

Nearly winning is more rewarding in gamblers addicts

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Credit: Radboud University

Pathological gamblers have a stronger brain reaction to so-called near-miss events: losing events that come very close to a win. Neuroscientists of the Donders Institute at Radboud University show this in fMRI scans of twenty-two pathological gamblers and just as many healthy controls. The scientific journal *Neuropsychopharmacology* published their results in an early view article last week.

Despite being objective losses, near-misses activate a particular reward-related area in the middle of our brain: the striatum. In the current study, neuroscientist Guillaume Sescousse and his colleagues show that this activity is amplified in [pathological gamblers](#). When compared to

healthy controls, pathological gamblers show more activity in the striatum after a near-miss event, than after a complete-miss event (see Figure). This activity is thought to reinforce gambling behaviour, supposedly by fostering an illusion of control on the game.

Example of a near-miss event (above) and a complete-miss event (below) in a slot machine.

To obtain these results, Sescousse compared fMRI scans of pathological gamblers and healthy adults while they were playing a [slot machine](#) game. 'We've made our gambling game as lifelike as possible by improving the visuals, adding more sounds and adapting the speed of the slot wheel compared to previous versions. In our game, the chance for a near-miss was 33%, compared to 17% for a win and 50% for a complete-miss.'

Intensive study

Gamblers have a strong illusion of control and they believe in luck more than others when they gamble. 'It was challenging to find the subjects for this experiment', according to Sescousse. 'The prevalence of pathological gambling is relatively low in the Netherlands, and our study was rather intensive. People had to come back to the Donders Institute three times, and they could not have any additional disorders, diseases or drug prescriptions.'

What is happening in the mind of a gambler when confronted with a near-miss event? Sescousse: 'In normal situations near-miss events signal the fact that you are learning: this time you didn't get it quite yet, but keep practicing and you will. Near-misses thus reinforce your behaviour, which happens by triggering activity in reward-related brain regions like the striatum. This also happens when gambling. But slot machines are random, in contrast to everyday life, which makes them such a great

challenge to our brain. That's why these near-misses may create an illusion of control.'

Surprise

Animal studies have shown that behavioral responses to near-miss events are modulated by dopamine, but this dopaminergic influence had not yet been tested in humans. Therefore, all subjects performed the experiment twice: one time after receiving a dopamine blocker, and one time after receiving a placebo. Surprisingly, brain responses to near-miss events were not influenced by this manipulation. 'For me, this is another confirmation of the complexity of the puzzle that we are working on', Sescousse explains.

More information: Guillaume Sescousse et al. Amplified Striatal Responses to Near-Miss Outcomes in Pathological Gamblers, *Neuropsychopharmacology* (2016). DOI: [10.1038/npp.2016.43](https://doi.org/10.1038/npp.2016.43)

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