

How Pain Distracts The Brain

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Anybody who's tried to concentrate on work while suffering a headache knows that pain compellingly commands attention—which is how evolution helped ensure survival in a painful world. Now, researchers have pinpointed the brain region responsible for pain's ability to affect cognitive processing. They have found that this pain-related brain region is distinct from the one involved in cognitive processing interference due to a distracting memory task.

Ulrike Bingel and colleagues at the University Medical Center Hamburg-Eppendorf published their discovery in the July 5, 2007 issue of the journal *Neuron*, published by Cell Press.

To search for the region responsible for pain's ability to usurp attention, the researchers asked volunteers to perform a cognitive task involving distinguishing images, as well as a working memory task involving remembering images. The researchers asked the volunteers to perform the tasks as they experienced different levels of pain caused by the zapping of their hands by a harmless laser beam.

During these tests, the volunteers' brains were scanned using functional magnetic resonance imaging (fMRI). In this widely used analytical technique, harmless magnetic fields and radio waves are used to scan the brain to determine blood flow across regions, which reflects brain activity.

The researchers' experiments identified a brain region called the lateral occipital complex (LOC) as the cognitive-related area affected by both

“working memory load” and pain. This finding was expected, since the LOC is known to be involved in processing images.

The researchers next sought to identify the brain region by which pain affects the functioning of the LOC. They theorized that the best candidate for this region was one called the rostral anterior cingulate cortex (rACC). This region is known to be involved in the brain’s processing of pain, and it is part of the anterior cingulate cortex, which plays an important role in “executive” functions such as attentional control. These structures are located deep in the brain in the region of connection between the two hemispheres.

Indeed, the researchers’ fMRI scans indicated that the rACC is, indeed, the brain center through which pain influences the LOC. By contrast, they found a working memory load affects the LOC through a different region, the inferior parietal cortex.

The researchers noted that the modulation of visual processing by pain that they observed in their fMRI studies is behaviorally relevant, because as their fMRI scans showed pain affecting the LOC, they also observed a parallel impairment of accuracy in subjects’ recognition of the images.

Source: Cell Press

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