

The 'Hot Hand' May Actually Be Real

A research paper shows how a simple coin toss may prove that basketball players really can get hot

By BEN COHEN

People have been hunting for proof of the hot hand in basketball longer than Stephen Curry has been alive. The search has lasted three decades and exhausted almost all options. But the results were usually the same. There was no evidence of the hot hand. A player who made a shot was no more or less likely to make his next shot.

Then something strange happened this summer. Economists, psychologists and statisticians started talking about a new paper on basketball. It claimed that the hot hand really does exist. But what made it truly mind-boggling was that the authors used the simplest scientific method: coin flips.

The new paper, written by Joshua Miller and Adam Sanjurjo, begins with a riddle. Toss a coin four times. Write down what happened. Repeat that process one million times. What percentage of the flips after heads also came up heads?

The obvious answer is 50%. That answer is also wrong. The real answer is 40%—and the authors say their correction should alter years of thinking about the hot hand.

The fallacy of the hot hand was established in a classic 1985 study that has since become a part of the social-sciences canon. The paper's conclusion—that the appearance of shooting streaks was nothing but a misreading of randomness—was so counterintuitive that many refused to believe it. The uproar hasn't abated over the years, yet even the most promising follow-ups found only a tepid hand. The feeling that you can't miss after making several shots in a row was still a "massive and widespread cognitive illusion," as the Nobel Prize winner Daniel Kahneman has written.

Nobel laureates think about the hot hand because it's a bias that shapes important decisions. For these academics, the hot hand isn't an isolated basketball occurrence. It's an accessible example of how human beings behave with consequences for almost every industry.

Now, though, comes the most intriguing argument that human intuition wasn't wrong. A basketball player who shoots the same percentage after a streak of makes as he does after a streak of misses was long accepted as proof against the hot hand. Miller and Sanjurjo's paper asserts it's actually evidence of the opposite.

"People were right to believe the hot hand exists," said Sanjurjo, an economist at the Universidad de Alicante in Spain.

Their breakthrough is the surprising math of coin flips. Write the 14 equally likely sequences of heads and tails with at least one heads in the first three flips—HHHH, HTHH, HTTH, etc. Look at a sequence at random. Select any flip immediately after a heads, and you'll see the bias: There is a 60% chance it will be tails in the average sequence.

"No one had realized," said Columbia statistician Andrew Gelman. A draft of the paper, which hasn't



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been published yet in a peer-reviewed journal, appeared online in July and caught the attention of psychologist Maya Bar-Hillel and statistician Yosef Rinott, who wrote a commentary to explain the "hitherto unnoticed point." They called the finding startling and far-reaching—if

Most basketball players think the hot hand is real because they swear they have felt it themselves

it stands up to scrutiny. "We endorse their mathematical point," they wrote, "but leave it for others to determine whether or not a hot hand exists regardless."

Cornell psychologist Tom Gilovich, the lead author of the 1985 paper, said the argument of the new study appears to be accurate and opens the possibility for future research, but it remains to be seen if it overturns the hot-hand fallacy.

"Unlike a lot of stuff that's come down the pike since 1985, this is truly interesting," Gilovich said. "What they discovered is correct." Whether the effect is "so small that the original conclusion stands or needs to be modified," he said, "is what needs to be determined."

There are few psychological phenomena with histories as contentious as the hot hand's. The decades of studies started when Gilovich took a Stanford class taught by Amos Tversky—a titan in his field who, with Kahneman, forever changed the science of decision mak-

many other variables, including how a player was defended and the difficulty of his shot. A controlled experiment in the 1985 study had college players take unguarded shots from the area of the court where they make about half their attempts—the equivalent of a coin flip. The study found the players were no more likely to make shots after runs of makes than they were runs of misses, nor were they able to predict what would happen even when they thought they were hot.

That study assumed a player who shot the same percentage after streaks of makes and misses didn't have the hot hand. Miller and Sanjurjo's paper, however, shows that 19 of the 25 players in the original study had the hot hand when adjusted with their math, and the average difference was 13 percentage points. Over a full NBA season, they say, that separates Curry from the average shooter. They also have working research that shows a hot hand in their own designed experiment and in an analysis of 29 years of the NBA 3-point contest.

Miller, an economist at Bocconi University in Milan, says their result reflects both traditional and behavioral economics. It suggests that

professional basketball players knew from experience that the hot hand wasn't nonsense, but it also hints at how faulty intuitions can lead even researchers astray. "Practitioners can see more than what we can see," he said. "We can definitely help them. But we have to listen to them, too."

No one knows yet how this will change the field of hot-hand studies. Bar-Hillel and Rinott called for recalculations in the literature, and Gilovich said he may get back in the game with new experiments of his own. Other scholars doubt that any hot hand that's discovered would be strong enough to match the imagination. "Almost anyone I've interacted with about this paper has said it's pretty compelling," said Hal Stern, a statistician at the University of California, Irvine, "but the effect is likely small."

Most discussions of the hot hand eventually turn into disagreements. In this case, though, there is one area where the academics agree: The new paper ensures the decades-old debate is set to heat up again. "If, in fact, people can conclusively document there is a modest hot hand," Gilovich said, "the story's going to get much more complicated."