

Cocaine users make riskier decisions after losing a gamble

January 10 2017

People addicted to cocaine make riskier decisions than healthy people after losing a potential reward, according to a study published in *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*. In the study, senior author Martin Paulus of the Laureate Institute for Brain Research in Tulsa, Oklahoma, and colleagues show that this heightened sensitivity to loss displayed by the cocaine users correlated with an exaggerated decrease in a part of the brain that processes rewards.

The results suggest that altered neural processing of risk and reward drives people with [cocaine](#) use disorder to take further risks to regain a lost reward, helping researchers to understand why [cocaine users](#) tend to make [risky decisions](#) despite the potential negative outcomes.

"This paradoxical relationship between how someone acts in response to a loss can give us clues for how to develop better interventions and how to track the recovery of the brain from [cocaine addiction](#)," said first author Joshua Gowin, of the University of California San Diego, where the research was completed, and of the National Institute on Alcohol Abuse and Alcoholism in Bethesda, Maryland.

In the study, 29 participants diagnosed with cocaine use disorder and 40 healthy control participants performed a Risky Gains Task, in which they could earn money by choosing between three monetary values - the lowest value being the safest option and higher values being riskier. Dr. Gowin and colleagues assessed differences in behavior and neuroimaging between the groups.

As the potential monetary value increased, the control group showed a proportional increase in activity of the ventral striatum, a brain region important for processing reward, which was not observed in the cocaine use disorder group. According to the authors, this suggests that riskier behavior in people with cocaine use disorder is not motivated by reward.

"In an interesting parallel to their real life behavior, brain activity and choice behavior during a gambling task used in this study indicate an aberrant sensitivity to loss and a tendency to double down and make risky choices," said Cameron Carter, Editor of *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*. The two groups made risky decisions at a similar frequency overall, but the effect was only observed after participants had lost a gamble in a previous round.

Additionally, the study showed that lifetime cocaine use correlates with activity of the anterior cingulate cortex during a risky decision, which suggests a direct relationship between neural processing of risk and substance use.

Because the data for the study were collected at a single time point after people had already developed cocaine use disorder, it remains unknown if the differences found in the study preceded cocaine use or were caused by it. Future studies that follow people at high risk for the disorder over time can help provide an answer to this question.

More information: Joshua L. Gowin et al, Doubling Down: Increased Risk-Taking Behavior Following a Loss by Individuals With Cocaine Use Disorder Is Associated With Striatal and Anterior Cingulate Dysfunction, *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging* (2017). [DOI: 10.1016/j.bpsc.2016.02.002](https://doi.org/10.1016/j.bpsc.2016.02.002)

Provided by Elsevier

Citation: Cocaine users make riskier decisions after losing a gamble (2017, January 10) retrieved 25 April 2024 from

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