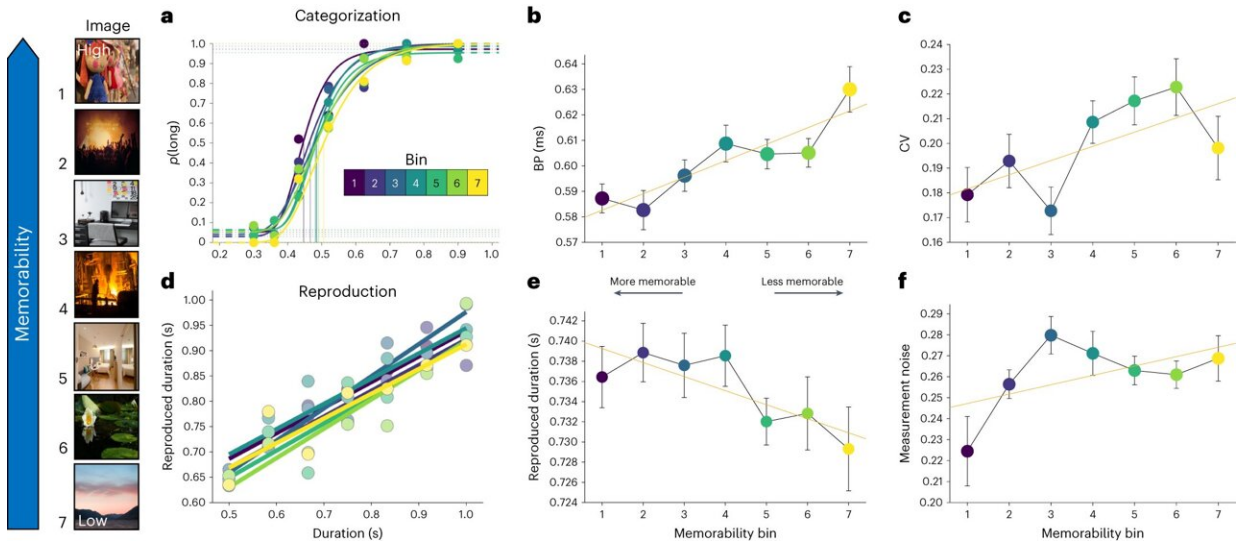
Experiments reveal that image memorability can sharpen our sense of time

July 27 2024, by Danielle Hawkins



Memorability dilates perceived time. Credit: *Nature Human Behaviour* (2024). DOI: 10.1038/s41562-024-01863-2

Research by George Mason professor Martin Wiener recently demonstrated that the more memorable an image is, the longer and more accurately its viewers can perceive the passage of time. In a series of experimental studies, participants were more likely to say more memorable images stayed on screen longer, they made that response faster, and they were more consistent about their responses with more memorable images, saying consistently that they stayed on-screen longer.

The paper is published in the journal *Nature Human Behaviour*.

"That study touched on something called memorability, which is the likelihood that you will remember something later," explained Wiener. "It's an open question of why there are some things that we just remember very well and some things we forget. Cognitive scientists and computer scientists have been very interested in this question, especially from a machine learning/AI perspective."

Wiener and colleagues conducted several experiments to determine how the size, memorability, and clutter of images affects our perception of time while viewing them. To examine memorability, they used a database built by computer science researchers at MIT that scores images at varying rates of memorability.

"We were trying to understand our visual sense of time by looking at how different types of images can influence it, and that led to a strong connection to memory that hadn't really been explored before," added Wiener.

Wiener and colleagues were also curious if this impacted how likely participants were to remember the images later, so they asked participants 24 hours later if they had seen the images, and they were more likely to remember seeing the images that were more memorable. Additionally, if they had reported seeing the image for a longer period of time (by holding down the space bar), they were even more likely to remember them the next day.

Given the findings of the experimental study with human participants, they used the same test with an artificial intelligence (AI) machine model of the visual system (a recurrent convolutional neural network). This model also reported that it saw the more memorable images for a longer period of time and made this response faster and more

consistently. This meant that the findings were not just limited to their experimental study and suggested that there was a mechanism for how the brain processes these images.

Wiener explained the significance of these findings. He said, "For some stimuli, the more memorable the images, the brain thinks this is very important. I need to process it as quickly as I can and gather as much information as I can, and in order to do that, I'm going to dilate time a little bit. The experience becomes longer, it becomes expanded.

"What that translates to is a better encoding into memory so that you can retain that better and remember it better a few hours later, 24 hours later, etc. That's where we got this connection between memory and time. Our sense of time seems to be something controllable by the brain and used by the brain to gather information."

Wiener's work is unique in that it is looking at very complicated images of scenes and pictures, seeing how those influence the sense of time. Previous researchers studied very simple visual stimuli—different sized squares, or high and low contrast images.

Adding to his work on memory, Wiener runs the Spatial, Temporal, Action, Representation (STAR) Lab at George Mason, which is uncovering how the senses build a perception of time. Students at all levels—from high school volunteers to doctoral students—work with Wiener on studies exploring very short intervals of time—everything from a few hundred milliseconds to multiple seconds to a maximum of about a minute. Some of their work has explored movement and time, which also has critical applications in fields beyond psychology, such as dance and music.

They found that when people are allowed to freely move, their sense of time is sharpened, meaning they perceive the passage of time more

precisely. More recent work is exploring how people learn intervals of time—how feedback and learning lets you acquire, understand, and measure intervals of time. Their findings could change how we teach topics and skills related to time.

All this discussion about time may leave you wondering if we can slow down time. As Wiener explains, you can, but generally it's not a good thing. They tend to be cases of high arousal—very frightening or intense situations.

"Usually situations in which time slows down tend not to be pleasant ones," he said. "They are often frightening or emotional or upsetting, like when you see something scary or something dangerous is occurring."

He said time also slows down in very boring and monotonous situations, such as waiting on hold or being stuck in traffic. "In those situations, we become more keenly aware of the passage of time, and the more you think about the passage of time, the slower it becomes," said Wiener.

Why does Wiener study this topic? "The stuff that excites me about time is how little we still know about the way the brain perceives it and measures it but how fundamental it is to everything," he said. "It's one of those things…on the surface it might not seem that interesting, but the more you think about it, the more you go wait, how does that happen?"

More information: Alex C. Ma et al, Memorability shapes perceived time (and vice versa), *Nature Human Behaviour* (2024). DOI: 10.1038/s41562-024-01863-2

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