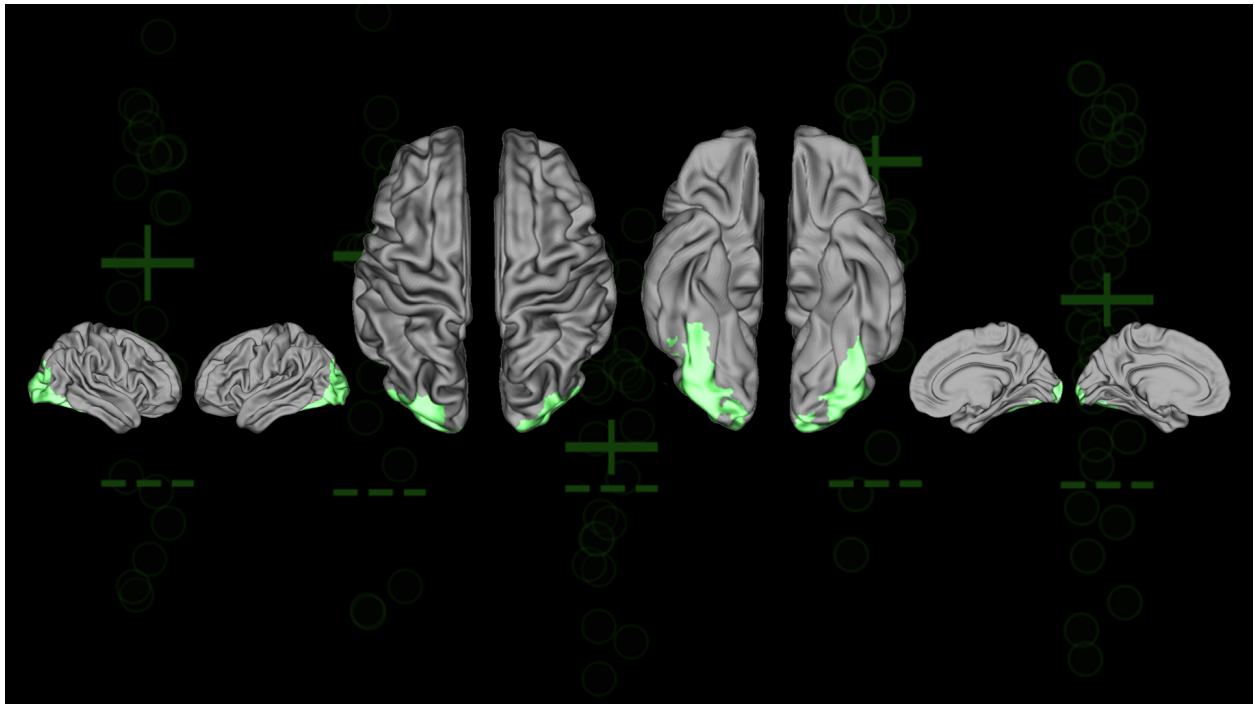


## Memories Can Sway a Decision Long Before It's Made

*Researchers find memories forge links to help people make new decisions quickly and accurately*



*Brain scans like these helped scientists classify how study participants made decisions. (Credit: Jonathan Nicholas / Shohamy lab/ Columbia's Zuckerman Institute).*

NEW YORK, NY — We often have to make a decision we have never made before, such as what to order at a new restaurant. Now, scientists at [Columbia's Zuckerman Institute](#) reveal that the brain may have done much of the thinking behind each choice ahead of time to help us react more quickly and accurately.

"Our ability to make a decision that we haven't faced before doesn't just come out of thin air," said [Daphna Shohamy](#), PhD, director and CEO of Columbia's Zuckerman Institute, and senior author on a [study](#) published recently in *Nature Communications*. "It may feel like you made a new decision, but more often than not, you are relying on memory

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associations that have already been formed in your mind and that are poised to help you with a decision later on."

Prior research suggested that reaching a decision might involve knitting together related experiences stored within our memories to imagine the consequences of various options. To choose what to order at a new restaurant, for instance, you rely on previous memories of dining.

Dr. Shohamy's team wanted to know when exactly we might use those memories. One possibility is that such mental activity happens reactively, at the moment we face a decision. Another is that this work occurs proactively, when we first encode the memories long before a choice is considered.

To explore this, the scientists showed volunteers a group of photos (dubbed set A). The people learned that each of these images was associated with another picture from a different group (set B). Next, they found out some photos from set B were linked to a reward while others were not. Finally, participants had to recall which image from set A might lead to a reward, given its relationship to a picture in set B.

For example, an image of a soccer ball might always appear with an image of a face. That face led to a reward. To claim the reward, the participant had to learn to pick the soccer ball.

As volunteers played this game, their brains were scanned with functional magnetic resonance imaging (fMRI). Different types of images trigger different patterns of brain activity, revealing if and when memories were accessed. People tended to default to the proactive approach, their memories reactivating upon learning about that reward. When they later made decisions using this approach, it proved advantageous compared to using a reactive strategy.

"Acting in a proactive manner and carrying out these mental computations ahead of time led to faster, more accurate decisions," said [Jonathan Nicholas](#), PhD, the study's first author, who carried out this research while a graduate student in the Shohamy lab and is now a postdoctoral scientist at NYU. "There's good reason to believe these helpful computations are happening automatically, because the brain often tries to forge new associations when it encounters them."

The volunteers did still sometimes access their memories in a reactive manner — for example when multiple photos from set A were linked to each picture in set B: when not just that soccer ball was associated with the rewarded face, but maybe a picture of the

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Eiffel Tower as well. That complicated which option might lead to the best outcome. In such a scenario, people then appear more likely to wait until it's time to make a decision to consider the available evidence, Dr. Nicholas said.

"This research helps shed light on how we build an understanding of how the world works beyond what we've directly experienced," said Dr. Shohamy, who is also co-director of Columbia's Kavli Institute for Brain Science and a Kavli professor of brain science. She added that this research may yield insights into conditions affecting memory, such as dementia. "If there's damage that impacts your ability to retrieve these associations between memories, that will also affect your decision-making," Dr. Shohamy said.

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The [paper](#), "Proactive and reactive construction of memory-based preferences," was published in *Nature Communications* on February 13, 2025.

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The authors report no conflicts of interest.