

Neuroscience of envy: Activated brain region when others are rewarded revealed

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Rhesus macaques on Qianling Shan in the outskirts of Guiyang. Credit: Wikipedia/CC BY-SA 2.0

How we feel about our own material wellbeing and status in society is largely determined by our evaluation of others. However, the neurological underpinnings of how we monitor the complex social environments under conditions of limited access to resources and whether we feel happy or disappointed with our lot have remained unclear.

In a new study reported in the journal *Nature Neuroscience*, researchers based at the Department of System Neuroscience, National Institute for Physiological Sciences, have shed light on the emotion of envy by performing scans of the macaque brains when receiving a [reward](#), or a watching a partner macaque receive a reward. Their results reveal a precise region of the brain that is associated with a reduction of the amount that macaques appreciate receiving a reward themselves depending on whether their partner has received one.

The team placed pairs of macaques opposite each other and repeatedly provided them with sips of water in association with visual and audio stimulations, eventually conditioning them to associate one with the other. They measured licking of the lips as an indicator of how much they valued their own rewards, including when their partner was rewarded. They also analyzed the macaque's gaze to confirm that the provision of a reward to one macaque was noted by its partner. Finally, they measured activity of parts of the brain known to be linked to reward processing.

The results showed that the macaques valued their own rewards less when their partner macaque was rewarded, even when their own rewards were left unchanged. This revealed the subjective valuation of one's own rewards depending on the social setting. The team considered this reasonable, because in the natural world where individuals are competing for limited resources, when a peer gains resources, this automatically means that fewer resources are available for oneself.

"We confirmed the behavioral and neurological findings by repeating the experiment when a paired macaque was present but did not receive sips of water as a reward, and when water was provided into a bucket, rather than a fellow [macaque](#)," corresponding author Masaki Isoda says. "In these cases, signs of envy were not exhibited."

The team also investigated the parts of the brain involved in the observed envy response and the pathways active between them. According to lead author Atsushi Noritake, "By measuring the timings at which the different regions were activated in the [envy](#)-related scenario, the pathway was shown to involve the flow of information from the [medial prefrontal cortex](#) to the midbrain."

Given the similarity between macaques and humans, the findings could be extrapolated to humans, with wide-reaching implications in fields as diverse as the treatment of behavioral diseases, economics, human resources, and advertising.

More information: Atsushi Noritake et al, Social reward monitoring and valuation in the macaque brain, *Nature Neuroscience* (2018). [DOI: 10.1038/s41593-018-0229-7](https://doi.org/10.1038/s41593-018-0229-7)

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