May Help Tailor Treatments for Depression

Vision Scientists Discover Why Humans Literally Don’t See Eye to Eye

Featured Open Neuroscience Articles visual neuroscience · July 14, 2020

Summary: *Our ability to pinpoint the exact size and location of objects varies from one person to the next, and even within our own individual field of vision.*

Source: *University of Cambridge*

We humans may not always see eye to eye on politics, religion, sports and other matters of debate. But at least we can agree on the location and size of objects in our physical surroundings. Or can we?

Not according to new UC Berkeley research, recently published in the *Proceedings of the Royal Society B: Biological Sciences* journal, that shows that our ability to pinpoint the exact location and size of things varies from one person to the next, and even within our own individual field of vision.

“We assume our perception is a perfect reflection of the physical world around us, but this study shows that each of us has a unique visual fingerprint,” said study lead author Zixuan

Wang, a UC Berkeley doctoral student in psychology.

The discovery by Wang and fellow researchers in UC Berkeley's Whitney Laboratory for Perception and Action has ramifications for the practices of medicine, technology, driving and sports, among other fields where accurate visual localization is critical.

For example, a driver who makes even a small miscalculation about the location of a pedestrian crossing the street can cause a catastrophe. Meanwhile, in sports, an error of visual judgment can lead to controversy, if not a fiercely disputed championship loss.

Take, for example, the 2004 U.S. Open quarterfinals, in which tennis icon Serena Williams lost to Jennifer Capriati after a series of questionable line calls. An umpire incorrectly overruled a line judge who called a backhand hit by Williams as in, resulting in an apology to Williams by the U.S. Tennis Association.

Researchers sought to understand if different people see objects in their surroundings exactly the same way. Image is in the public domain.

"Line judges need to rule on whether the ball is outside or inside the parameters. Even an error as small as half a degree of visual angle, equal to a sub-millimeter shift on the judge's retina, may influence the result of the whole match," said Wang, a die-hard tennis fan.

Researchers sought to understand if different people see objects in their surroundings exactly the same way. For example, when glancing at a coffee cup on a table, can two people agree on its exact position and whether its handle is big enough to grip? The result of a series of experiments suggest not, though there's an upside.

"We may reach for a coffee mug thousands of times in our life, and through practice we reach our target," Wang said. "That's the behavioral aspect of how we train ourselves to coordinate how we act in relation to what we see."

How they conducted the study

In the first task to test visual localization, study participants pinpointed on a computer screen the location of a circular target. In another experiment looking at variations of acuity within each person's field of vision, participants viewed two lines set a minimal distance apart and determined whether one line was located clockwise or counterclockwise to the other line.

And in an experiment measuring perception of size, participants viewed a series of arcs of varying lengths and were asked to estimate their lengths. Surprisingly, people perceived the exact same arcs to be bigger at some locations in the visual field and smaller at other locations.

Overall, the results showed remarkable variations in visual performance among the group and even within each individual's field of vision. The data were mapped to show each study participant's unique visual fingerprint of perceptual distortion.

> "Though our study might suggest that the source of our visual deficiencies can originate from our brain, further investigations are needed to uncover the neural basis," said Wang.

"What's also important," she added, "is how we adapt to them and compensate for our errors."

See also

Featured Neuroscience Psychology April 26, 2020

From Voldemort to Vader, science says we prefer fictional villains who remind us of ourselves

About this visual neuroscience research article

Source:
University of Cambridge
Media Contacts:
Yasmin Anwar – University of Cambridge
Image Source:
The image is in the public domain.

Original Research: Open access
"Idiosyncratic perception: a link between acuity, perceived position and apparent size" by Zixuan Wang et al. *Proceedings of the Royal Society B: Biological Sciences*

Abstract

Idiosyncratic perception: a link between acuity, perceived position and apparent size

Perceiving the positions of objects is a prerequisite for most other visual and visuomotor functions, but human perception of object position varies from one individual to the next. The source of these individual differences in perceived position and their perceptual consequences are unknown. Here, we tested whether idiosyncratic biases in the underlying representation of visual space propagate across different levels of visual processing. In Experiment 1, using a position matching task, we found stable, observer-specific compressions and expansions within local regions throughout the visual field. We then measured Vernier acuity (Experiment 2) and perceived size of objects (Experiment 3) across the visual field and found that individualized spatial distortions were closely associated with variations in both visual acuity and apparent object size. Our results reveal idiosyncratic biases in perceived position and size, originating from a heterogeneous spatial resolution that carries across the visual hierarchy.