

Extreme Memory

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On the stage, memory researcher Henry L. Roediger, III, spoke random digits at a rate of one every 2 seconds. A few feet to his left, memory athlete Nelson Dellis sat in a chair absorbing each one. Dellis hunched over, his hands pressed over his eyes, his face a bit red with intensity. After Roediger announced the 100th digit, Dellis leaned back and asked for a moment to let it all sink in. He was going to recite the digits — all 100 — back to the audience, in order.

A crowd never sat so silent in anticipation.

Roediger and Dellis had spent the past hour revealing the secrets of mnemonic memory as part of the Bring the Family Address at the 2014 APS Annual Convention. Roediger, APS Past President and a psychological scientist at Washington University in St. Louis, has pivoted some research attention to the spectacular feats of extreme memorizers. Dellis, the reigning three-time US Memory Champion, helped him demonstrate to the crowd just how spectacular those feats are.

Mnemonic techniques go back to the days when ancient Greeks had to memorize lengthy speeches, said Roediger. Later, Romans trained bright slaves, known as *graeculi*, or Little Greeks, to memorize things for them. In the 16th century, the Jesuit priest Matteo Ricci famously created the so-called “memory palace” — a physical space he could roam in his mind to retrieve information based on the spatial retrieval cues.

Linking, Pegging, and Journeying

Roediger discussed three conventional favorites among mnemonic techniques. One is the “link” method, which strings together a series of images that remind users of a topic. Another is the “peg” method, which establishes a series of mental pegs to “hang” a memory on. The most popular mnemonic device is the “journey” or “loci” method. In the spirit of Ricci’s memory palaces, users of the journey method envision a physical path they can’t forget — such as the walk through their houses — and place items they want to remember in spots along it. All these mnemonic techniques rely on the power of mental imagery or visualization, the ability to imagine objects in spaces, which provides a powerful boost to remembering.

Roediger first studied the power of mnemonics several decades ago. He gave study participants three lists of words to memorize in order using one of the main three mnemonic techniques. Controls using no mnemonic recalled about five words in order. Participants using the link method doubled that, and those using the loci and peg methods did even better, Roediger reported in a 1980 issue of the *Journal of Experimental Psychology: Human Learning and Memory*.

“Here without much effort, without much practice, we show recall is much better using simple

techniques in a standard laboratory setting,” he said. He now regrets not pursuing this line of work at that time.

After a long hiatus, Roediger dived back into the world of mnemonics. He and his collaborators (APS Fellow David A. Balota, APS Fellow Kathleen B. McDermott, and Mary Pyc, all colleagues at Washington University) recently gathered seven world-class memory athletes (including Dellis) in the lab for a series of tests and compared their performances against that of 15 (unfortunate) college students. It wasn't much of a match. Of a list of 100 words given 2 seconds apart, the athletes recalled about 70 and the controls about 10. On a surprise test a day later, athletes got about 50 words and controls got one or two.

Roediger was most impressed by how well the memory athletes performed on more complex working memory tasks. These tasks are thought to assess attentional control as much as memory, yet the athletes still excelled. For one task, the “computation span,” participants had to state whether an equation like $5+4=9$ was true or false while also remembering the middle digit. In a series of seven span trials presented at a fast rate, the athletes got six or seven right, and the controls got only two. The memory athletes also did very well on another task that involves mental control, the Stroop color-word task.

“So a hallmark of being a memory athlete is not just having a great memory, it's being able to control your attention really well,” said Roediger. “Besides using these mnemonic techniques, you really have to be able to focus.”

In the Cards

Focus is clearly not a problem for Nelson Dellis. He has memorized 310 consecutive digits in 5 minutes and 193 consecutive names in 15 minutes; he holds a number of memory records, including the US national record for memorizing a deck of shuffled cards in 63 seconds. (The first thing he did upon taking the stage at the APS Convention was recite a deck that Roediger had shuffled and handed him before the show.) An avid mountaineer, Dellis decided to pursue intense memorization after watching his grandmother suffer from Alzheimer's disease. He now heads Climb for Memory, a charity aimed at raising awareness about the disease.

What intrigued Dellis the first time he witnessed memory athletes in action was that none of them seemed to be naturals. On the contrary, he said, everyone who took part in competitive memory events claimed to have improved an average memory through training and practice.

“What I do, what all these memory athletes do, is learning,” he said. “At one point I didn't have this skill. I read a book and just practiced a lot. That's why I'm here.”

The two keys to memorization, in Dellis's mind, are visualization and storage. Visualization means using an incredibly detailed image to represent the information you want to remember. That works better than simply trying to memorize a list of numbers, he believes, because our minds evolved to remember scenes with far greater accuracy.

For storage, Dellis relies primarily on the “journey” mnemonic technique. To demonstrate its power, he showed the audience a list of 14 words on a screen

for about a minute, then asked if anyone could recall them. No one volunteered. Then he showed a new list of 14 words and walked the crowd through the sort of process he'd use to lock them into mind.

Dellis divided the stage into seven locations, each of which became home to a pair of words. The word pairs were embellished with highly detailed images. So, *giraffe* and *foot* at the podium became a giraffe planting a huge human foot right beside the microphone, stink lines drifting upward from the toes. After Dellis walked the audience through all seven locations — without even setting aside time for direct memorization — the crowd recited all 14 words back to him without a problem.

“You’re going to go home tonight and you’re not going to forget these words — unfortunately,” he said. “The mere fact that we did this process, making it very visual and storing it in a way where you know where they are, you can close your eyes and picture where I was standing, and you’ll be able to remember those words pretty vividly for a long time.”

It wasn't until the talks ended that Roediger challenged Dellis to remember the 100 digits. As his memory palace, Dellis said he was going to use a hotel in Kathmandu where he'd stayed before climbing Mt. Everest. The crowd quivered with a mixture of fear and delight as Dellis made his way through the list, shown on a screen behind him, two digits at a time. He missed only two numbers, tripped up by the image of Oscar de la Hoya eating a slice of pizza.

That felt a little disappointing to Dellis but made things all the more memorable to the audience. The usual memory span studied by psychologists is about 7 items, whereas for Dellis it was 98!