

# Testing improves memory

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"We've known for over 100 years that testing is good for memory," says Kent State University psychology graduate student Kalif Vaughn. Psychologists have proven in a myriad of experiments that "retrieval practice"—correctly producing a studied item—increases the likelihood that you'll get it right the next time. "But we didn't know why."

In the past, many researchers have believed that testing is good for [memory](#), but only for the exact thing you are trying to remember: so-called "target memory." If you're asked to recall the Lithuanian equivalent of an English word, say, you will get good at remembering the Lithuanian, but you won't necessarily remember the English. Vaughn wondered whether practice testing might boost other types of memory too.

It does. This is the finding of a study he conducted with Kent State psychologist Katherine A. Rawson, which will be published in an upcoming issue of *Psychological Science*, a journal of the Association for Psychological Science. Says Vaughn: "With retrieval practice, everything gets substantially better."

That "everything" includes target memory; "cue memory," for the stimulus (the Lithuanian) that evinces the target; and "associative memory," of the relationship between things—in this case, the word pair.

To pinpoint which of these components was improving the researchers conducted two slightly different experiments, one involving 131

undergraduates and the other, 69. In both preparation sessions, English-Lithuanian word pairs were displayed on a computer screen one by one, each for 10 seconds of study. After studying the list, the participants underwent retrieval trials: A Lithuanian word appeared and they had to type the English equivalent within eight seconds. If the answer was correct, the word went to the end of the list to be asked again. If wrong, the participant got to restudy it. Each item was pre-assigned a "criterion level" from one to five—the number of times it needed to be correctly recalled during practice. Once that level was reached, the word was dropped from practice.

Participants then returned—two days later in Experiment 1, seven in Experiment 2—and completed tests recruiting different types of memory. First, they performed one of four recall tests, plus trials including recognizing words they had or had not studied and picking out correct word pairings among incorrect ones. To eliminate the potentially enhancing effect of a prior recall [test](#)—and get a "pure" assessment of recognition of cues, targets, and associations—the second experiment eliminated the preceding recall tests.

The experiments yielded the same results: Items with higher "criterion levels"—which had been correctly retrieved more times during practice—exhibited better performance on tests of all three kinds of memory: cue, target, and associative.

Vaughn stresses that it isn't just testing, but successful testing—getting the answer right—that makes the difference in memory performance later on. He also admits the study leaves much to be discovered. "We know that repeated retrieval is good for memory. Testing is a modifier of memory. But we still don't know how that works. We don't understand the mechanism."

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