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Making decisions over prolonged periods doesn't diminish accuracy, new study finds

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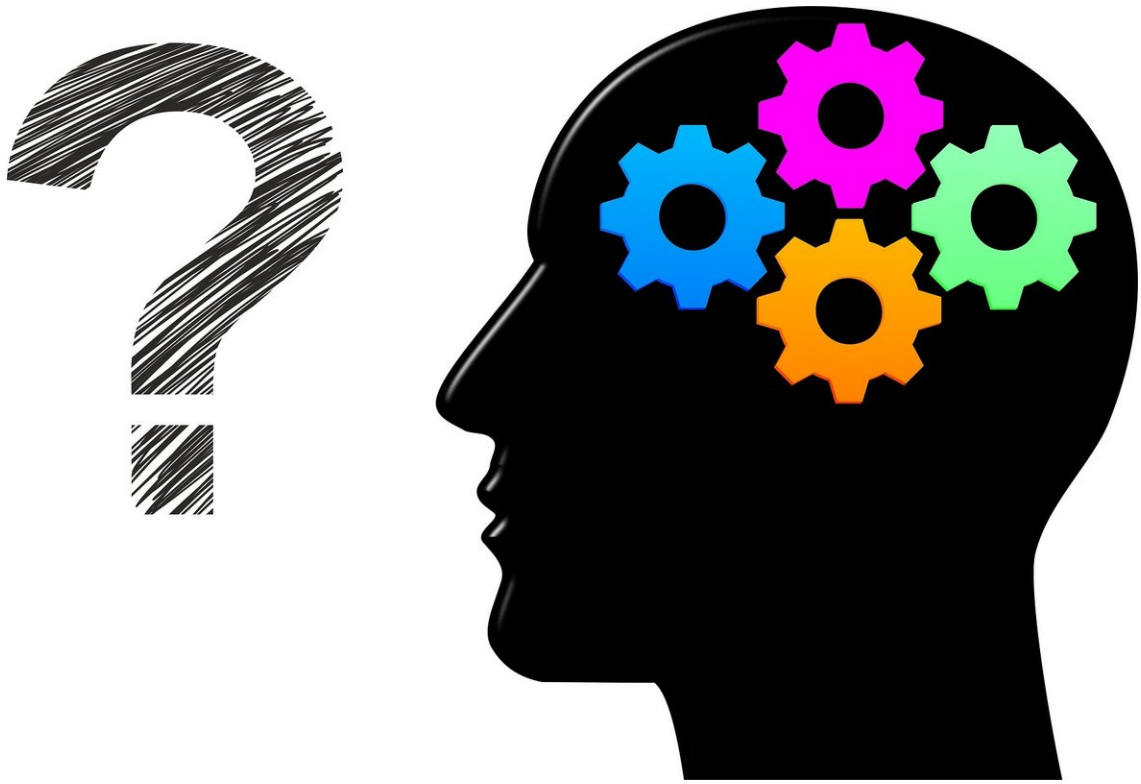

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Making good decisions typically involves gathering information over at least several seconds, much longer than the time that individual brain cells take to process their inputs. However, this disparity does not reduce our ability to make accurate choices, finds a new study by

neuroscientists at New York University. Their results, which appear in the journal *Current Biology*, suggest a newfound ability to incorporate information over prolonged periods.

"Humans can accurately integrate pieces of information that they encounter over extended periods of time, which shows that decision making is not fundamentally limited by forgetting or by 'noise' in our memory," explains Michael Waskom, an NYU post-doctoral fellow and the paper's lead author.

"If the loss of information is not inevitable, meaning we can hold on to information longer than previously realized, we can begin to explore ways for diminishing the mistakes we make in our decisions," adds Roozbeh Kiani, a professor in NYU's Center for Neural Science and the paper's senior author, "What appears as inaccurate decision making due to loss of information may instead be caused by suboptimal strategies, and these can be improved."

Previous studies of the decision-making process have largely focused on fast decisions that rely on information gathered over a few hundreds of milliseconds. This research has been influential in shaping our perspective about the neural computations that underlie decision making.

Notably, simulations of how circuits in the brain carry out these fast decisions suggest that prolonged deliberation would be vulnerable both to memory loss and to noise. As a result, the passage of time might be expected to result in poor decisions.

However, in our daily lives, we can take much longer than a few hundreds of milliseconds to make up our minds, meaning that existing research may not capture how the brain works during this process—and, in fact, may be underestimating our ability to retain information vital to decision making.

To address this, the NYU research team conducted a series of experiments in which human subjects made decisions about the appearance of synthetic images that had variable intensity, or "contrast." After viewing several images, the subjects needed to determine whether their contrast was, on average, high or low. This required them to integrate information that they had gathered at different points in time.

Each image was followed by a delay that lasted from two to eight seconds; overall, it could take up to 30 seconds before the subjects had all the relevant information for their choice. This feature was intended to replicate the deliberation times of many daily decisions.

The results showed that subjects could respond correctly regardless of the duration they had to wait between images, indicating that the passage of time does not result in a significant loss of information or otherwise deteriorate accuracy.

"Our results are at odds with the predictions of many existing models and favor models that are largely invariant to passage of time. This will focus our search for the neural circuits that underlie real-world decisions," observes Kiani.

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