Medical Xpress

Culture influences brain function

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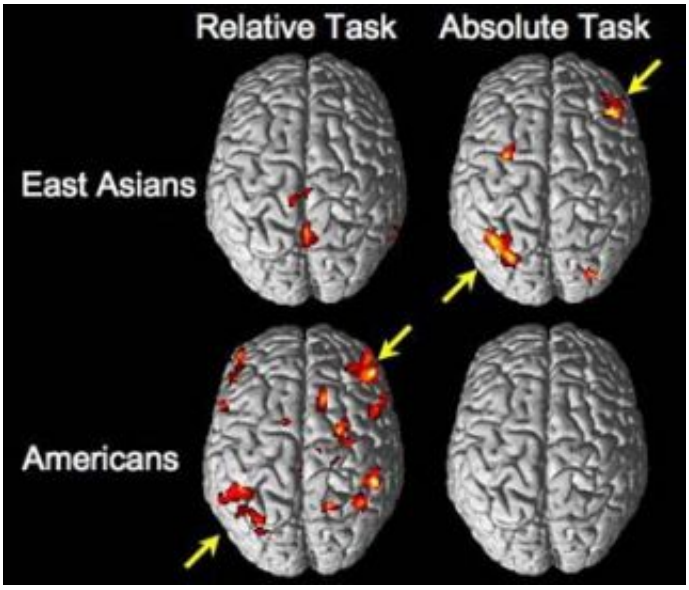

Brain activity in East Asians and Americans as they make relative and absolute judgments. The arrows point to brain regions involved in attention that are engaged by more demanding tasks. Americans show more activity during relative judgments than absolute judgments, presumably because the former task is less familiar and hence more demanding for them. East Asians show the opposite pattern. Image courtesy / Trey Hedden

People from different cultures use their brains differently to solve the same visual perceptual tasks, MIT researchers and colleagues report in the first brain imaging study of its kind.

Psychological research has established that American culture, which values the individual, emphasizes the independence of objects from their

contexts, while East Asian societies emphasize the collective and the contextual interdependence of objects. Behavioral studies have shown that these cultural differences can influence memory and even perception. But are they reflected in brain activity patterns"

To find out, a team led by John Gabrieli, a professor at the McGovern Institute for Brain Research at MIT, asked 10 East Asians recently arrived in the United States and 10 Americans to make quick perceptual judgments while in a functional magnetic resonance imaging (fMRI) scanner--a technology that maps blood flow changes in the brain that correspond to mental operations.

The results are reported in the January issue of *Psychological Science*. Gabrieli's colleagues on the work were Trey Hedden, lead author of the paper and a research scientist at McGovern; Sarah Ketay and Arthur Aron of State University of New York at Stony Brook; and Hazel Rose Markus of Stanford University.

Subjects were shown a sequence of stimuli consisting of lines within squares and were asked to compare each stimulus with the previous one. In some trials, they judged whether the lines were the same length regardless of the surrounding squares (an absolute judgment of individual objects independent of context). In other trials, they decided whether the lines were in the same proportion to the squares, regardless of absolute size (a relative judgment of interdependent objects).

In previous behavioral studies of similar tasks, Americans were more accurate on absolute judgments, and East Asians on relative judgments. In the current study, the tasks were easy enough that there were no differences in performance between the two groups.

However, the two groups showed different patterns of brain activation when performing these tasks. Americans, when making relative

judgments that are typically harder for them, activated brain regions involved in attention-demanding mental tasks. They showed much less activation of these regions when making the more culturally familiar absolute judgments. East Asians showed the opposite tendency, engaging the brain's attention system more for absolute judgments than for relative judgments.

“We were surprised at the magnitude of the difference between the two cultural groups, and also at how widespread the engagement of the brain's attention system became when making judgments outside the cultural comfort zone,” says Hedden.

The researchers went on to show that the effect was greater in those individuals who identified more closely with their culture. They used questionnaires of preferences and values in social relations, such as whether an individual is responsible for the failure of a family member, to gauge cultural identification. Within both groups, stronger identification with their respective cultures was associated with a stronger culture-specific pattern of brain-activation.

How do these differences come about" “Everyone uses the same attention machinery for more difficult cognitive tasks, but they are trained to use it in different ways, and it's the culture that does the training,” Gabrieli says. “It's fascinating that the way in which the brain responds to these simple drawings reflects, in a predictable way, how the individual thinks about independent or interdependent social relationships.”

Source: Massachusetts Institute of Technology