

BUSINESS INSIDER

Researchers Tested The 'Gambler's Fallacy' On Real-Life Gamblers And Stumbled Upon An Amazing Realization



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One of the most interesting things that comes out of behavioral research is the situation in which people act as though they believe one thing and their actions cause the opposite outcome to occur.

A [study by University College London](#) psychology professor Nigel Harvey and graduate student Juemin Xu, published in the May 2014 issue of [Cognition](#), found that online gamblers on a betting website believed in one common gambling fallacy, the "gambler's fallacy," and this led to them experiencing an opposite effect, the "hot-hand fallacy" (via [Cardiff Garcia](#)).



AP Photo/Garry Jones

The hot-hand fallacy occurs when gamblers think that a winning streak is more likely to continue. This belief is based on the idea that having already won a number of bets improves the probability that they will win the next bet or the next number of bets. Luck will continue favoring them, and the same outcome of winning bets gets more likely the more times it happens.

The gambler's fallacy works in the opposite direction. This is the idea that during a losing streak, it is likely that a gambler's luck will turn around and that they will start winning. Here, repeatedly getting the same outcome decreases the probability of that outcome occurring in the future.

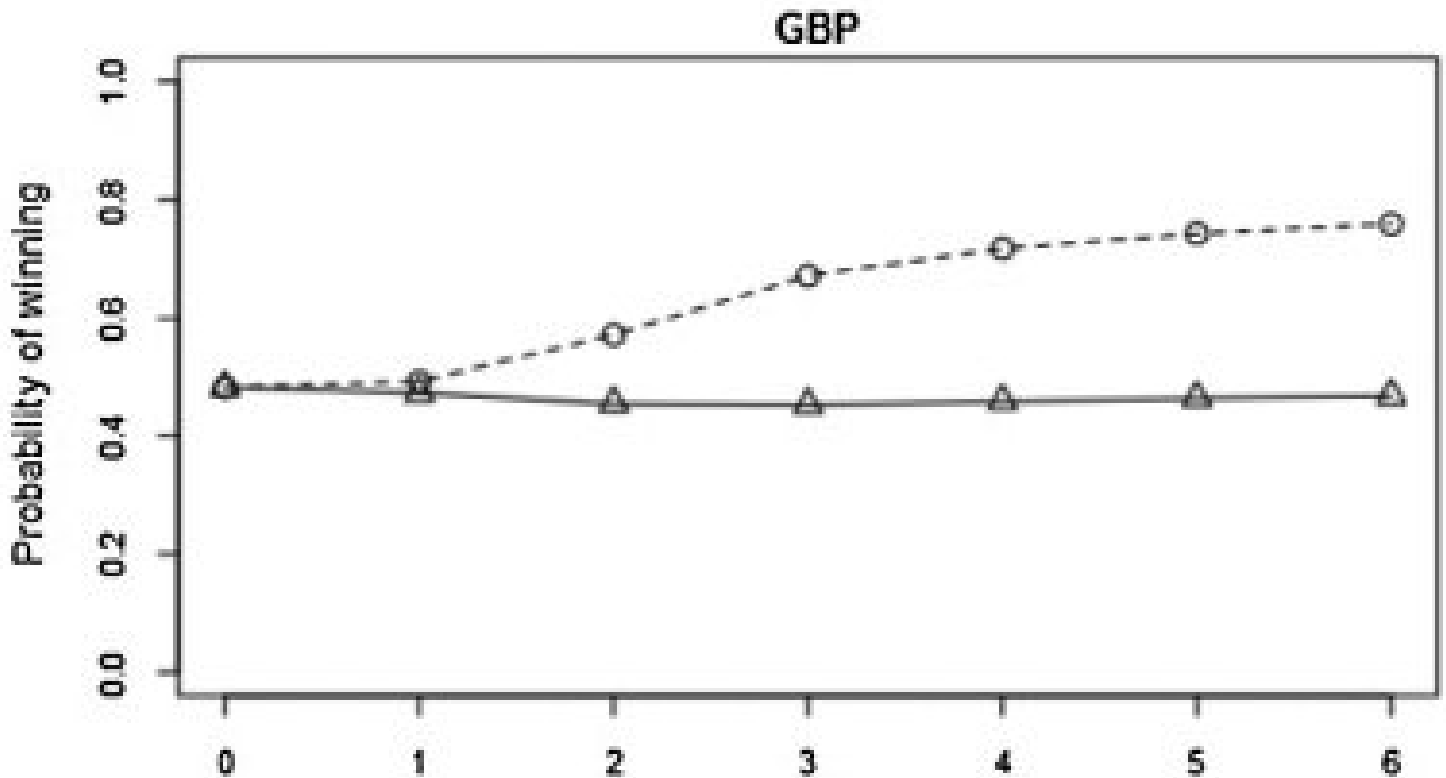
The problem with both of these, and the reason they're labeled fallacies, is the fact that, in most games of chance, subsequent outcomes are independent from each other. A roulette ball landing on red after one spin has zero effect on what happens on the next spin. A pair of dice landing on 7 on one roll doesn't do anything to the next roll. Each time the game is played, the universe essentially forgets all previous outcomes and starts from scratch.

This independent nature of gambling games means that streaks have no particular meaning. Winning bets five times in a row has no effect on what happens on the sixth bet. This means that both the hot-hand fallacy, saying

that winning many times in a row increases your chances of winning on the next bet, and the gambler's fallacy, saying that losing many times in a row increases your chances of winning on the next bet, are wrong.

So, it's somewhat surprising that Xu and Harvey actually found evidence *that the hot-hand effect really does happen*. They analyzed the records of an online sports betting website, containing hundreds of thousands of bets on horse races, soccer games, and dog races. Amazingly, they saw that, the longer a streak went on, the more likely the gambler would win their next bet.

Here's a chart from their paper showing this result, based on all bets made on the site in British pounds. The dotted line with circle markers shows the increasing probabilities for winning the next bet based on already having won a streak whose length is indicated on the horizontal axis. The solid line with triangle markers shows the probability of winning the next bet if you haven't had a streak of that length:



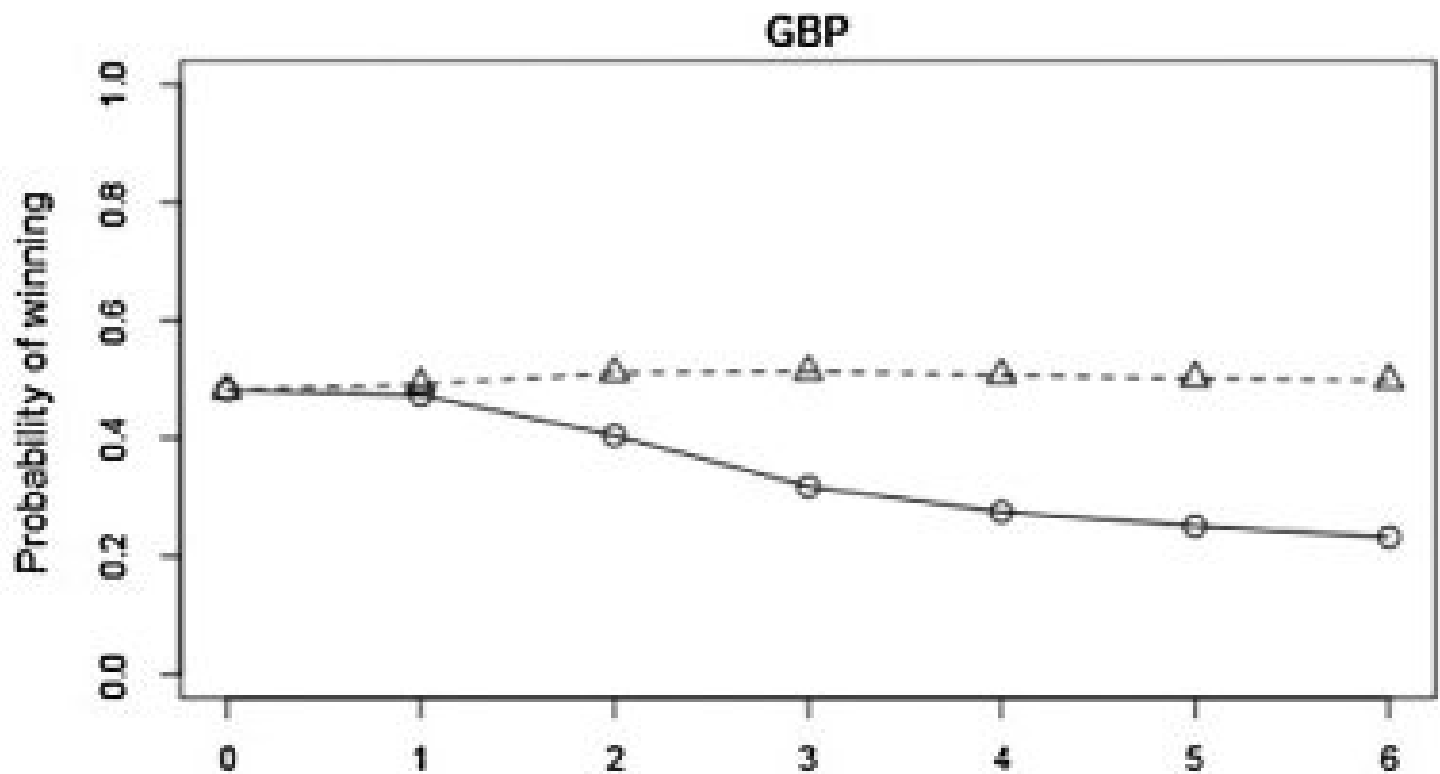
Xu and Harvey, May 2014

The longer the winning streak, the more likely the next bet is also a win. Initially, looking at all the bets overall, 48% were winners. If you win your first bet, you have a slightly improved 49% chance of winning your second bet as well, higher than the 47% chance of winning if you lost your first bet.

After that, the hot-hand effect takes off. People who won two bets in a row had a 57% chance of winning their third bet — far higher than the 45% chance of winning for people who didn't have a winning streak of two in a row.

As the chart shows, the longer the streak went on, the more the odds of winning the next bet improved. By the time you won six bets in a row, you had a 76% chance — better than 3 in 4 — to win your seventh bet.

Xu and Harvey also saw a mirror-image effect with losing streaks. The longer a losing streak a gambler was on, the more likely that they would continue to lose. The next chart from the paper shows this effect. The solid line with circle markers shows the probability of winning the next bet if you have already lost the number of bets indicated on the horizontal axis; the dotted line with triangles shows the probability of winning if you're not on a losing streak of that length:



Xu and Harvey, May 2014

As losing streaks go on, the probability of winning the next bet drops. By the time you're on your sixth loss in a row, you have just a 23% chance of winning the seventh bet.

What could cause this? The outcome of one horse race or soccer game shouldn't have any effect on the outcome of the next race or game that a gambler bets on.



People wait for the start of a race at the San Siro horseracing center in Milan May 23, 2009.

REUTERS/Alessandro Garofalo

Maybe the people who experience winning streaks are better at placing bets than the people who don't get hot. Xu and Harvey compared the overall returns for gamblers who had at least one streak of getting six bets right

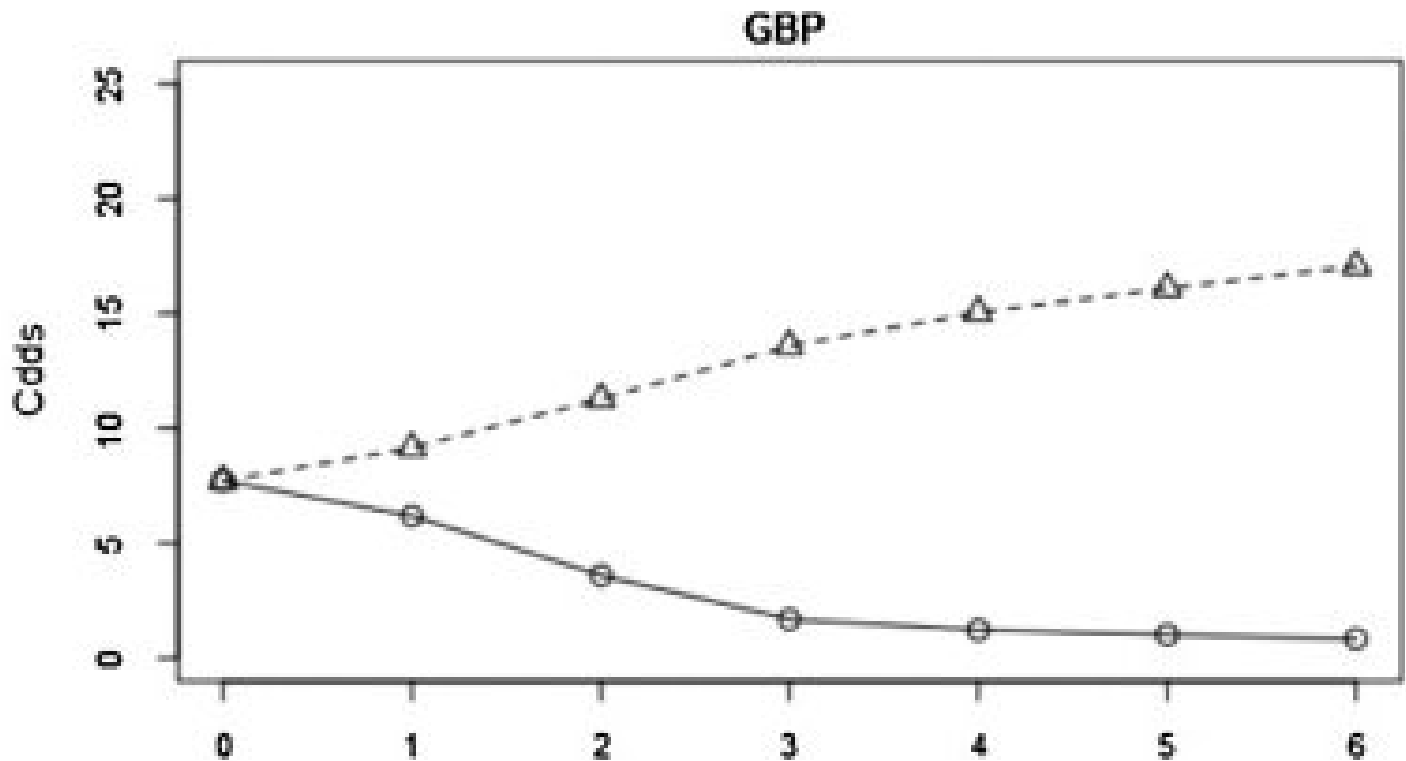
in a row to the returns for the gamblers who didn't, and saw that there was no difference: Winning-streak gamblers had an average loss of £1.0078 for each pound they bet; non-streaky gamblers had an almost identical average loss of £1.0077.

This rules out the idea that gamblers with winning streaks are better at picking winners. If they were, we would expect them to win more bets overall and make more money than non-streaky gamblers, which does not happen.

Xu and Harvey then looked at what kinds of bets were being made by gamblers on both winning and losing streaks and found something amazing. Bettors were behaving as though the gambler's fallacy were true and that either a winning or losing streak meant that their luck was more likely to change on the next bet. This behavior actually could lead to the hot-hand effect we saw above.

To see this, Xu and Harvey looked at the odds of winning for the next bet placed by gamblers on winning streaks and losing streaks. Gamblers on winning streaks became more conservative and started betting on races and games with better odds of winning, acting as though they believed that their luck was going to run out. Gamblers on losing streaks became more risk seeking, and started betting more on long shots, apparently believing in the classic gambler's fallacy that their luck would have to turn around sometime soon.

The following chart shows this behavior. The odds against winning for gamblers on a losing streak with length indicated by the horizontal axis are shown on the dashed line with triangle markers, and the odds against winning for gamblers on a winning streak are shown on the solid line with circle markers. Higher odds against means a smaller chance that the bet will win.



Xu and Harvey, May 2014

Players on losing streaks went for riskier and riskier bets, taking bets with higher odds against in the hope that a big payoff would make up for their losses. Players on winning streaks went in the opposite direction and made bets that were more likely to win as their streaks went on.

This behavior could explain the hot-hand effect. If players on winning streaks are taking more likely bets, then that could lead to the streaks continuing. If players on losing streaks are taking riskier bets, then that could lead to their losing streaks continuing.

The interesting part of this is that the gamblers appear to be behaving as though they believe in the gambler's fallacy, that winning or losing a bunch of bets in a row means that the next bet is more likely to go the other way. Their reactions to that belief — with winners taking safer bets under the assumption they're going to lose and

losers taking long-shot bets believing their luck is about to change — lead to the opposite effect of making the streaks longer.

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