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Perception and working memory are deeply entangled, study finds

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Holding a color in mind affects the perceived color of an image. Credit: Dwight Kravitz

Many people have an intuitive, though incorrect, understanding of how the brain works: Our senses perceive objectively factual data, and our

higher-level thought processes interpret that data, pull some levers and shape our conclusions and behavior accordingly.

But perception and thought are fundamentally linked, according to research published in *Nature Human Behavior* last week by Dwight Kravitz, an assistant professor of cognitive neuroscience at the George Washington University.

"We create a false separation between our perception of the world and the way that we're thinking about it," Dr. Kravitz said. "But actually these two things occur at the same time, in the same place, and as a result they interfere with each other. What you're holding in mind changes what you see, and what you see changes what you're holding in mind."

Existing literature has established that perception and visual working memory (VWM), the ability to temporarily maintain and manipulate information, take place in the same parts of the brain. But "Visual Working Memory Directly Alters Perception," written with postdoctoral student Chunyue Teng in the Columbian College of Arts and Sciences Department of Psychology, demonstrates the behavioral consequences of that proximity.

The study's three experiments involved holding a visual stimulus in mind—either a color or a line tilted to a specific orientation—and then introducing a new color or orientation as a distractor during a distinct task. When the distractor was similar to the maintained content, it biased visual reports toward itself.

In the third experiment, which Dr. Kravitz called "the least purely academic," subjects were asked to distinguish between two colors or orientations while holding in mind a third. When the maintained information fell between the two stimuli, subjects rated them as more similar; when it fell outside, subjects were more likely to differentiate

them.

A subject might be asked to hold a shade of rose pink in their mind, for instance, and then be shown two more shades—one greener than the maintained shade, the other pinker. The subjects were likely to be able to differentiate between the new colors. If both introduced shades were greener (or pinker) than the rose pink the subject was thinking about, however, the subject was less able to tell them apart.

"The human system is nothing like a camera," Dr. Kravitz said. "The way you're thinking about the world changes not just the way things are emphasized, but also your baseline perceptions. The actual content of the world shifts slightly in reference to the things you're holding in mind."

Dr. Kravitz said further research could have major implications about the way the stereotypes we hold in mind affect our perception.

"To find effects here, on this really basic level of visual perception, means that if you move up to more complicated judgments—trustworthiness of faces, likelihood of particular things happening—they're likely going to show similar, if not larger, effects," Dr. Kravitz said. "The things that you're holding in mind and the biases that you bring are going to change what you see and how you act."

More information: Chunyue Teng et al. Visual working memory directly alters perception, *Nature Human Behaviour* (2019). DOI: 10.1038/s41562-019-0640-4

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