

## Gamblers Take Note: The Odds in a Coin Flip Aren't Quite 50/50

And the odds of spinning a penny are even more skewed in one direction, but which way?

- By Dan Lewis, [Smithsonian.com](http://Smithsonian.com), November 30, 2012

Imagine you're at a bar and another patron offers you the following wager. He's going to flip a coin — a standard U.S. penny like the ones seen above — a dozen or so times. If it comes up heads more often than tails, he'll pay you \$20. If it comes up tails more than heads, you pay him the same. There are no hidden tricks. It's a fair bet — safe to take, if you're looking for a 50/50 chance.

Now, imagine the same offer, except that instead of flipping the coin, the other patron tells you he's going to spin it. In fact, he'll even let you provide the penny, just to guarantee there is no funny business. Twenty-five spins and if it comes up heads more often than tails, he'll give you \$20 again. But if tails comes up more often, you owe him \$20.

Fair bet? Not if Persi Diaconis is right.

Diaconis is a professor of mathematics and statistics at Stanford University and, formerly, a professional magician. While his claim to fame is determining how many times a deck of cards must be shuffled in order to give a mathematically random result (it's either five or seven, depending on your criteria), he's also dabbled in the world of coin games. What he and his fellow researchers discovered is that most games of chance involving coins aren't as even as you'd think. For example, even the 50/50 coin toss really isn't 50/50 — it's closer to 51/49, biased toward whatever side was up when the coin was thrown into the air.

But more incredibly, as reported by Science News, spinning a penny, in this case one with the Lincoln Memorial on the back, gives even more pronounced odds — the penny will land tails side up roughly 80 percent of the time. The reason: the side with Lincoln's head on it is a bit heavier than the flip side, causing the coin's center of mass to lie slightly toward heads. The spinning coin tends to fall toward the heavier side more often, leading to a pronounced number of extra "tails" results when it finally comes to rest.

Because the coins typically pick up dirt and oils over time, trying the experiment at home may not yield such a large percentage of "tails" over "heads" — but a relatively new coin should still give you noticeable results.