

Mindfulness smoking-cessation app can change the brain

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Researchers have found that a mindfulness-based smartphone app designed to help people stop smoking was effective at reducing study participants' self-reported daily cigarette consumption. And those who

reduced their cigarette consumption the most also showed decreased reactivity to smoking-related images in a brain region known to be activated when someone experiences a craving.

Dr. Jud Brewer, an associate professor of behavioral and social sciences and psychiatry at Brown University, led a team in conducting a randomized controlled trial that compared [smoking](#)-cessation apps. For four weeks, one group of 33 participants used a mindfulness-based app, while another group of 34 participants used a free smoking-cessation app from the National Cancer Institute (NCI).

"This is the first study to show that mindfulness training could specifically affect a mechanism in the [brain](#) and to show that changes in this [brain mechanism](#) were connected to improved clinical outcomes," said Brewer, who is the director of research and innovation at the Brown University School of Public Health's Mindfulness Center. "We're moving in the direction of being able to screen someone before treatment and offer them the behavior-change interventions that will be most likely to help them. This will save everybody time and money."

The findings were published on Tuesday, April 30, in the journal *Neuropsychopharmacology*.

The mindfulness app includes daily videos and activities to help users identify their smoking triggers, become more aware of cravings and learn mindfulness methods to ride out the cravings. The NCI app helps users track smoking triggers, provides inspirational messages and delivers distractions to help users deal with cravings.

The research team found that participants who used the mindfulness app for a month reduced their self-reported daily cigarette consumption by a wide range, with an average drop of 11 [cigarettes](#) per day. The NCI app users also reduced cigarette consumption by a wide range, with an

average decrease of nine per day. Some participants in both groups reported smoking no cigarettes by the end of the month.

Participants in both groups completed an average of 16 out of 22 stand-alone modules of the app. Participants in the mindfulness group who completed more modules were likely to have a greater reduction in their cigarette consumption; this correlation was not found for the NCI group. Participants in the mindfulness group were also significantly more likely to say that they would recommend the app to a friend than participants in the NCI group.

To determine how the mindfulness app worked in the brain, the researchers conducted [functional magnetic resonance](#) imaging brain scans of the participants as they looked at smoking-associated images or other images not associated with smoking. These scans were conducted before and after participants used one of the two apps.

Specifically, the researchers looked at the changes in [brain activity](#) in the [posterior cingulate cortex](#)—a ping-pong-ball-sized brain region known to be activated when someone gets caught up in craving cigarettes, cocaine or even chocolate, Brewer said. The posterior cingulate cortex has also been shown to be deactivated by meditation, so Brewer hypothesized that this region would play a critical role in how mindfulness-based interventions—app-based or otherwise—affect the brain and change behaviors.

When the researchers directly compared the changes in brain reactivity in the target region between the two groups before and after they used the apps, they found no statistical differences. However, when they looked at the individual level and compared the reduction in cigarettes smoked to the changes in brain reactivity, they found that the participants in the mindfulness group who had the greatest reduction in number of cigarettes per day—those for whom the app was most

effective—also showed a significant reduction in brain reactivity to smoking images. They saw no correlation between number of cigarettes smoked and brain reactivity for the participants who used the NCI app. They also noted that the correlation between number of cigarettes smoked and brain reactivity was particularly significant for women in the mindfulness group.

Surprisingly, 13 percent of participants were non-reactive to smoking images before they used either app, a phenomenon not encountered in previous scientific literature, Brewer said. Other participants became more reactive to smoking images after they used either app; this has been seen before in people who craved cigarettes more while trying to quit, he added.

Brewer plans to study the apparent difference in the efficacy of the mindfulness app for women in more detail. He also plans to combine neurofeedback training with the mindfulness app and track participants in the future study for six months after using the app—the gold standard for determining clinical efficacy in smoking-cessation studies, he said.

"Digital therapeutics, such as smartphone apps, are an accessible and affordable way to deliver an evidence-based treatment—if an app is developed with an [evidence base](#) behind it, because 99 percent of apps aren't—with 100 percent fidelity," Brewer said. "You know exactly what training people are getting, because you're not depending on a therapist to follow a manual. As a psychiatrist, I think a lot of us are pretty excited about the promise of digital therapeutics."

More information: Amy C. Janes et al, Quitting starts in the brain: a randomized controlled trial of app-based mindfulness shows decreases in neural responses to smoking cues that predict reductions in smoking, *Neuropsychopharmacology* (2019). [DOI: 10.1038/s41386-019-0403-y](https://doi.org/10.1038/s41386-019-0403-y)

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