“Blink” and you might miss it … but your brain won’t

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We are bombarded with visual stimuli while driving, shopping and watching television. New research published in the Feb. 5, 2004, issue of Neuron reports that although we may not be aware of all that we see, our brains are registering this information.

“When we have to deal with a lot of information quickly, such as when we are driving, our ability to perceive and react to much of it is severely compromised,” said research team leader René Marois, assistant professor of psychology at the Vanderbilt Vision Research Center and the Vanderbilt Center for Integrative and Cognitive Neuroscience and an investigator in the Vanderbilt Kennedy Center for Research on Human Development. “This normal impairment shows up in problems such as driver distraction, a major cause of motor vehicle accidents.”

Vision researchers have long been aware of a perceptual phenomenon called the “attentional blink,” which refers to our transient inability to be aware of a visual object or event, such as a face or a road sign, if we are already paying attention to another visual event. What was unknown was how our brains processed the information presented to our visual system during the attentional blink.

To understand the “neural fate” of information received during the attentional blink, Marois and his co-investigators Do-Joon Yi and Marvin Chun, now at Yale University, used functional magnetic resonance imaging (fMRI) to view activity of the cortex in human subjects. FMRI registers blood flow to functioning areas of the brain to reveal the areas that respond to various stimuli.

In the experiment, participants were presented with a rapid succession of still visual images. Mixed in among scrambled versions of indoor and outdoor scenes were one image of a face and one image of an intact scene. The image of the intact scene was presented about one-half second after the image of the face.

Although the participants could easily see the face, they frequently missed the scene, even though it was right in front of their eyes. The effect was as if the participants’ minds “blinking” to the presentation of the scene when they were paying attention to the target they were told to look for, the face.

The fMRI results revealed that the scene activated different brain regions depending upon whether it was consciously perceived or not. The inferior temporal cortex, an area of visual cortex, was activated even when participants were not aware of the presentation of the scene. In contrast, the frontal cortex, the brain area associated with complex cognition and motor functions, was activated only when the subject reported having seen the scene.

“Overall our results indicate that a visual image can activate the inferior temporal cortex even when we are not aware of the presentation of this image, and that the frontal cortex may be necessary for us to consciously perceive the image,” Marois said.

“Our perception of a visual event is likely the result of an interaction of its sensory representation in the visual cortex and the attentional network needed to process it in the frontal cortex,” Marois continued. “These findings give us a better understanding of the areas of the brain that are important for conscious and unconscious perception.”