Digital content could be altering your visual perception

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So much of modern life is spent on screens: Zoom meetings and websites, smartphones and video games, televisions and social media. How are all those pixels and rectangles affecting how we see?

Binghamton University Professor of Psychology Peter Gerhardstein and doctoral candidate Nicholas Duggan explore the phenomenon in "Levels of Orientation Bias Differ Across Digital Content Categories: Implications for Visual Perception," recently published in the journal *Perception*. Their paper covers the extent to which online content of various types differs from real images of natural, urban and suburban scenes in terms of visual orientation.

"When you're online, you are experiencing a different world," Gerhardstein said.

Gerhardstein and Duggan study the "oblique effect," in which the brain pays more attention to horizontal and vertical lines than those coming in at an oblique angle. Think of it this way: In the natural world, you will see both horizontal phenomena such as the horizon, and vertical ones, most often trees. But you will also see objects oriented at a wide array of angles, such as tree branches, sloping hillsides and nodding flowers.

In a "carpentered" environment manufactured by human hands, many of those oblique angles are eliminated. Instead, the landscape is dominated by horizontal and vertical objects such as buildings, street lamps, power lines and road signs. Suburban environments, with their infusion of small pockets of nature, are somewhere in between.

Digital media, from Zoom video calls and websites to video games, also exhibit the oblique effect. In the article, the researchers used Fourier analysis to investigate the visual orientation of a wide range of digital scenes, from cartoons and video games to websites, and compared the results with real-life scenes from natural, suburban and urban environments.

They found that video games meant to imitate the natural world actually do a passing job of it, preserving oblique angles, although not to the

extent seen in nature. On the other end of the spectrum are pixelated video games and social media sites, which are essentially primarily composed of boxes; these exhibit the oblique effect to an extreme not seen in real-world environments, their research shows.

"The question is: Is this shifting our overall profile of orientation sensitivity? People are spending so much time looking at these digital environments that it may become influential," Duggan said.

Shifting perception

Overexposure to digital content can potentially shift what your brain pays attention to visually—at least for a while. In a previous research project conducted with then-graduate student Daniel Hipp, students played Minecraft for four hours; afterward, their sensitivity to vertical and horizontal lines had increased.

As seen with the Minecraft players, the oblique effect tends to fade once viewers reengage with the natural world and stop playing the game. On the other hand, research from Canada in the 1970s indicates that Indigenous people who were raised in naturalistic environments were more sensitive to oblique angles in general than those who grew up in an urban environment such as Toronto, Gerhardstein said.

"At this point, we really don't know the implications of this," he said.

The canary in the coal mine may be young people with digital media overuse disorder. Hipp is now a clinical neuroscience researcher in Colorado, where he is studying a group of high school and college students experiencing just that.

"We're talking about kids who were dropping out of school because they play video games every waking moment. The conjecture is that these

people may be subjecting themselves to a digital environment that is substantively different from what other people typically experience on a daily basis," Gerhardstein explained.

Binghamton researchers are also working with Hipp's group and have surveyed around 1,200 undergraduates about digital media overuse. While an article on the topic has yet to be published, they discovered that 90% of the sample reported frequent video game use, and up to 10% worry about the amount of time they're spending in game play.

Has their visual perception already been altered by their digital use? It's a topic that merits further study.

Perceptual changes aren't reflective of eyesight or necessarily negative, the researchers point out. Even after heavy digital use, people are able to perceive oblique angles; they just didn't pay as much attention to them as to horizontal and vertical lines.

"There is a lot of benefit to online content in general. Unless you are overusing it, we strongly suspect there is no real impact here," Gerhardstein said. "But if you are heavily overusing digital content, you could be altering some aspects of your basic visual perception."

More information: Nicholas Duggan et al, Levels of orientation bias differ across digital content categories: Implications for visual perception, *Perception* (2023). DOI: 10.1177/03010066221148673

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