Medical Xpress

New study locates the source of key brain function

June 1 2011

Scientists at the University of Southern California have pinned down the region of the brain responsible for a key survival trait: our ability to comprehend a scene—even one never previously encountered—in a fraction of a second.

The key is to process the interacting objects that comprise a scene more quickly than unrelated objects, according to corresponding author Irving Biederman, professor of psychology and computer science in the USC Dornsife College and the Harold W. Dornsife Chair in Neuroscience.

The study appears in the June 1 issue of *The* Journal of Neuroscience.

The brain's ability to understand a whole scene on the fly "gives us an enormous edge on an organism that would have to look at objects one by one and slowly add them up," Biederman said. What's more, the interaction of objects in a scene actually allows the brain to identify those objects faster than if they were not interacting.

While previous research had already established the existence of this "scene-facilitation effect," the location of the part of the brain responsible for the effect remained a mystery. That's what Biederman and lead author Jiye G. Kim, a graduate doctoral student in Biederman's lab, set out to uncover with Chi-Hung Juan of the Institute of Cognitive Neuroscience at the National Central University in Taiwan.

"The 'where' in the brain gives us clues as to the 'how,'" Biederman said.

This study is the latest in an ongoing effort by Biederman and Kim to unlock the complex way in which the brain processes visual experience. The goal, as Biederman puts it, is to understand "how we get mind from brain."

To find out the "where" of the scene-facilitation effect, the researchers flashed drawings of pairs of objects for just 1/20 of a second. Some of these objects were depicted as interacting, such as a hand grasping for a pen, and some were not, with the hand reaching away from the pen. The test subjects were asked to press a button if a label on the screen matched either one of the two objects, which it did on half of the presentations.

A recent study by Kim and Biederman suggested that the source of the scene-facilitation effect was the lateral occipital cortex, or LO, which is a portion of the brain's visual processing center located between the ear and the back of the skull. However, the possibility existed that the LO was receiving help from the intraparietal sulcus, or IPS, which is a groove in the brain closer to the top of the head.

The IPS is engaged with implementing visual attention, and the fact that interacting objects may attract more attention left open the possibility that perhaps it was providing the LO with assistance.

While participants took the test, electromagnetic currents were used to alternately zap subjects' LO or IPS, temporarily numbing each region in turn and preventing it from providing assistance with the task.

All of the participants were pre-screened to ensure they could safely receive the treatment, known as transcranial magnetic stimulation (TMS), which produces minimal discomfort.

By measuring how accurate participants were in detecting objects shown

as interacting or not interacting when either the LO or IPS were zapped, researchers could see how much help that part of the brain was providing. The results were clear: zapping the LO eliminated the scene-facilitation effect. Zapping the IPS, however, did nothing.

When it comes to providing a competitive edge in identifying objects that are part of an interaction, the lateral occipital cortex appears to be working alone. Or, at least, without help from the intraparietal sulcus.

Provided by University of Southern California

Citation: New study locates the source of key brain function (2011, June 1) retrieved 6 May 2024 from https://medicalxpress.com/news/2011-06-source-key-brain-function.html