

Structural and functional changes that cocaine cause in the brain favour addiction

Cocaine use produces structural changes in the brain reducing the volume of certain regions, and also functional changes affecting motivational and cognitive processes. These changes favour addiction. The objective of a project headed by Alfonso Barrós Loscertales of the Neuropsychology and Functional Imaging Group at the Universitat Jaume I in the frame of the Spanish National Plan on Drugs (Plan Nacional sobre Drogas) studies how these changes and effects are produced in the brain.

Through a study of a broad sample of abstinent [cocaine addicts](#), the research revealed that cocaine use is related to a reduction in volume of the area known as striatum, directly implicated with consume and addiction. But beyond this structure, the researcher Alfonso Barrós Loscertales explains that research demonstrates important changes in the way the brain works.

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The brain has been studied by functional magnetic resonance imaging while it carries out two processes that are affected by the cocaine use: motivational and cognitive control. "Addiction is fundamentally manifested by the compulsive search of the drug and its origin comes from two reasons. On the one hand, there is the effect that the drug has on the motivational system. On the other hand, the problems that the addict person has to control himself or herself, although she or he sees that drug addiction has negative consequences".

Researchers emphasize that, in certain circumstances, cognitive activity is lower in cocaine addicts than in non-addicts. To carry out the study, brain functioning was analysed while it was solving problems related to Stroop effect, in which the name of a colour was read, with added cognitive interference caused by text written in a different colour. "In this case, we saw how patients with addiction answered more slowly with lower brain activation, which implicates a poorer brain functioning", explains Barrós.

Regarding the processing of motivational stimulus, the study developed by researchers at the UJI analysed the answer of the brain before the possibility of earning money. In this case, the brain response before the possibility of earning money was more reduced in people addicted to cocaine and it varied depending on the time that a patient had been in treatment or abstinent. The reduction in the ability to control behaviour connected to the loss of motivation in face of other stimulus different from drugs favours addiction and makes detoxification processes more difficult.

Barrós explains that results make sense when they are added to other studies that are being carried out in the same field, despite the fact that variations in samples can give contradictory results among studies. Additionally, we have to consider to what extent changes in the brain are being produced by the drug use in front of the possibility that a particular structure and brain function increase the predisposition to take this kind of substances.

"In any case, a better understanding of the way the brain of cocaine addicts works may favour more suitable treatments", highlights the researcher. In coming years, this research group at the UJI will analyse interactions among motivational and cognitive processes in cocaine users, "by relating cognitive control with the possibility to obtain a reward, i.e., by defining when a person is capable of controlling himself or herself, even if they could win something". For the development of the researches, the group works with the collaboration of the Addictive Behaviour Units in San Agustín, La Vall d'Uixó and Hospital de Sagunto, and its origin comes from two reasons. On the one hand, there is the effect that the drug has on the motivational system. On the other hand, the problems that the addict person has to control himself or herself, although she or he sees that [drug addiction](#) has negative consequences".

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