

Belief about nicotine content in cigarette may change brain activity, craving

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insula activation associated with both market value and craving

told no nicotine, smoked placebo



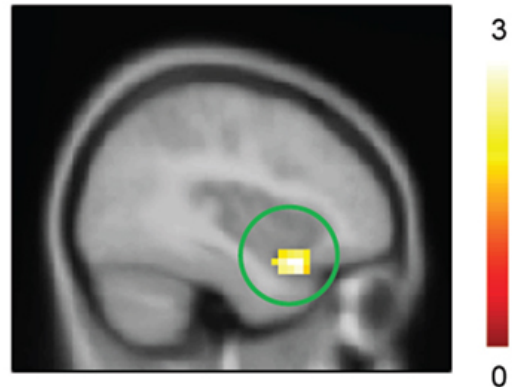
told nicotine, smoked placebo



told no nicotine, smoked nicotine



told nicotine, smoked nicotine



Smokers showed significant ventral anterior insula activation related to both market value r and post-smoking craving only when they were told "nicotine in cigarette" and smoked nicotine but not in other conditions. Credit: Gu et al.,

2016

How the brain responds to nicotine depends on a smoker's belief about the nicotine content in a cigarette, according to new research from the Center for BrainHealth at The University of Texas at Dallas.

The study, recently published in *Frontiers in Psychiatry*, found that smoking a nicotine cigarette but believing that it lacked nicotine failed to satisfy cravings related to [nicotine addiction](#). Contrary to their expectations, researchers found that in order to satisfy nicotine cravings, smokers had to not only smoke a cigarette with nicotine but also believe that they were smoking nicotine.

"These results suggest that for drugs to have an effect on a person, he or she needs to believe that the drug is present," said Dr. Xiaosi Gu, assistant professor in the School of Behavioral and Brain Sciences and the study's lead author.

The scientists used [functional magnetic resonance](#) imaging (fMRI) to capture neural activity in the insula cortex, a region of the brain that plays a role in diverse functions such as bodily perception and self-awareness. The insula cortex is also associated with drug cravings and addiction, Gu said.

Twenty-four chronic, nicotine-addicted smokers participated in the double-blind study. Over four visits, participants were twice given a nicotine-containing cigarette and twice a placebo. With each type of cigarette, they were once accurately told what type they had and once told the opposite.

"We examined the impact of beliefs about cravings prior to and after

smoking while also measuring neural activity," said Gu, who also serves as the head of the Computational Psychiatry Unit at the Center for BrainHealth.

Each visit, participants underwent an fMRI scan and were administered a cigarette, but each visit tested a different condition:

- Believes the cigarette contains nicotine but receives placebo.
- Believes the cigarette does not contain nicotine but receives a nicotine cigarette.
- Believes the cigarette contains nicotine and receives nicotine.
- Believes the cigarette does not contain nicotine and receives placebo.



Read Montague, director of the Human Neuroimaging Laboratory and the Computational Psychiatry Unit at the Virginia Tech Carilion Research Institute, was part of a multi-institutional team of researchers that showed belief about the presence of nicotine affects cravings and brain activity. The discovery was published in *Frontiers of Psychiatry*. Credit: Jim Stroup/Virginia Tech

After smoking the provided cigarette, participants completed a reward learning task while undergoing fMRI. They rated their levels of craving before smoking the cigarette and after the task.

The fMRI scans showed significant [neural activity](#) that correlated to both craving and learning signals when participants smoked a nicotine cigarette and believed its nicotine content was genuine. However, [smoking nicotine](#) but believing it was a placebo did not produce the same brain signals.

Results from this study support [previous findings](#) that beliefs can alter a drug's effects on craving, providing insight into possible avenues for novel methods of addiction treatments.

More information: Xiaosi Gu et al, Belief about Nicotine Modulates Subjective Craving and Insula Activity in Deprived Smokers, *Frontiers in Psychiatry* (2016). [DOI: 10.3389/fpsy.2016.00126](https://doi.org/10.3389/fpsy.2016.00126)

Provided by Center for BrainHealth

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