

Investigating working memory

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Have you ever heard anyone brag about what a good memory they have? Probably not often, and there's a reason for that.

"Our brains do an enormous amount of processing, in fact they work like very effective computers," said Dawn Blasko, associate professor of psychology at Penn State Erie. "So effective that we only notice the few things we forget. We never think about the vast amount of material that we do, in fact, remember."

Blasko is one of a number of social scientists working to understand what causes memories to fail. To learn potential causes for memory failure, scientists devise ways to overload the brain and systematically determine what causes the system to break down.

In a recent experiment, "Attentional Interference in Judgments of Musical Timbre: Individual Differences in Working Memory," Blasko and Michael Hall, a colleague at the University of Nevada, Las Vegas, used musical timbre as a method of exploring individual differences in working memory. Timbre is a unique sound of an instrument; for example, a clarinet playing a certain note on a scale sounds very different from a violin playing the same note. Blasko defines working memory as the information we can retain and pay attention to at one time, similar to a central processing unit. In contrast, long-term memory is stored information, similar to a computer's hard drive.

"Working memory involves both memory and attention," said Blasko. "Newer theories claim that we are either born with our working memory, rather like IQ, or that we learn to use the memory we have more

efficiently. Working memory seems to be increased as we are better able to allocate our attention."

As an example, she sets the scene with college students. Some can work easily in a computer lab with printers in motion, a CD playing on their iPod and people asking questions of the lab attendant. Other college students hide in a far and quiet corner of the library, work alone and seek as little distraction as possible, so they can better remember what they are studying.

"Our memories are more efficient if we are able to ignore unimportant information," Blasko said. She also points out that humans are dynamic systems whose memories also are more efficient with regular food and sleep, pointing again to the difference in college students.

In their research, published in the January 2005 "Journal of General Psychology," Blasko and Hall used an Operations Span Task tool to assess the working memory capacity of their subjects. In this task, people are asked to do simple mental arithmetic while remembering a series of words.

In a second task, participants heard high or low tones made by either a violin or clarinet in both ears at the same time, and they were asked to pay attention to the instrument in one ear and ignore the other. All listeners had more difficulty remembering when they heard a different instrument in each ear, as opposed to hearing the same instrument in both ears.

The authors indicated that although the listeners showed some interference from hearing a different instrument in the to-be-ignored ear, the interference was greater for listeners with a low working memory span. They had much more difficulty ignoring the irrelevant information.

"We learned two things from this research," said Blasko. "We learned that controlling attention, in terms of working memory, matters not only with words and visual images, but with the timbre of musical sound as well. We also learned that our musical timbre judgment task is an excellent method of examining individual differences in attention."

Now that the researchers have demonstrated the success of their method, they've plotted their next steps: to look at how musical experience affects attention to timbre. Psychology professor Victoria Kazmerski and students Holly Basko-Drabik and Joshua Rowe are looking at how musicians and nonmusicians use attentional systems to process musical timbre in the brain. Musicians appear to have an edge in this task, according to Blasko, possibly because those that play in groups must learn to focus on parts of the musical score and ignore others.

"Working memory is required for much of what human beings need to accomplish in a day," said Blasko. "I hope our research in this area encourages students and other researchers to continue building on what we've learned so far."

Source: Penn State

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