Don’t Talk to a Friend While Reading This; Multi-Tasking Adversely Affects the Brain’s Learning Systems

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Multi-tasking affects the brain's learning systems, and as a result, we do not learn as well when we are distracted, UCLA psychologists report this week in the online edition of *Proceedings of the National Academy of Sciences*.

"Multi-tasking adversely affects how you learn," said Russell Poldrack, UCLA associate professor of psychology and co-author of the study. "Even if you learn while multi-tasking, that learning is less flexible and more specialized, so you cannot retrieve the information as easily. Our study shows that to the degree you can learn while multi-tasking, you will use different brain systems.

"The best thing you can do to improve your memory is to pay attention to the things you want to remember," Poldrack added. "Our data support that. When distractions force you to pay less attention to what you are doing, you don't learn as well as if you had paid full attention."

Tasks that require more attention, such as learning calculus or reading Shakespeare, will be particularly adversely affected by multi-tasking, Poldrack said.

The researchers used functional magnetic resonance imaging (fMRI) to examine brain activity and function, a technique that uses magnetic fields to spot active brain areas by telltale increases in blood oxygen.

Participants in the study, who were in their 20s, learned a simple classification task by trial-and-error. They were asked to make predictions after receiving a set of cues concerning cards that displayed various shapes, and divided the cards into two categories. With one set of cards, they learned without any distractions. With a second set of cards, they performed a simultaneous task: listening to high and low beeps through headphones and keeping a mental count of the high-pitch beeps. While the distraction of the beeps did not reduce the accuracy of the predictions — people could learn the task either way — it did reduce the participants' subsequent knowledge about the task during a follow-up session.

When the subjects were asked questions about the cards afterward, they did much better on the task they learned without the distraction. On the task they learned with the distraction, they could not extrapolate; in scientific terms, their knowledge was much less "flexible."

This result demonstrates a reduced capacity to recall memories when placed in a different context, Poldrack said.

"Our results suggest that learning facts and concepts will be worse if you learn them while you're distracted," Poldrack said.

Different forms of memory are processed by separate systems in the brain, he noted. When you recall what you did last weekend or try to remember someone's name or your driver's license number, you are using a type of memory retrieval called declarative memory. (Patients with Alzheimer disease have damage in these brain areas.) When you remember how to ride a bicycle or how to play tennis, you are using what is called procedural memory; this requires a different set of brain areas than those used for learning facts and concepts, which rely on the declarative memory system. The beeps in the study disrupted declarative memory, said Poldrack, who also studies how the types of memory are

related.

The brain's hippocampus — a sea-horse-shaped structure that plays critical roles in processing, storing and recalling information — is necessary for declarative memory, Poldrack said. For the task learned without distraction, the hippocampus was involved. However, for the task learned with the distraction of the beeps, the hippocampus was not involved; but the striatum was, which is the brain system that underlies our ability to learn new skills.

The striatum is the brain system damaged in patients with Parkinson disease, Poldrack noted. Patients with Parkinson's have trouble learning new motor skills but do not have trouble remembering the past.

"We have shown that multi-tasking makes it more likely you will rely on the striatum to learn," Poldrack said. "Our study indicates that multi-tasking changes the way people learn."

The researchers noted that they are not saying never to multi-task, just don't multi-task while you are trying to learn something new that you hope to remember. Listening to music can energize people and increase alertness. Listening to music while performing certain tasks, such as exercising, can be helpful. But tasks that distract you while you try to learn something new are likely to adversely affect your learning, Poldrack said.

"Concentrate while you're studying," he said.

Source: UCLA

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