

One act of remembering can influence future acts: study

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Can the simple act of recognizing a face as you walk down the street change the way we think? Or can taking the time to notice something new on our way to work change what we remember about that walk? In a new study published in the journal *Science*, New York University researchers show that remembering something old or noticing something new can bias how you process subsequent information.

This novel finding suggests that our memory system can adaptively bias its processing towards forming new memories or retrieving old ones based on recent [experiences](#). For example, when you walk into a restaurant or for the first time, your memory system can both encode the details of this new environment as well as allow you to remember a similar one where you recently dined with a friend. The results of this study suggest that what you did right before walking into the restaurant can determine which process is more likely to occur.

Previous scholarship has demonstrated that both encoding new memories and retrieving old ones depend on the same specific brain region—the hippocampus. However, computational models suggest that encoding and retrieval occur under incompatible network processes. In other words, how can the same part of the brain perform two tasks that are at odds with each other?

At the heart of this paradox is distinction between encoding, or forming a new memory, and memory retrieval, or recalling old information. Specifically, encoding is thought to rely on pattern separation, a process

that makes overlapping, or similar, representations more distinct, whereas retrieval is thought to depend on pattern completion, a process that increases overlap by reactivating related memory traces.

With this in mind, the researchers saw a potential resolution to this neurological paradox – that the hippocampus can be biased towards either pattern completion or pattern separation, depending on the current context?

To address this question, the researchers conducted an experiment in which participants rapidly switched between encoding novel objects and retrieving recently presented ones. The researchers hypothesized that processing the novel objects would [bias](#) participants' memory systems towards pattern separation while processing the old ones would evoke pattern completion biases.

Specifically, they were shown a series of objects that fell into three categories: novel objects (i.e., an initial presentation of an image, such as an apple or a face), repeated objects, or objects that were similar but not identical to previously presented ones (e.g., an apple with slightly different shape from the initial image). Participants were then asked to identify each as new (first presentation), old (exact repetition), or similar (not exact repetition). The similar items were the critical study items since they contained a little old and little new information. Thus, participants could either notice the novel details or incorrectly identify these stimuli as old.

The researchers found that participants' ability to notice the new details and correctly label those stimuli as 'similar' depended on what they did on the previous trial. Specifically, if they encountered a new stimulus on the preceding trial, participants were more likely to notice the similar trials were similar, but not old, items.

By contrast, in another experiment, the researchers demonstrated that the same manipulation can also influence how we form [new memories](#). In this study, the researchers tested how well participants were able to form links between overlapping memories. They found that participants were more likely to construct these links when the overlapping memories were formed immediately after retrieving an unrelated old object as compared to identifying a new one. This suggests that after processing old objects, participants were more likely to retrieve the associated memories and link them to an ongoing experience.

"We've all had the experience of seeing an unexpected familiar face as we walk down the street and much work has been done to understand how it is that we can come to recognize these unexpected events," said Lila Davachi, an associate professor in NYU's Department of Psychology and the study's senior author. "However, what has never been appreciated is that simply seeing that face can have a substantial impact on your future state of mind and can allow you, for example, to notice the new café that just opened on the corner or the new flowers in the garden down the street."

"We spend most of our time surrounded by familiar people, places, and objects, each of which has the potential to cue memories," added Katherine Duncan, the study's first author who was an NYU doctoral student at the time of the study and is now a postdoctoral researcher at Columbia University. "So why does the same building sometimes trigger nostalgic reflection but other times can be passed without notice? Our findings suggest that one factor maybe whether your [memory system](#) has recently retrieved other, even unrelated, memories or if it was engaged in laying down new ones."

More information: "Memory's Penumbra: Episodic Memory Decisions Induce Lingering Mnemonic Biases," by K. Duncan et al. *Science*, 2012.

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