

Abnormal brain structure linked to chronic cocaine abuse

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Researchers at the University of Cambridge have identified abnormal brain structures in the frontal lobe of cocaine users' brains which are linked to their compulsive cocaine-using behaviour. Their findings were published today, 21 June, in the journal *Brain*.

Led by Dr Karen Ersche, the Cambridge researchers scanned the brains of 120 people, half of whom had a dependence on cocaine. They found that the [cocaine users](#) had widespread loss of [grey matter](#) that was directly related to the duration of their cocaine abuse (i.e. the longer they had been using cocaine, the greater the loss of grey matter), and that this reduction in volume was associated with greater compulsivity to take cocaine.

The scientists also found that parts of the [brain reward](#) system where cocaine exerts its actions (the basal ganglia) were significantly enlarged in cocaine users; but the size of the enlargement was not related to the duration of [cocaine use](#). The researchers believe this may suggest that alterations in the brain's reward system predate [cocaine abuse](#), possibly rendering these individuals more vulnerable to the effects of the drug.

Dr Ersche, of the Behavioural and Clinical Neuroscience Institute (BCNI) at the University of Cambridge, said: "This research gives us important insight into why some people are more vulnerable to [drug addiction](#). Not only is this important for the future development of more effective therapeutic interventions for people who have become dependent on drugs, it will also inform improved strategies to prevent drug addiction in the first place."

Cocaine, one of the most [addictive drugs](#) on the illicit drug market, exerts its effects on the brain by changing the way a person thinks and feels. People addicted to cocaine feel an overwhelming,

uncontrollable need for the drug, even in the face of aversive consequences.

Dr Ersche added: "People with cocaine dependence describe their out-of-control drug use as a 'compulsion' to use cocaine. Our current work has laid the foundation for a better understanding of cocaine dependence and why this compulsion occurs."

The researchers also showed that changes in other brain structures of chronic cocaine users were linked to debilitating attention problems.

Dr Ersche added: "Our findings are important because they show a clear relationship between the brain, the duration of cocaine use and some of the common attention problems that people with cocaine dependence report. These data show that cocaine dependence is a disorder of the brain, which is very relevant information for the treatment of people who are trying to beat their addiction."

The researchers will next explore whether there is an inherited vulnerability to develop [cocaine dependence](#). Although cocaine is a highly addictive drug, not everyone who uses develops an addiction. They will research whether people with an enlarged brain [reward system](#) are more at risk of becoming dependent on cocaine as well as what the effects of recreational cocaine use has on the brain.

More information: The paper 'Abnormal structure of frontostriatal brain systems is associated with aspects of impulsivity and compulsivity in cocaine dependence' will be published in the 21 June edition of *Brain*.

Provided by University of Cambridge

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