

# San Diego neuroscientist says brain-buzzing device causes weight loss

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A San Diego entrepreneur just took first place in a big startup

competition put on by all the University of California schools, winning judges over with its brain-manipulating wearable device used for weight loss.

Neurovalens makes a headset (worn like headphones) that stimulates a region of the [brain](#) tied to appetite. Wearing the device for an hour per day is resulting in a 5 percent reduction in body fat for its users over three to four months, said the company's founder Jason McKeown, a visiting scholar at UC San Diego.

It sounds like science fiction—or at least a late-night infomercial—right? Well, the device actually has some interesting science behind it, and the company's founder is seeking approval from the U.S. Food and Drug Administration to treat obesity.

Neurovalens competed alongside 150 entrepreneurs across 10 campuses in the annual UC Entrepreneur Pitch Competition. McKeown was the winner of the later-stage category, earning \$15,000.

## **How does it work?**

The brain controls [weight loss](#) and [weight gain](#) by managing appetite, hormones, metabolism and more. That's why the newest anti-obesity drugs target the brain, rather than older methods like stomach staples and balloons.

The company's device, called Modius, targets a region of the brain called the hypothalamus, which regulates appetite by picking up messages about fullness and satiation from hormones like leptin and insulin. The brain gleans information from these signals to control hunger.

McKeown, a neuroscientist at UC San Diego's Center for Brain and Cognition, said the Modius headset stimulates the vestibular nerve

through the back of the head, which then sends a message to the hypothalamus to dial down appetite and cravings.

Helping to curb hunger is especially hard for people trying to lose [weight](#), McKeown said, because their brains want to cling to the fat for survival.

"You can lose weight through diet and exercise, but the process is difficult," McKeown said. "The more you exercise, the hungrier you get. Your hypothalamus makes you want to eat more. The desire increases and increases. People feel like they're never full, their mood is low, and they have strong drive for sugary foods."

Modius is meant to help with the painful process of weight loss, not replace a healthy diet and exercise. The goal, McKeown said, is slow and maintainable weight loss. Not overnight success.

## **Is it legit?**

Obviously, Neurovalens has had its fair share of skepticism since launching a public crowdfunding campaign in 2017, in which it raised over \$2 million. After all, the science is very new and the company hasn't yet earned the FDA's stamp of approval proving that it works. And let's be honest, probing the brain while sitting on the couch seems too good to be true. But McKeown said the company is currently enrolling over 100 patients for a pivotal trial, the last stage of clinical testing before asking the FDA for approval.

The U-T reached out to several unaffiliated experts in weight loss to see what they thought about Neurovalens' device. Most declined to comment on the company's technology, saying they weren't familiar enough with neurostimulation to offer perspective. But one researcher at the Salk Institute for Biological Studies weighed in: neuroscientist Sung Han, who

studies neural circuits underlying brain disorders.

"Yes, there is emerging evidence that hypothalamic appetite neurons can be manipulated by neurostimulation," he wrote in an email. "We stop eating when our stomach feels full. The stomach uses two ways to send a satiety signal to the brain when it's full. It secretes satiety hormones into the bloodstream so the hormone gets into the brain's satiety center, the hypothalamus. Alternatively, the stomach can directly communicate with the brain via the [vagus nerve](#), which directly connects the stomach and the brain. This company uses a way to hijack and manipulate satiety signals from the gut using a neurostimulation device. The vagus nerve goes up to the brain through our neck, so we can non-invasively manipulate the vagus nerve fiber passages in our neck. Although we still don't fully understand how it works, preclinical studies shows convincing evidence that vagus nerve stimulation can reduce appetite, relieve depressive symptoms, and even alleviate seizure frequency in some form of epilepsy."

## **How long does it take?**

McKeown said the company hoped to see 5 percent fat reduction over the course of one year. However, early data collected from Neurovalens' mobile app suggests people are meeting that goal within four to five months. That data isn't as trustworthy as clinical data, mind you. Customers log their own information through the app, leaving a margin for error. And there's no way to know what other factors are influencing their weight loss.

McKeown said the Modius device shouldn't be pegged as a "quick fix" for weight loss, when anti-obesity drugs try to achieve much faster results. His device, by comparison, is a very slow fix.

"Some weight loss drugs promise people 10 pounds of weight loss in

seven days," McKeown said.

But he said he understands the suspicion people have.

"In the weight loss sector, there's a healthy degree of skepticism, and that's a good thing," McKeown said. "People are always seeking the next quick fix. But this is the opposite of that. We're looking for long-term health and a way to manage fat levels over a long period of time."

While it remains to be seen if Modius works or not, Han said he's optimistic that this kind of technology could offer an alternative to traditional weight loss drugs. Anti-obesity drugs can cause depression and other unfavorable side effects due to how they manipulate the brain.

"Due to the side effects, there are currently no tolerable anti-obesity drugs available," Han said. "Therefore, in my opinion, interrogating the brain-gut wired system (vagus nerve), instead of a wireless system (satiety hormones) may provide us with a more specific and side-effect-free anti-obesity therapeutic intervention."

Based on older neurostimulation technology, Modius is considered a safe device and can therefore already be sold in the U.S. and elsewhere. The device costs \$500. But remember: just because it's safe doesn't mean it's effective. Waiting to see if an FDA approval comes through might be wise.

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