered brain wave activity in the left hemisphere and resulted in a tendency toward depression.

In 1997 Davidson lectured at Northwestern about his findings. His audience included Baehr's collaborator, Rosenfeld.

“When I listened to Davidson’s lecture, I wondered if you could train animals and people to change their brain waves,” Rosenfeld recalls. To find out, he started with rats — though “I wasn’t trying to cure rats of depression,” he jokes. He then worked with cats, then dogs and finally, humans.

“We trained 10 people to change their brain wave asymmetry,” says Rosenfeld of his first human study. “With minimal training they changed their brain wave patterns. Nobody can tell you how they do it. They seem to think about small happy thoughts ... thoughts about, say, skiing down a mountain.”

Of the first 13 people Rosenfeld trained, nine were able to make changes in just three sessions. This 70 percent rate of response to the treatment encouraged him.

“Since most clinical neurofeedback protocols involve upward of 30 training sessions, rather than the three sessions we used, we felt that our result was extremely promising,” he explains.

Yet 15 years later, Rosenfeld says, physicians and psychotherapists remain slow to use neurofeedback in treating depressed patients. “They’d rather prescribe pills,” he says. Rosenfeld says that “it’s very hard to get support” for controlled studies of less profitable methods of treatment such as neurofeedback.

“Still, Dr. Baehr gets big effects,” he says. “This deserves to be tested by further control studies.” Although controlled studies have proven the effectiveness of neurofeedback therapy in treating ADHD and other disorders, comprehensive studies on using neurofeedback to treat depression haven’t been done yet. But Rosenfeld and Baehr, who have collaborated on the research and co-written papers, are encouraged by other researchers’ success in replicating their results.

Indeed, promising results have led to more widespread research on brain wave activity as it relates to mood and emotion. Andrew Tomarken, a psychologist at Vanderbilt University, found that brain activity patterns could predict how strongly an individual would react to happy or distressing visual images. People with more right-brain activity demonstrated

more negative feelings of disgust and repulsion when viewing grisly films of surgery. Those with more left-side activity responded with greater delight to films showing a playful puppy or a gorilla taking a bath.

Even 10-month-old infants display the same brain wave patterns. A 1989 study by Davidson and Nathan Fox, professor of human development at the University of Maryland at College Park, determined that infants with more brain wave activity on the right side of their brains would cry more when their mothers left the room.

“Every single infant who cried had more right-frontal activation,” Davidson reported. “Every one who did not had more activity on the left.”

Research has branched out from depression to examine other conditions that may be alleviated by work on brain waves. Women who suffer with a severe form of premenstrual syndrome called premenstrual dysphoric disorder, for

example, show alpha brain wave patterns identical to those of depressed patients during certain days in the menstrual cycle, though Baehr and Rosenfeld have found the same is not true of women who suffer with a less severe form of premenstrual disorder known as premenstrual syndrome. PMDD patients reported that they often had mood swings and homicidal and suicidal thoughts during the week before the onset of their menstrual periods. Their symptoms were successfully treated with neurofeedback and antidepressants.

Baehr recently reported at a meeting of the American Association of Applied Psychophysiology on a pilot study of 24 never clinically depressed subjects. The study identified a brain wave signature for these people. After clinically depressed patients of Baehr’s completed neurofeedback treatments, their brain wave patterns looked similar to those of nondepressed patients.

“This finding gives a clear picture of the differences in brain waves of a depressed and nondepressed person,” says Baehr. “It also shows when a depressed person’s brain has normalized.”

Yet Baehr, too, is frustrated by the medical profession’s slow acceptance of neurofeedback to treat depression and other disorders. She says she sees an example of this reluctance in the fact that many of her publications have been in books and peer-reviewed academic journals, such as the *International Journal of Psychophysiology*, rather than medical journals. Baehr says that while comprehensive, controlled clinical studies need to be done, “every person serves as his or her own control,” each with a unique before-and-after comparison. Follow-up studies after five, 10 and 15 years show the lasting effect of treatment.

And Baehr has seen too many successes to concede a data deficit. Among hundreds of patients she and her staff have trained

to increase their left-brain activity in fighting depression, “the clinical pictures and the long-range outlook for most of these patients were improved,” she says.

And Baehr is not an antiestablishment maverick pursuing her own interests to the exclusion of all else. “I believe that neurofeedback works best in conjunction with other treatments such as talk therapy and/or medication,” Baehr says, “though many patients reduce and sometimes eliminate medications as they retrain their brains.”

Baehr’s former patients, while more than willing to discuss their successful treatment with her, continue to experience the stigma of mental illness and asked not to be identified by their full names in print. Without exception, however, they were and are convinced of the relief they found under her care.

Ann, the very first patient Baehr treated, had suffered from lifelong depression. After completing a year’s neurofeedback treatment, she has kept her brain waves in a healthy balance for more than 20 years. Now in her 80s, she says she’s “upbeat” and “optimistic” despite life challenges that include a bout with cancer. She has not had a major depressive episode since ending neurofeedback therapy.

Barbara wrote to thank Baehr, saying that after fighting depression for most of her life, she feels transformed after the treatment. “I feel again like I am 17 in many ways,” she wrote. “My life lies optimistically ahead of me. There is a renewed sense of purpose. The joy and passion are back.”

Carla, who had suffered from depression for as long as she can remember, sought treatment from Baehr in 1993. “I worked with her for five years, 15 years ago,” Carla says. “This was when they were just developing neurofeedback techniques, so the treatments weren’t as quick. We battled the enemy on all fronts — neurofeedback, talk therapy, medication and meditation.

“I don’t really like to talk about this because people

don’t believe me,” Carla says. “But one day it was like a switch went off in my brain. I was no longer depressed. Now I go in once a year to check my brain wave ratios. They’re always fine. I worship the ground Elsa walks on.”

Because Baehr works independently, outside the traditional academic setting, she’s functionally invisible to the medical profession. She has been widely recognized by her peers, however, with awards including the 2004 Presidential Award of Merit from the International Society for Neurofeedback and Research. This was a particular honor, she says, because the organization’s president at the time was a prominent neurofeedback pioneer, Joel Lubar, of the University of Tennessee.

The award recognized Baehr’s groundbreaking research and clinical application of neurofeedback and her work in conducting longitudinal studies. And the validation from her peers, she admits, is sweet.

Baehr continues her work today in the Skokie building where the sampler on her wall reminds patients as well as staff of the importance of its message.

“No, Elsa,” says a teenage patient as she reads Baehr’s sampler. “You have not lived in vain.” Then she smiles broadly at the clinician.

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*Tell us what you think. If you have questions or comments, please e-mail the editors at letters@northwestern.edu.*



**Above, Elsa Baehr discusses the asymmetry protocol display with a patient. Left, an electro-cap used for the quantitative electroencephalography (EEG) brain map.**

**Right, a display used for neurofeedback training on the BrainMaster equipment.**

