Recent News

When We See But Don't See: Using Illusions to Test Our Perceptions

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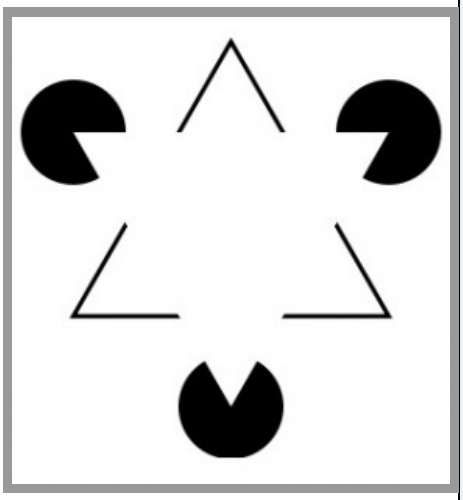
DEC 13

When We See But Don't See: Using Illusions to Test Our Perceptions

If you are driving home from work listening to a song on the radio or talking to your spouse in the car, you may miss other things happening around you – like a giant display of Christmas trees for sale or even a car on fire on a nearby street. Even if you traveled pass these visuals, you might not have registered that you saw them because you were busy. When we fail to recognize such items, we may say that we saw them only "unconsciously," but a new study argues that we may in fact see them consciously and just not reflect on them – questioning the very definition of "conscious."



A Kanizsa triangle, where we perceive edges that aren't physically present; credit: Fibonacci, GFDL

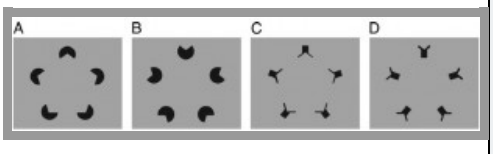
"People often think that what they perceive must be an accurate reflection of what their brain processes," says Johannes Fahrenfort of the University of Utrecht. "In other words, they assume that they are the gods of their own reality. But in fact, our brain plays tricks on us to make sense of the world."

And when it comes to our daily observations, our brains take in a lot of information but we only reflect upon what we need to meet our goals, he says. To test if it was possible that we consciously see things but just do not report on them, Fahrenfort, with Annelinde Vandenbroucke and colleagues from the University of Amsterdam, used brain scans and optical illusions.

Specifically, they turned to Kanizsa illusions – where shapes become visible to the viewer even though they have no physical contours or edges. The shapes will even appear brighter than the background even though it is all the same color. "The perceptual nature of this inference is very convincing in this illusion," Fahrenfort says. "You do not cognitively infer the presence of a surface, you actually see it."

Previous research has shown that seeing these illusions require conscious processing of the visual inputs, making it a great test case for "inattentional blindness" – when we see things but don't report them. "We wanted to challenge the notion that reporting is a necessary ingredient for obtaining conscious representations," Fahrenfort says.

So the researchers took a Kanizsa figure and three control figures that contain comparable physical stimulation but that do not involve the same perceptual processing – all create a pentagon shape but only the Kanizsa does so absent physical edges. One of the unique aspects of the study, which was published in the Journal of Cognitive Neuroscience, was its use of three control figures for the Kanizsa figure.



The Kanisza figure (A) with the three controls used in the study that all show pentagons but without the illusion; Vandenbroucke et al.

The researchers recorded brain activity of people in fMRI while viewing the four figures during a demanding memory task. The idea was to distract them from the figures. After the task, some participants were able to

identify the Kanizsa figure among 7 other figures not used in the distraction task, while others were not. Yet the neural signature unique to processing Kanizsa figures was present in both groups – suggesting that those who could not identify the illusion consciously saw the figure but simply could not report on it.

"This shows that reporting itself is not the critical factor that produces a neural signature of perceptual inference," Fahrenfort says. "As a result, one might question whether reporting is really a necessary ingredient for producing representations that are normally thought to be associated with conscious perception."

He also notes that in a control run, subjects who were previously inattentionally blind to the Kanizsa figures were able to report on them once instructed to do so. "Unconscious items, however, can never be perceived, no matter how hard a subject tries," Fahrenfort says. "Moreover, the neural signature associated with these 'non-reported' perceptual effects were robust and integrated, and not fleeting as in unconscious representations."

Scientists either need to come up with another word then for this type of perception such as "pre-conscious," he says, or need accept that we can consciously see something but just not be able to report it because we are engaged in other things. Again think of driving home and not even remembering the route you took to get back, you probably wouldn't call yourself "blind," just absent minded.

–Lisa M.P. Munoz

The paper, "**Seeing without Knowing: Neural Signatures of Perceptual Inference in the Absence of Report**", Annelinde R. E. Vandenbroucke, Johannes J. Fahrenfort, Ilja G. Sligte, Victor A. F. Lamme, was published in the Journal of Cognitive Neuroscience online on November 27, 2013.

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← Holiday Blues? Identifying Markers for Anxiety in the Brain

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