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Addicted individuals less responsive to reward-anticipation

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It may be difficult for addicted individuals to learn when they can expect a reward. This learning problem could perhaps explain why they are more prone to addiction and find it difficult to kick the habit. Researchers at Radboud university medical center and Radboud University reached this conclusion on the basis of an extensive meta-analysis of the brain imaging literature. Their findings were published in *JAMA Psychiatry* on 1 February.

People with an addiction process rewards in their brain differently from people who are not addicted. However, whether this is associated with "too much" or "too little" brain activity is an open question. Indeed, past research has produced conflicting findings. In order to get a reliable answer, researchers Arnt Schellekens (Radboud university medical center), Guillaume Sescousse and Maartje Luijten (Radboud University) have combined 25 studies investigating brain reward sensitivity in more than 1200 individuals with and without addiction to various substances such as alcohol, nicotine, cocaine but also gambling. By analyzing the brain images from these studies, they have discovered an important difference in brain activity between expecting a reward and receiving a reward.

Reward

Compared with non-addicted individuals, individuals with substance or gambling addiction showed a weaker brain response to anticipating

monetary rewards. "There was less brain activity in the striatum, a core region of the brain reward circuit, suggesting that they did not expect much from the reward," said Arnt Schellekens, a researcher and psychiatrist at Radboud university medical center. In addition, the striatum of individuals addicted to substances showed a stronger response to receiving the reward. "This increased response, often interpreted as increased surprise to getting the reward, could actually follow from low expectations" said Schellekens. This same effect was not found among people addicted to gambling.

Learning problem

Reward stimuli constitute an important factor in learning behaviour. The researchers interpret their findings as a sign that learning problems may lie at the basis of addiction. Because the processing of rewards is disrupted, these patients are unable to learn when they can actually expect the monetary reward. This may explain why they fail to succeed in choosing not to use drugs or not to gamble.

Treatment

Further research should reveal whether it is possible to influence these learning processes by, for example, psychological treatment or medication. "We want to compare the reactions to various types of rewards such as money, social rewards or drugs and also see how those reactions change over time. We are convinced that addiction treatment will benefit from a better understanding of the brain mechanisms that contribute to addiction," Schellekens concluded.

More information: Maartje Luijten et al. Disruption of Reward Processing in Addiction, *JAMA Psychiatry* (2017). DOI: 10.1001/jamapsychiatry.2016.3084

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