

Biomedical/Educational Update:

Can behavior mod change the brain?

The most effective treatment for autism is behavior modification, a non-medical therapy. Until now, researchers have assumed that the therapy altered behavior while leaving underlying brain abnormalities unchanged. But a new study suggests that behavior modification may actually change the functioning of the brain.

Psychiatrist Jeffrey Schwartz and colleagues at UCLA performed PET scans on nine patients before and after they underwent behavioral therapy for obsessive-compulsive disorder (OCD). Three patients did not benefit from the therapy, but six others did—and the PET scans taken after their therapy showed marked changes in brain functioning. Differences were seen in the links between four brain areas associated with OCD (the orbital frontal cortex, caudate nucleus, cingulate gyrus, and thalamus). In addition, the caudate nucleus—a brain region that is overactive in patients with OCD—became less active.

During their 10 weeks of therapy, the patients learned to label their obsessive-compulsive urges as part of their disorder, rather than giving in to them. They also were instructed to engage in 15 minutes of enjoyable activities, such as playing music or walking, each time they felt an obsessive or compulsive urge.

Schwartz says the study is significant because it suggests that in OCD, abnormal brain function "can be reversed by cognitive-behavioral therapy alone, without medication."

"Therapy found to produce brain changes," Daniel Goleman, *New York Times*, February 15, 1996.

New interest in old epilepsy diet

A seizure treatment known since Biblical days, the ketogenic diet, is gaining popularity again—largely due to the efforts of movie producer Jim Abrahams and his wife.

Abrahams' infant son, who suffered hundreds of seizures per day despite surgery and the use of multiple anticonvulsant drugs, became seizure-free after beginning a ketogenic (high-fat, low-carbohydrate, low-protein) diet several years ago under the supervision of physician John Freeman of Johns Hopkins University. Abrahams and his wife have established the Charlie Foundation to Help Cure Pediatric Epilepsy, in order to provide information about the use of the ketogenic diet in treating otherwise intractable epilepsy, particularly in children. (The foundation's toll-free number is 1-800-FOR-KETO.)

The idea of the ketogenic diet, which produces some of the physiological effects of fasting, stemmed from observations (some recorded in the Bible) that fasting can

reduce the incidence of seizures. The diet was most popular between the 1920s and 1940s, when the Mayo Clinic used it successfully with more than 230 patients. It was replaced by medications, but the ketogenic diet appears to control seizures in a number of patients for whom drug treatments fail.

The ketogenic diet causes the brain to burn ketone bodies (byproducts of fat metabolism) instead of sugar for energy—a condition known as "ketosis." The treatment appears to be more effective in stopping myoclonic seizures than other forms of seizures. Physician Donald Shields, who treated the Abrahams' son before the child was placed on the diet by Freeman, was skeptical about the treatment; but after witnessing the boy's improvement, he started using the treatment with other patients who did not respond to drugs, and reports a success rate of about forty percent. He emphasizes, however, that "this is not a first line of treatment."

"The diet is not a silver bullet for epilepsy," says Freeman, who is Director of the Pediatric Epilepsy Center at Johns Hopkins. "But there is no question in my mind that it works." Why it works, however, remains a mystery.

Both benefits, drawbacks significant

The benefits of the ketogenic diet, particularly for very young children, can be remarkable. Many children can be weaned off the diet after three years or so, with no recurrence of seizures. In addition, the diet, which can be used alone or in conjunction with seizure drugs, reduces or avoids the sometimes serious hazards of anticonvulsant medications.

However, the ketogenic diet is not entirely without drawbacks. For one thing, it is very unpalatable, requires careful measuring, and must be followed to the letter because even minor "cheating" will nullify its benefits. Because the diet is unbalanced, careful supplementation with vitamins and minerals is necessary. In addition, the diet requires strict regulation of fluid intake, increasing the risk of kidney stones. Other potential side effects include alopecia (hair loss), growth retardation, optic neuropathy, nausea, vomiting, constipation, diarrhea, and susceptibility to bacterial infections caused by impaired functioning of neutrophils (white blood cells involved in immune system activity).

"Long-lost diet checks epilepsy," *Arizona Republic*, December 7, 1995.

—and—

"Use of the traditional ketogenic diet for treatment of intractable epilepsy," Alice Gasch, *Journal of the American Dietetic Association*, Vol. 90, No. 10, October 1990, pp. 1433-1434. Address not given.

—and—

"Impaired neutrophil function in children with seizures treated with ketogenic diet," Robert C. Woody, Russell Steele, Whitfield Knapple, and Neylon Pilkington, Jr.; *Journal of Pediatrics*, Vol. 115, No. 3, September 1989, pp. 427-431. Address not given.

Music promotes autistic children's sign/speech learning

A common method of teaching autistic children to communicate is "simultaneous communication," in which the therapist signs and speaks to the child at the same time. Noting that autistic children recognize and enjoy musical patterns and are often musically gifted, Evelyn Buday set up an experiment to test whether children with autism would learn more words or signs if the simultaneous communication technique was combined with music.

Buday worked with ten autistic children, teaching them a total of 14 signed and spoken words. Seven of the words were incorporated in a musical verse, and the other seven were part of a rhythmic verse which was not set to music. While the music or non-musical verse was played on a cassette player, the therapist would speak and sign only the targeted words. (For instance, if the verse was "three bears out for a walk one day," the therapist would say the word "bears" along with the singer or narrator on the tape.) In addition, as each word was approaching on the tape, the experimenter would show a picture of the item the word represented.

"Results indicated a significant difference in the number of signs correctly imitated," Buday notes, "with more signs imitated during music condition training than rhythm condition training." Buday also found that students imitated more spoken words during the sessions, and recalled more spoken words the next day, if they had learned the words during the sessions involving music. There was no significant difference in the number of signs recalled.

Buday suggests that music reduces boredom, thus allowing autistic children to focus more intently on the words being taught. She notes, "I observed less hand [flapping] and head movements during the music conditions as well as less incoherent babbling."

She adds that the children appeared to enjoy the music sessions much more than the non-music sessions, saying that "many of my subjects would sing or speak many (in some cases all) of the words in the music verse in addition to the tested key words." In contrast, she says, "it was evident that the children who spoke frequently during music testing would often stop talking altogether during [non-music] rhythm testing, or their voices would become dramatically softer."

"The effects of signed words taught with music on sign learning by children with autism," Evelyn M. Buday, Master's thesis, University of Illinois at Chicago Circle, 1995. Address: Evelyn Buday, Department of Psychology (M/C 285), 1009 Behavioral Sciences Building, 1007 W. Harrison Street, Chicago, IL 60607-7137.