Study finds unpredictability improves memory recall

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Dr. Chandramallika Basak

Memory training with unpredictable components could be more effective in enhancing episodic memory than training with predictable elements, according to new findings from UT Dallas researchers published in the journal *Frontiers in Psychology*.

Episodic memories are those associated with autobiographical events, such as a past birthday party or first trip to an amusement park. This type of memory is crucial to our ability to accurately retell stories.

Dr. Chandramallika Basak, assistant professor at UT Dallas' Center for Vital Longevity (CVL), and graduate student Margaret O'Connell tested episodic memory in 46 adults between the ages of 60 and 86 at three different stages: before memory training, immediately after training and one and a half months after completing the training. Participants were separated into two groups—predictable training or unpredictable training—and did not differ in terms of education or cognitive abilities.

For both groups, sequences of digits in different colors were presented. Participants were asked to indicate when the color of the current digit matched an earlier one of the same color. In training that involved a predictable element, the changing colors occurred in a fixed order, whereas the color switching was random in the training that involved unpredictability.

"Completing the task when the color changes occur unpredictably requires more cognitive resources, or control," said Basak, who directs the Lifespan Neuroscience and Cognition Laboratory at CVL. She likens the effect to what happens when you take a new, previously uncharted way home from work. The cognitive demands required to navigate new landmarks that are part of the journey increase with the new route's unpredictability.

The two groups of participants demonstrated equivalent story recall before training, but the group given training with the unpredictable element was able to narrate a previously heard story more accurately than the other group. That benefit, however, appeared to fade when the same group was tested a month and a half later.

"Training-related improvements from our novel approach dissipated when performance was tested awhile after completion of the training," Basak said. "This could be a case of use it or lose it—that the training must be sustained. Future research could investigate if booster training may help with retaining the long-term benefits.

"Studies such as this one shed light on the role of cognitive control in memory training. They also highlight the differences in training-related performance gains between people, and could help researchers and clinicians develop better cognitive training strategies for older adults who are at risk for dementia."

The findings support Basak's hypothesis—her theory of working memory adaptability—which posits that switching between items in working memory involves cognitive control, and that different types of cognitive training regimens can influence demands on cognitive control.

Working memory involves the ability to keep information in the focus of attention and to manipulate or reorder it despite distractions—the sort of mental juggling required in everyday life, she said.

"When you have multiple items to remember, you need to focus your attention on what is most relevant and up-to-date, setting aside what may be distracting," Basak said. "Such focusing of attention is more challenging when cues appear in an unpredictable order, thus requiring more cognitive control. It seems from our study that improving the efficiency of focusing attention to the target using unpredictable training

strategy led to more accurate episodic memory."

Provided by University of Texas at Dallas

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