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Does the Desire for Drugs Begin Outside Awareness?

NIDA Research Reveals Subconscious Signals Can Trigger Drug Craving Circuits

Using a brain imaging technology called functional magnetic resonance imaging (fMRI), scientists have discovered that cocaine-related images trigger the emotional centers of the brains of patients addicted to drugs -- even when the subjects are unaware they've seen anything. The study, published Jan. 30 in the journal *PLoS One*, was funded by the National Institute on Drug Abuse (NIDA), part of the National Institutes of Health (NIH).

A team of researchers at the University of Pennsylvania, led by Dr. Anna Rose Childress and Dr. Charles O'Brien, showed cocaine patients photos of drug-related cues like crack pipes and chunks of cocaine. The images flashed by in just 33 milliseconds -- so quickly that the patients were not consciously aware of seeing them. Nonetheless, the unseen images stimulated activity in the limbic system, a brain network involved in emotion and reward, which has been implicated in drug-seeking and craving.

"This is the first evidence that cues outside one's awareness can trigger rapid activation of the circuits driving drug-seeking behavior," said NIDA director Dr. Nora Volkow. "Patients often can't pinpoint when or why they start craving drugs. Understanding how the brain initiates that overwhelming desire for drugs is essential to treating addiction."

To verify that the patterns of brain activity triggered by the subconscious cues reflected the patients' feelings about drugs, Childress and her colleagues gave the patients a different test two days later, allowing them to look longer at the drug images. The patients who demonstrated the strongest brain response to unseen cues in the fMRI experiment also felt the strongest positive association with visible drug cues. Childress notes, "It's striking that the way people feel about these drug-related images is accurately predicted by how strongly their brains respond within just 33 milliseconds."

Childress and her colleagues also found that the regions of the brain activated by drug images overlapped substantially with those activated by sexual images. This finding supports the scientific consensus that addictive drugs usurp brain regions that recognize natural rewards needed for survival, like food and sex.

According to Childress, these results could improve drug treatment strategies. “We have a brain hard-wired to appreciate rewards, and cocaine and other drugs of abuse latch onto this system. We are looking at the potential for new medications that reduce the brain’s sensitivity to these conditioned drug cues and would give patients a fighting chance to manage their urges.”

You can view the paper (after January 29) at: http://www.plosone.org/doi/pone.0001506

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For more information about cocaine, go to: http://www.drugabuse.gov/DrugPages/Cocaine.html

The National Institute on Drug Abuse is a component of the National Institutes of Health, U.S. Department of Health and Human Services. NIDA supports most of the world’s research on the health aspects of drug abuse and addiction. The Institute carries out a large variety of programs to inform policy and improve practice. Fact sheets on the health effects of drugs of abuse and information on NIDA research and other activities can be found on the NIDA home page at www.drugabuse.gov.

The National Institutes of Health (NIH) — *The Nation's Medical Research Agency* — includes 27 Institutes and Centers and is a component of the U.S. Department of Health and Human Services. It is the primary Federal agency for conducting and supporting basic, clinical and translational medical research, and it investigates the causes, treatments, and cures for both common and rare diseases. For more information about NIH and its programs, visit *www.nih.gov*.