Visual learning study challenges common belief on attention

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A visual learning study by scientists at The University of Texas Health Science Center at Houston indicates that viewers can learn a great deal about objects in their field of vision even without paying attention. The findings will appear in the April 14 print issue of the journal *Current Biology*.

Contrary to common belief, attention may actually impair the ability of people to draw conclusions based on the visual images or stimuli they observe, reports Valentin Dragoi, Ph.D., the study's senior author and an assistant professor at The University of Texas Medical School at Houston.

"Even when you ignore environmental stimuli, your brain may still be sensitive to their content and store information that will influence subsequent decisions," Dragoi said. "Paradoxically, paying attention may actually reduce learning during repeated exposure to visual images."

This new insight into visual attention could lead to novel teaching strategies to help people with sensory impairment after stroke or attention deficit disorder, Dragoi said.

Six people participated in the multiple-day study designed to measure the ability of human subjects to process visual stimuli in the absence of attention.

Participants were asked to stare at a dot in the center of a computer

monitor while paying attention to one flashing stimulus and ignoring another. To make sure they were paying attention, study subjects were asked to press the spacebar when the stimulus they were concentrating on varied in contrast.

In the subsequent sessions, participants were tested to see how well they could detect changes in the angles of the flashing stimulus at both the location they were supposed to attend and the one they were supposed to ignore. The flashing stimulus in the exposure part of the study was a circle with parallel bars. It was later replaced with fifteen natural images.

"Surprisingly when subjects were tested for their ability to discriminate fine orientation differences between new stimuli, their learning performance was greater at the unattended location," Dragoi said. "That is, ignoring the stimuli presented over days of exposure was more effective than actually attending them. We believe this finding can be explained by the fact that, typically, attention filters out unwanted stimuli so they are not consciously processed. However, in the absence of attention, stimuli are able to escape the attentional mechanisms and induce robust learning after multiple exposures."

The next step, according to Dragoi, is to learn more about the neurophysiological mechanisms associated with this phenomenon, as well as to conduct additional experiments to investigate the generality of the findings. "The same could hold true with other sensory modalities, such as auditory or tactile," he said.

"It is conceivable that the brain has developed mechanisms to take advantage of the signals outside the spotlight of attention. … Although it is well accepted that 'practice makes perfect,' we show here that robust learning can arise from passive, effortless exposure to elementary stimuli," the authors wrote.

"Our visual systems have evolved during millions of years," said Diego Gutnisky, lead author and a graduate research assistant at The University of Texas Graduate School of Biomedical Sciences at Houston (GSBS). "For instance, inhabitants in the poles can discriminate different white hues better than other people who are not commonly exposed to predominantly white environments. In this way, the visual system can learn, without the requirement of attention, to extract the most relevant features of the environment to be more efficient at representing it internally."

More information: "Attention Alters Visual Plasticity During Exposure-Based Learning," Current Biology.

Source: University of Texas Health Science Center at Houston (news : web)