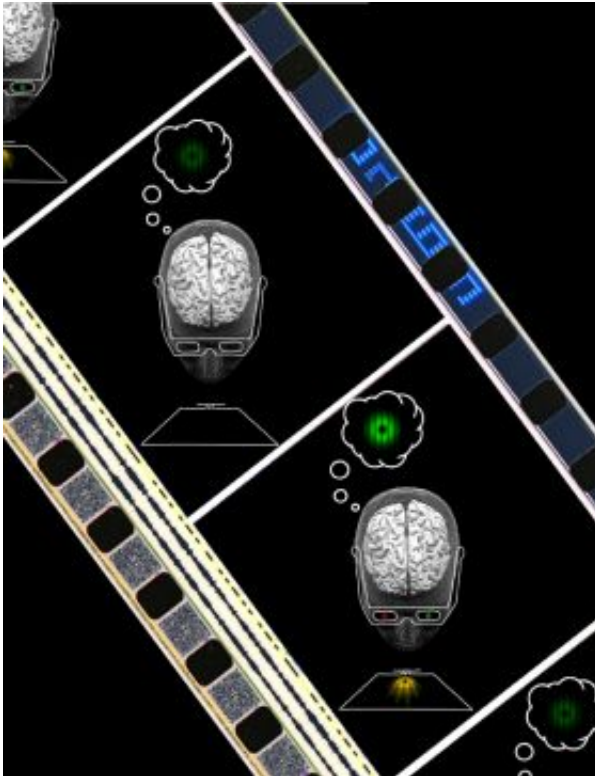


'Mind's eye' influences visual perception

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A graphic depiction of the sequence of events in the experiment from top left to bottom right. First, a person looks at a blank screen and imagines a green pattern. Next, she puts on the red-green glasses and looks at a screen with two superimposed patterns: one green and one red. The green pattern is visible to one eye and the red image is visible to the other eye. The longer she has spent imagining the green pattern, the more likely it is that she will see the green pattern, demonstrating that what people imagine can influence what they see later in time. Credit: Joel Pearson

Letting your imagination run away with you may actually influence how you see the world. New research from Vanderbilt University has found that mental imagery—what we see with the "mind's eye"—directly impacts our visual perception.

The research was published online June 26 by the journal *Current Biology* in a paper titled, "The Functional Impact of Mental Imagery on Conscious Perception."

"We found that imagery leads to a short-term memory trace that can bias future perception," says Joel Pearson, research associate in the Vanderbilt Department of Psychology, and lead author of the study. "This is the first research to definitively show that imagining something changes vision both while you are imagining it and later on."

"These findings are important because they suggest a potential mechanism by which top-down expectations or recollections of previous experiences might shape perception itself," Pearson and his co-authors write.

It is well known that a powerful perceptual experience can change the way a person sees things later. Just think of what can happen if you discover an unwanted pest in your kitchen, such as a mouse. Suddenly you see mice in every dust ball and dark corner—or think you do. Is it possible that imagining something, just once, might also change how you perceive things?

"You might think you need to imagine something 10 times or 100 times before it has an impact," says Frank Tong, associate professor of psychology and co-author of the study. "Our results show that even a single instance of imagery can tilt how you see the world one way or another, dramatically, if the conditions are right."

To test how imagery affects perception, Pearson, Tong and co-author Colin Clifford of the University of Sydney had subjects imagine simple patterns of vertical or horizontal stripes, which are strongly represented in the primary visual areas of the brain. They then presented a green horizontal grating pattern to one eye and a red vertical grating pattern to the other to induce what is called binocular rivalry. During binocular rivalry, an individual will often alternately perceive each stimulus, with the images appearing to switch back and forth before their eyes. The subjects generally reported they had seen the image they had been imagining, proving the researcher's hypothesis that imagery would influence the binocular rivalry battle.

Additional experiments found that the effect of imagery on perception was approximately the same as showing the research subject a faint representation of one of the patterns between trials. Stronger shifts in perception were found if subjects either viewed or imagined a particular pattern for longer periods of time. They found that both imagery and perception can lead to a build-up of a "perceptual trace" that influences subsequent perception.

Pearson, Clifford and Tong also discovered that changing the orientation of the image from what had been imagined greatly reduced the impact of imagery on perception. Because orientation is processed in early visual areas, this suggests that imagery's interaction with perception may occur at early stages of visual processing.

The new findings offer an objective tool to assess the often-slippery concept of imagination.

"It has been very hard to pin down in the laboratory what exactly someone is experiencing when it comes to imagery, because it is so subjective," Tong says. "We found that the imagery effect, while found in all of our subjects, could differ a lot in strength across subjects. So

this might give us a metric to measure the strength of mental imagery in individuals and how that imagery may influence perception."

The findings may also help settle a longstanding debate in the research community over whether mental imagery is visual—that one imagines something just as one sees it—or more abstract.

"More recently, with advances in human brain imaging, we now know that when you imagine something parts of the visual brain do light up and you see activity there," Pearson says. "So there's more and more evidence suggesting that there is a huge overlap between mental imagery and seeing the same thing. Our work shows that not only are imagery and vision related, but imagery directly influences what we see."

Source: Vanderbilt University

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