

Assessing loss of control over substance use for sucrose, alcohol and cocaine using the novel seeking under the threat of adversity (STA) task

Layman's Summary

Substance addiction is a detrimental illness that affects millions of people world-wide. Besides its impact on the affected individuals, substance addiction is also the most expensive brain disorder, costing billions of euros for the health care system and authorities. One of the characteristic symptoms of addiction is loss of control over the use of drugs, which is seen through the patient's inability to control the amount of the drug they consume. It is also seen through their tendency to get involved in risky behaviours to get the drug, such as drunk driving, getting into fights, and even consuming substances that are not intended for consumption (such as drinking mouth wash and sanitary alcohol). In this way, losing control over the behaviour can be devastating to the patient and the people surrounding them.

We aim to better understand loss of control and how it develops in certain people, but not others, by observing the behaviour of rats in a newly designed research model that can capture some of the main features of human addiction. People are aware of the possible consequences of doing drugs, but these consequences do not always occur, and this what our model aims to capture. The Seeking under the threat of adversity (STA) model aims to mimic this behaviour. Rats are trained to voluntarily press on a lever to get a small amount of a drug. Initially, their seeking of the drug is not punished. But after some time, a tone which acts as a warning signal is introduced. If any presses are made during this time, they have a $\frac{1}{4}$ chance to receive a mild electrical shock. In this way, we hope the rats will feel a similar dilemma to what humans feel in the moment they must decide whether to get a drug or not.

We find that rats tested of the STA model are more likely to lose control for drugs like alcohol and cocaine, but not for food sources like sucrose. We also see that a proportion

of the animals are more eager to get the drug compared to others, which is also commonly seen in the humans. And finally, we show that our model can be used for testing treatments for addiction.

This study is important because validating a research model that can better mimic human behaviour can help us get closer to treating and curing addiction, by having a better means of testing treatments. Moreover, it will save a lot of money to the public health sector and hopefully can help decrease the stigma associated with drug consumption in the process.