



Does Noninvasive Brain Stimulation Hold Promise For Treating Eating Disorders? Harvard Medical School Reaction

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The January 19, 2008 article "[Is Transcranial Magnetic Stimulation a new Treatment of Bulimia Nervosa?](#)" published on *Medical News Today* casts this potential new therapy for eating disorders in too dark of a light. As was mentioned previously, researchers at the Innsbruck University (Austria) tested the effects of repeated sessions of transcranial magnetic stimulation (TMS) on bulimia nervosa. Their data show that the average number of binges per day declined significantly, but there was no significant difference between sham and active stimulation (Walpoth *et al* 2008).

The use of TMS to modulate food intake is still a developing therapy, and it is important to keep in mind limitations in study designs when evaluating results. The negative results of this particular study might be due to several reasons: (1) The small sample size of 14 women resulted in a low power to detect differences between treatment groups, (2) The effects of TMS might last only for few minutes after stimulation, and thus no long-term effect on binges or purges were seen, (3) Higher doses of stimulation might be necessary to modify eating behavior significantly in subjects with bulimia compared with healthy subjects.

It is also imperative to keep in mind the theory behind the therapy. There is an increasing amount of evidence that the decision to eat originates in brain regions associated with executive control. Although several factors influence food consumption-such as levels of blood sugar, hormonal changes, food availability, emotional state (including anxiety and depression), physical activity, and memory-these factors are finally processed in the neural networks associated with decision making. Therefore, a potential approach to regulating food cravings is to interfere with this decision making process by changing the activity of the dorsolateral prefrontal cortex (DLPFC) - a brain area intimately associated with decision making.

Preliminary studies evaluating brain stimulation for the treatment of eating disorders have been performed using two different techniques: transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS). Both noninvasive techniques have been shown to be effective in modulating cortical excitability and brain activity (increasing or decreasing according to the parameters of stimulation); and tDCS has additional advantages as it is a simple, portable and non-expensive method of stimulation.

Two initial studies investigating the effectiveness of TMS and tDCS on food intake were performed in healthy subjects. The first study showed that high-frequency (10 Hz) rTMS of the left DLPFC decreased food craving in 28 women suffering from frequent food cravings; cravings during exposure to food remained constant in the active treatment group but increased in the sham treatment group (Uher *et al* 2005). In addition, a similar study using tDCS demonstrated that active DLPFC stimulation significantly reduced food cravings. Subjects consumed a smaller amount of food and fixated on pictures of food for significantly less time after active tDCS stimulation than with sham stimulation (Fregni *et al* 2007).

What is more, at the International Neuromodulation Society's (INS) eighth world congress in December 2007, Bomin Sun, MD presented data that demonstrated the effectiveness of deep brain stimulation (DBS) as a treatment for anorexia nervosa. His more than two-year study of 20 patients whose previous psychiatric and pharmaceutical therapies had been ineffective showed that two months following DBS treatment, anorexic patients gained between 17 and 44 pounds, and many saw significant improvement in obsessive-compulsive and anxiety symptoms. These results question whether noninvasive approaches will be able to induce similar results.

While these results are extremely promising and exciting, it is still early to draw more definitive conclusions on the role of noninvasive (and invasive) brain stimulation for eating disorders. However, the initial data and the serious nature of anorexia and bulimia encourage further studies.

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