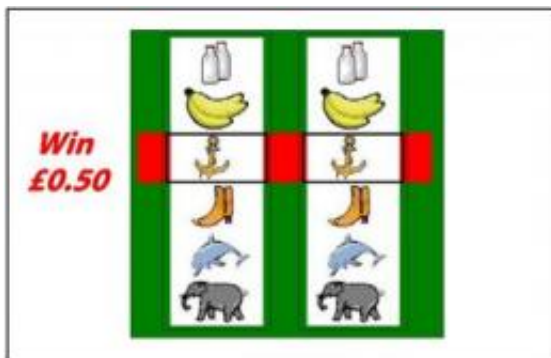


## Problem gamblers provoked by 'near misses' to gamble more

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The slot machine task presents two wheels, each with six icons, and a horizontal line across the center of the screen. If the right wheel stopped on the selected icon (i.e., matching icons were aligned), the subject was awarded £0.50 (approximately 75 cents). All other outcomes won nothing. When the wheels stopped within one icon of a match, the outcome was considered a "near miss." Credit: Courtesy, with permission: Chase and Clark. *The Journal of Neuroscience* 2010.

The brains of problem gamblers react more intensely to "near misses" than casual gamblers, possibly spurring them on to play more, according to new research in the May 5 issue of *The Journal of Neuroscience*. The researchers found the brain region that responds to rewards by delivering a dose of the chemical dopamine was especially active in these individuals.

Studies have shown that pathological gambling is an addiction, similar in

many ways to [drug addiction](#). Now, U.K. researchers Luke Clark, PhD, of the University of Cambridge, and Henry Chase, PhD, of the University of Nottingham find that the degree to which a person's brain responds to near misses may indicate the severity of addiction. In a given year, more than two million U.S. adults feel an uncontrollable urge to gamble despite negative consequences.

In this study, the researchers used [functional magnetic resonance imaging](#) (fMRI) to scan the brains of 20 gamblers. The participants' gambling habits ranged from buying the occasional lottery ticket to compulsive sports betting.

During the experiment, volunteers used an onscreen slot machine with two spinning wheels of icons. When the two icons matched, the volunteer won about 75 cents, and the brain's reward pathways became active. An icon mismatch was a loss. However, when the wheels stopped within one icon of a match, the outcome was considered a near miss. Clark and his team found that near misses activated the same brain pathways that wins did, even though no reward was given.

"These findings are exciting because they suggest that near-miss outcomes may elicit a dopamine response in the more severe gamblers, despite the fact that no actual reward is delivered," Clark said. "If these bursts of dopamine are driving addictive behavior, this may help to explain why [problem gamblers](#) find it so difficult to quit."

In particular, the authors detected strong responses in the midbrain, an area associated with addiction that is packed with dopamine-releasing brain cells. They also found the near misses were linked with increased activity in brain regions called the ventral striatum and the anterior insula, areas tied with reward and learning.

Studies have shown that people who play games of chance, such as slot

machines or the lottery, often mistakenly believe some level of skill is required to win. This illusion of control often pushes players to continue. Matthew Roesch, PhD, an expert in reward and behavior at the University of Maryland College Park who was unaffiliated with the study, said the increased levels of dopamine during near misses may be critical in driving pathological gambling and supporting the misconception that games of chance involve any skill.

"Future work will be necessary to determine if this response is causal or if this abnormality is a preexisting trait of pathological gamblers — and whether or not it is common across addictions," Roesch said.

Provided by Society for Neuroscience

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