Decision making predicts future drug addiction in recreational users

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Activity in decision-making brain regions of people who use recreational stimulants predicts who will discontinue use and who will develop a drug use disorder, according to a new study led by Martin Paulus, Ph.D., of Laureate Institute of Brain Research, Tulsa, Oklahoma.

The study, which appears in *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, measured brain activity in young adults using recreational stimulants, including cocaine and the prescription amphetamines Adderall and Ritalin, and followed up 3 years later to determine the participants' outcome. The findings suggest that an inability to learn from previous risky decisions in some people may predispose them to continue drug use despite the negative consequences.

At a time when recreational stimulant use is quickly growing into a public health problem, the new study helps researchers understand why occasional use becomes an addiction in some people, but not others. "These results are compelling in showing that changes in behavior and brain activity predict the emergence of addiction three years later in young people experimenting with drugs," said Cameron Carter, M.D., Editor of *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*.

"Our sample of recreational users offers a unique approach to studying addiction," said first author Melanie Blair, a doctoral student in the laboratory of Jennifer Stewart, Ph.D., of City University of New York. Most previous studies of addiction focus on chronic users, making it difficult to tease out the cause of the disorder from the effects of long-term drug use. "By finding differences between our groups prior to problematic use, our results suggest that certain brain patterns might be existing vulnerabilities that predispose an individual to addiction," said Ms. Blair.

"Studies such as this demonstrate how the use of modern neuroscientific tasks and brain imaging are taking us a step closer towards a whole new approach to prospectively predicting later addiction risk in young adulthood," said Dr. Carter.

Blair and colleagues used brain imaging to measure activity of several brain regions involved in decision making in 144 young adults. During the brain scans, the participants performed a task requiring them to make risky or safe decisions. Although all participants in the study were experimenting with stimulants at the time, some showed a tendency for making riskier choices.

"Compared to individuals who stopped using, those who later developed problem use were more reactive to rewards and showed weaker activity in regions of the brain that are critical for decision making," said Ms. Blair. These participants had lower activity in a brain circuit that provides feedback on risky decisions, suggesting they might not be as good at adapting their behavior based on previous experiences. Weaker brain activity in regions associated with decision making also predicted greater marijuana use in the future.

It is unclear yet if the brain differences that emerged in the study will be effective at predicting outcomes on an individual level, which would be a valuable tool in clinics. "Identifying at-risk individuals may lead to accurate screening measures and targeted interventions that reduce substance use disorders," said Ms. Blair.

More information: Melanie A. Blair et al. Blunted Frontostriatal BOLD Signals Predict Stimulant and Marijuana Use, *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging* (2018). DOI: 10.1016/j.bpsc.2018.03.005

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