

## Gamblers, judges and baseball umpires constantly make this dumb mistake

By **Jeff Guo** March 9

Say you're flipping a fair coin, and it comes up heads three times in a row. That's kind of remarkable. Now, what are the odds the coin comes up heads a fourth time?

The correct answer is that the odds are unchanged. There's always a 50/50 chance the next toss will result in heads. The coin has no memory. It doesn't know what happened in the past.

But humans have notoriously bad instincts about probability. There's a surprisingly common belief that the universe will even things out — that after a streak of heads, you're more likely to see tails.

This is called the gambler's fallacy. People literally behave like this when they play games of chance. Using video from a Reno casino, for instance, researchers [have shown](#) that if the roulette ball lands on a red number four times in a row, people are more likely to bet black for the next spin.

What's unsettling is how this superstition also undermines the thinking of important decision-makers — seemingly reasonable, intelligent people who wield considerable power over the lives of others.

In a draft paper released last week by the National Bureau of Economic Research, economists at the University of Chicago and the Toulouse Institute of Advanced Studies provide evidence that the gambler's fallacy noticeably influences the work of American asylum judges, loan officers at an Indian bank, and even U.S. Major League Baseball umpires.

The researchers focused on people who have to make repeated decisions on different cases every day. Asylum judges have to decide whether to deport someone; loan officers have to decide whether to approve a loan; and baseball umpires have to call balls or strikes.

In each of those scenarios, it turns out that recent decisions linger in people's minds and corrupt future choices.

- All else held equal, if a judge just deported someone, that same judge is about three percentage points more likely to allow the next person to stay in the country.

- If a loan officer approved a loan, they're about eight percentage points more likely to reject the next one.
- And if a Major League Baseball umpire just called a strike, he's about one percentage point less likely to call the next pitch a strike, after controlling for the actual position of the ball.

What's happening here reveals a common misunderstanding of probability, explains Kelly Shue, one of the paper's authors and an assistant professor of finance at the University of Chicago.

"There's a mistaken belief that streaks of good cases or streaks of bad cases are unlikely to happen, even though they actually do occur by chance," she says. "So when you see a good case, you believe, incorrectly, that the next case is less likely to be a good case."

Streaks are actually more common than most people think they are. Two examples:

- If you flip a coin three times in a row, you'll get all heads or all tails 25 percent of the time.
- If you flip a coin five times in a row, there's a 50 percent chance you'll get a streak of at least three heads or three tails.

Multiple-choice tests are a good way to illustrate the temptations of the gambler's fallacy. On the SAT, every question has five possible answers, A through E. Say you've just bubbled in "D" for the last three questions. Wouldn't that make you wary of answering "D" for the next question? What are the chances, after all, that there would be a streak of four identical answers?

Assuming that the answers are distributed randomly, your chances are actually *more than one-in-eight* that you'll see a streak of four or more identical answers in a section of 25 questions. And there's about a 2.7 percent chance you'll see a streak of five or more consecutive identical answers.

If you were being perfectly rational, you wouldn't even be thinking about these streak probabilities, though. Seasoned test-takers know to ignore the pattern of past answers, to consider each question on its own terms.

This is easier to do when the answers are more obvious — a fact that Shue and her colleagues, Daniel Chen and Tobias Moskowitz, observed in their data as well. They found that the gambler's fallacy becomes less influential when the decisions are more clear-cut, or when the decision-makers have more experience.

Veteran asylum judges, for instance, are less swayed by recent past decisions that they've made. That's probably because they have more confidence in their ability to judge a case by its merits, while rookie judges are more likely to second-guess themselves.

In situations of high uncertainty, the gambler's fallacy starts to take over people's minds. Umpires are 10 to 15 times more likely to fall victim to the bias when they have to call pitches that are on the border of the strike zone.

The results of the study have caused Shue to reexamine how she makes her own decisions. Nowadays when she interviews potential students, she tries reminds herself that streaks aren't so uncommon. Just because she's seen three sterling candidates in a row doesn't mean the next one is bound to be a dud.

*But what are the chances of seeing four really great applicants one after the next?*

The chances are probably higher than you think.

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