

# Deep brain stimulation may improve memory

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Deep brain stimulation (DBS) surgery, which is used to treat Parkinson's disease and other movement disorders, is now being studied for its potential to treat a variety of conditions. For example, DBS of the hypothalamus has been used to treat cluster headaches and aggressiveness in humans, and stimulating this area influences feeding behavior in animals.

A new study found that hypothalamic DBS performed in the treatment of a patient with morbid obesity unexpectedly evoked detailed autobiographical memories. The study will be published online in the *Annals of Neurology*, the official journal of the American Neurological Association.

Led by Andres Lozano, Professor of Neurosurgery and Canada Research Chair in Neuroscience and his team at the Toronto Western Hospital in Toronto, Ontario, researchers conducted an experimental study to treat a 50-year-old man with a lifelong history of obesity in whom a variety of treatment approaches had failed. While they were identifying potential appetite suppressant sites in the hypothalamus by stimulating electrode contacts that had been implanted there, the patient suddenly experienced a feeling of "déjà vu."

He reported the perception of being in a park with friends from when he was around 20 years old and as the intensity of the stimulation was increased, the details became more vivid. These sensations were reproduced when the stimulation was performed in a double-blinded manner. The contacts that most readily induced the memories were

located in the hypothalamus and estimated to be close to the fornix, an arched bundle of fibers that carries signals within the limbic system, which is involved in memory and emotions. Stimulation was shown to drive the activity the temporal lobe and the hippocampus, important components of the brain's memory circuit.

At the first office visit two months after the patient was released from the hospital, the researchers were able to induce and videotape the memory effects seen in the operating room by turning on the electrical stimulation. They also tested the patient's memory during and without stimulation and found that after three weeks of continuous hypothalamic stimulation he showed significant improvements in two learning tests.

In addition, the patient was much more likely to remember unrelated paired objects when stimulation was on than when it was off. They conclude that “just as DBS can influence motor and limbic circuits, it may be possible to apply electrical stimulation to modulate memory function and, in so doing, gain a better understanding of the neural substrates of memory.”

Source: Wiley-Blackwell

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