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# Brain stimulation enhances motivation to work for food

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Electrical stimulation of the brain through the vagus nerve increases the motivations to work for food, according to recent findings of a research group at the University of Tübingen. These findings, which were presented at the annual meeting of the Society for the Study of Ingestive Behavior this week in Utrecht, Netherlands, demonstrate a novel method to alter motivation to obtain food.

"Vigorous work is costly and has to be recuperated by energy intake. That makes it vital for us to know when it is worth the effort. The vagus nerve helps set the tone for actions by signaling, for example, if energy is readily available for that action or not," says Dr. Nils B. Kroemer, the Principal Investigator of the study and junior group leader of the University's Neuroscience of Motivation, Action, and Desire Laboratory (neuroMADLAB) . "We knew that vagus nerve stimulation changes dopamine levels in animals and that chronic stimulation improves depressive symptoms in humans, but it was not known if it could acutely improve motivation. We found that it may provide a much-needed technique to rapidly change reward-related behavior such as eating".

The researchers invited 81 hungry participants to their laboratory on two occasions. Everyone was offered a tasty breakfast, but there was a catch. Participants had to exert physical effort to win reward points that could be "cashed in" for their favorite cereals. At one of the two sessions, participants completed the task while receiving electrical stimulation of the vagus nerve; during the other session, they received placebo stimulation. Results showed that stimulation boosted how vigorously

participants exerted effort for the rewards at stake compared to the control condition.

"This ambitious experiment is one of the first to study motivational changes during acute vagus nerve stimulation," said Monja P. Neuser, a Ph.D. student in the neuroMADLAB and lead study author. "The motivational effects elicited by the stimulation are very promising and encourage us to further unravel the exact neural mechanisms. We think that the stimulation increases dopamine levels in the brain, which is known to enhance vigor. "

By using concurrent functional neuroimaging, researchers of the neuroMADLAB will continue investigating how non-invasive vagus nerve stimulation can be administered to maximize its benefits. Most notably, researchers plan to apply this technique in people suffering from anhedonia—an absence of desire to engage in normally pleasurable activities such as eating—to determine whether it increases their motivation to seek out and consume food.

**More information:** Research citation: Going with your gut: tVNS increases invigoration for food rewards, Presented July 2019 at the Society for the Study of Ingestive Behavior, Utrecht, NL

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