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# Reduction in insomnia symptoms associated with non-invasive neurotechnology

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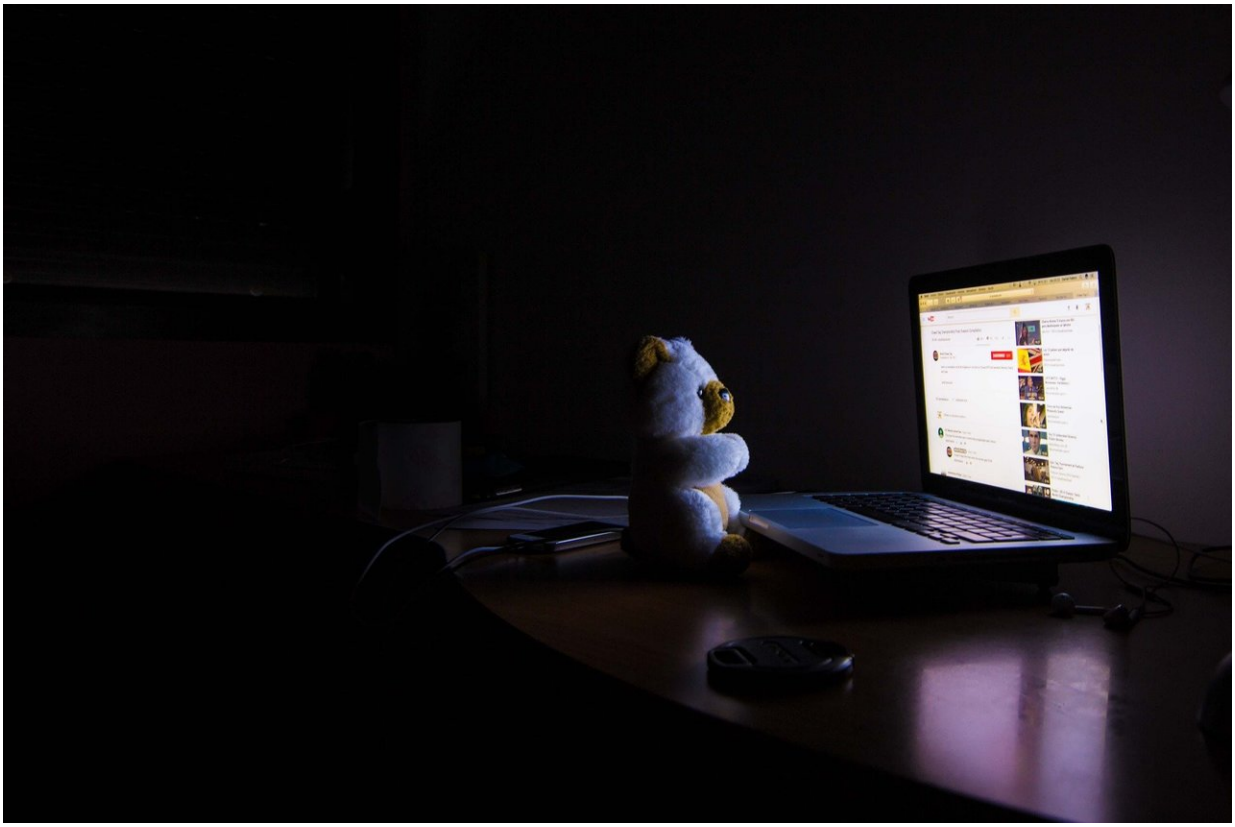

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For people with chronic insomnia, a good night's sleep is elusive. But what if insomnia symptoms could be alleviated by simply listening to one's own brainwaves?

Researchers at Wake Forest Baptist Health conducted a clinical trial that showed reduced insomnia symptoms and improved autonomic nervous system function using a closed-loop, acoustic stimulation neurotechnology. The study is published in the September 17 online edition of the journal *Brain and Behavior.*

High-resolution, relational, resonance-based electroencephalic mirroring (HIRREM) uses scalp sensors to monitor brainwaves and software algorithms to translate specific frequencies into audible tones of varying pitch in real time.

These tones linked to brainwaves are echoed back instantaneously via ear buds. This allows the brain a chance to listen to itself, to look at itself in an acoustic mirror.

"Sleep is foundational for optimal health, healing and well-being," said principal investigator Charles H. Tegeler, M.D., chair of neurology at Wake Forest School of Medicine, part of Wake Forest Baptist Health.

"HIRREM is a unique non-drug, noninvasive, acoustic neuromodulation intervention that supports the brain to balance and quiet itself. Our results show durable benefit for both reduced symptoms of insomnia and significantly improved objective measures of autonomic function."

HIRREM technology supports the brain to self-adjust, to reset from what may have become stuck trauma and stress patterns, believed to contribute to insomnia, Tegeler said. The brain pattern is observed to shift toward improved balance and reduced hyperarousal with no conscious, cognitive activity required.

According to the American Academy of Sleep Medicine, about 30 to 35% of Americans have experienced insomnia, which can reduce life expectancy and increase the risk of cardiovascular events, obesity,

diabetes and other illnesses.

The study included 107 adult men and women with moderate to severe insomnia. Approximately half received the HIRREM intervention, and the placebo group received an active intervention of random tones. All participants kept a daily sleep diary, and each received 10, 60-minute intervention sessions (either HIRREM or placebo), over a three-week period.

In the study, changes were recorded on the Insomnia Severity Index (ISI), a self-reporting instrument to assess insomnia symptoms. Researchers also recorded heart rate and blood pressure to objectively analyze autonomic cardiovascular regulation.

After completion of the intervention sessions and at follow-up visits up to four months later, subjects in the HIRREM group reported clinically meaningful reductions for insomnia symptoms. Four months following the intervention, 78% of those receiving HIRREM reported no significant insomnia symptoms. They also showed significant, durable improvements in autonomic function across multiple objective measures of heart rate variability (HRV) and baroreflex sensitivity (BRS) compared to those who received random tones. HRV is a powerful biometric that reflects the health of the autonomic nervous system, and BRS measures blood pressure regulation.

In this study, the HIRREM participants were five times more likely than placebo to have improvement in their HRV measured as rMSSD by more than 50%. They were also twice as likely to have improved BRS by more than 50% compared to placebo.

These changes may lead to long-term improvement in the cardiovascular health of the participants, Tegeler said. There were no serious adverse events, and less than 6% of study participants dropped out.

"These findings add to the rapidly growing interest in neuromodulation and demonstrate that a brief intervention with closed-loop acoustic stimulation can improve sleep in a meaningful way, while also improving autonomic function," Tegeler said. "It's an important alternative approach for people who suffer from insomnia."

**More information:** Catherine L. Tegeler et al, High-resolution, relational, resonance-based, electroencephalic mirroring (HIRREM) improves symptoms and autonomic function for insomnia: A randomized, placebo-controlled clinical trial, *Brain and Behavior* (2020). DOI: 10.1002/brb3.1826

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