

Forgetting May Be Part of the Process of Remembering



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Whether drawing a mental blank on a new A.T.M. password, a favorite recipe or an old boyfriend, people have ample opportunity every day to curse their own forgetfulness. But forgetting is also a blessing, and researchers reported on Sunday that the ability to block certain memories reduces the demands on the brain when it is trying to recall something important.

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The [study](#), appearing in the journal *Nature Neuroscience*, is the first to record visual images of people's brains as they suppress distracting memories. The more efficiently that study participants were tuning out irrelevant words during a word-memorization test, the sharper the drop in activity in areas of their brains involved in recollection. Accurate remembering became easier, in terms of the energy required.

Blocking out a distracting memory is something like ignoring an old (and perhaps distracting) acquaintance, experts say: it makes it that much harder to reconnect the next time around. But recent studies suggest that the brain plays favorites with memories in exactly this way, snubbing some to better capture others. A lightning memory, in short, is not so much a matter of capacity as it is of ruthless pruning — and the new study catches the trace of this process as it happens.

"We've argued for some time that forgetting is adaptive, that people actively inhibit some memories to facilitate mental focus," as when they are trying to recall a friend's new phone number or the location of a parking space, said Michael Anderson, a professor of cognitive neuroscience at the [University of Oregon](#).

Dr. Anderson, who was not involved in the new research, said it was "important new work because it maps out how this is happening neurobiologically."

The researchers, neuroscientists at [Stanford University](#), used a memory test intended to gauge how well people can recall studied words from among many similar words they have also seen. They had 20 young men and women, mostly Stanford students, view in quick succession a list of 240 word pairs. These included 40 capitalized words, each paired with six related, lower-case words: For example, "ATTIC-dust," "ATTIC-junk," and so on.

After studying the pairs, the participants were instructed to memorize three selected pairs from each

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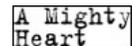


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of 20 capitalized words. In effect, this forced them to flag individual pairs, like ATTIC-dust, while trying to tune out very similar, distracting ones, like ATTIC-junk, for half of the total list of pairs they saw. They were told not to memorize any pairs from the other half of the list.

The researchers tested each person's memory several times, and found that scores ranged from about 30 percent accuracy to 80 percent. They also measured how well each person suppressed the distracting word pairs, by comparing recall of those pairs with recall of the half of the list that was studied at first but later ignored. All the testing was done while participants were having their brains scanned by an M.R.I. machine.

"We found that the magnitude of the decrease in activity on M.R.I. was correlated to the amount of weakening of these competing memories" when the subjects were recalling the target words, said Brice Kuhl, a graduate student in the psychology department at Stanford and the study's lead author. His co-authors were Anthony Wagner, Nicole Dudukovic and Itamar Kahn.

In particular, the researchers found that the more a study participant had suppressed the memory of distracting word pairs, the steeper the decrease in activity in a region of the brain called the anterior cingulate cortex. This neural area is especially active when people are engaged in weighing choices, say, in choosing which card to play in a game of hearts with two or more good options.

"From a broader point of view, given what we know about this area, the activity decreases as the task becomes more automatic, less demanding," said Dr. Wagner, the senior author.

People blank on new passwords so often because of the distracting presence of old or other current passwords. The better the brain can block those distracting digits, the easier it can bring to mind the new ones, Dr. Wagner said.

This process is extremely familiar to people who have been immersed in a foreign language. In a recent study of native English speakers led by Dr. Anderson, researchers showed that beginners being drilled in Spanish were very slow to link pictures and words in English, compared with more bilingual participants. Those fluent in both languages had resolved the competition between the two tongues, inhibiting the encroachment, for example, of the word "zapato" on the word "shoe."

In all, this research suggests that memories are more often crowded out than lost. An ideal memory improvement program, Dr. Anderson said, "would include a course on how to impair your memory. Your head is full of a surprising number of things that you don't need to know."

The findings should also reduce some of the anxiety surrounding "senior moments," researchers say. Some names, numbers and details are hard to retrieve not because memory is faltering, but because it is functioning just as it should.

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