Specific brain areas for sex, money

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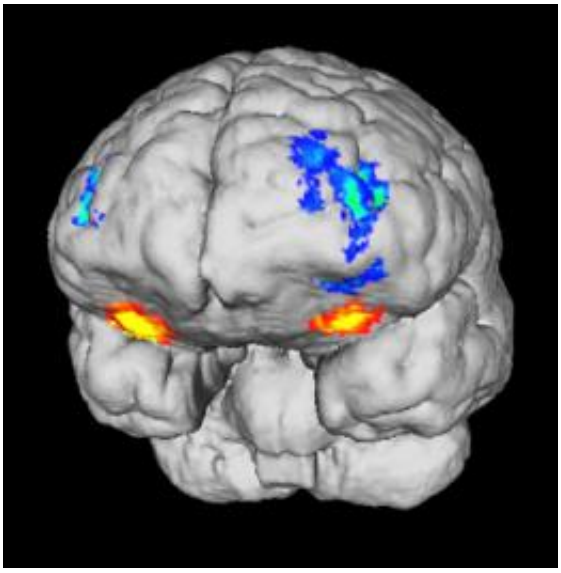


This image illustrates the dissociation between primary and secondary rewards in the orbitofrontal cortex, a frontal region of the brain that is known to play a role in the evaluation of gratification. The more primitive region (in the back, shown in yellow) represents the value of erotic images shown to the participants, while the most recent region (in the front, in blue) represents the value of monetary prizes won by the volunteers in the experiment. Credit: © Sescousse / Dreher

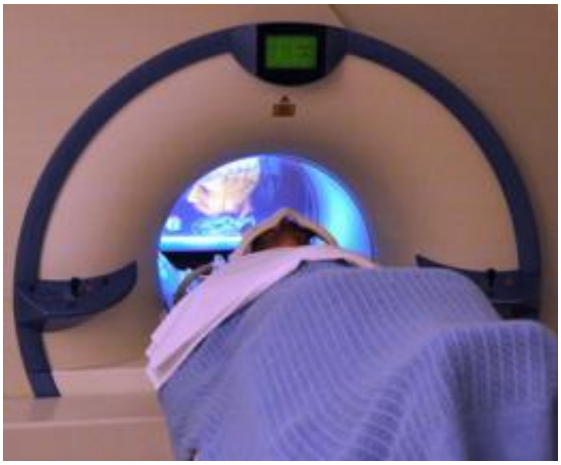
A team of French researchers headed by Jean-Claude Dreher of the Centre de Neuroscience Cognitive in Lyon, France, has provided the first evidence that the orbitofrontal cortex (located in the anterior ventral part of the brain) contains distinct regions that respond to secondary rewards like money as well as more primary gratifications like erotic images. These findings, published in *The Journal of Neuroscience*, open

new perspectives in the understanding of certain pathologies, such as gambling addiction, and the study of the neural networks involved in motivation and learning.

In our everyday lives, we often encounter various types of "rewards": a 20-euro bill, a chocolate bar, a glass of good wine... Moreover, we must often choose between them, or trade one for another. To do this, we must be able to compare their relative value on a single consistent scale, which suggests that all types of rewards are assessed in the same brain areas. At the same time it is possible that, due to their individual characteristics, different rewards may activate distinct cerebral regions. In particular, there could be a dissociation between so-called "primary" gratifications such as food or sex, which satisfy basic vital needs and have an innate value, and more "secondary" rewards such as money or power, which are not essential for survival and whose value is assessed by association with primary gratifications.

To verify these hypotheses, Jean-Claude Dreher and Guillaume Sescousse conducted an original experiment in the form of a game that rewarded 18 volunteers with money or erotic images, while their cerebral activity was monitored using an FMRI (functional magnetic resonance imaging) scanner.

The experiment showed that the rewards are indeed evaluated in partially shared cerebral regions, namely the ventral striatum, insula, mesencephalon and anterior cingulate cortex. The researchers have also confirmed that there is a dissociation between primary and secondary rewards in the orbitofrontal cortex. Its posterior region (more primitive) is specifically stimulated by erotic images (a primary reward), while its anterior region (which is more recent in man) is activated by monetary gain (a secondary reward). The more abstract and complex the reward, the more its representation stimulates the anterior regions of the orbitofrontal cortex.



The volunteers in the experiment played a game in which they could win money or view erotic images, while their cerebral activity was recorded using an FMRI scanner. Credit: © CERMEP - Imagerie du Vivant

These results provide the first evidence of a dissociation in the brain between two types of reward, suggesting the existence of distinct regions corresponding to various gratifications. Dreher and Sescousse's research could lead to a better understanding of certain psychiatric disorders, including gambling addiction.

More information: G. Sescousse, J. Redouté, J-C Dreher (2010) The architecture of reward value coding in the orbitofrontal cortex. *J Neurosci*, 30 (39)

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