

Arthritis pain, the brain and the role of emotions

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How does the brain process the experience of pain? Thanks to advances in neuroimaging, we now know the answer lies in a network of brain structures called the pain matrix. This matrix contains two parallel systems. The medial pain system processes the emotional aspects of pain, including fear and stress, while the lateral system processes the physical sensations—pain's intensity, location, and duration.

Marked by morning stiffness, joint aches, and flare-ups, the pain of arthritis tends to be acute and recurrent, in contrast to many chronic pain conditions. Arthritis pain therefore makes an ideal model for comparing common clinical pain with experimental pain. Inspired by this observation, researchers at University of Manchester Rheumatic Diseases Centre in the United Kingdom conducted the first study to compare directly the brain areas involved in processing arthritis pain and experimental pain in a group of patients with osteoarthritis (OA). Their results, published in the April 2007 issue of *Arthritis & Rheumatism*, shed light on the role of emotions in how patients feel arthritis pain.

The study focused on 12 patients with knee OA—6 women and 6 men, with a mean age of 52 years. All subjects underwent positron emission tomography (PET), to measure and map 18F-fluorodeoxyglucose (FDG) uptake in the brain as an indicator of brain activity. PET scans were performed during three different pain conditions: arthritic knee pain; experimental pain, achieved by heat application; and pain-free. The brain responses to each pain state were then rigorously examined and statistically evaluated and compared for significant differences.

In all OA subjects, both pain conditions activated the entire pain matrix. However, during arthritic pain, activity was increased within the medial pain system of the brain, including most of the cingulate cortex, the thalamus, and the amygdala. This suggests that, for these patients, arthritis pain has more emotional impact—and perhaps stronger associations with fear and distress—than experimental pain. Arthritis pain also prompted heightened activation of the prefrontal cortex and the inferior posterior parietal cortex, areas of the brain instrumental in the supervision of attention. Their activation while suffering arthritis pain may reflect the patients' concentration on coping strategies.

"The present study demonstrates the importance of the medial pain system during the experience of arthritic pain and suggests that it is a likely target for both pharmacologic and nonpharmacologic interventions," notes its leading author, Prof. A.K.P. Jones. "Considering the recent concerns about the long-term safety of cyclo-oxygenase inhibitors, we hope that our current findings will stimulate partnerships between academia and the pharmacological industry to develop a new class of analgesics for arthritic pain that specifically target the medial pain system."

As Prof. Jones acknowledges, the study's main limitation is its small number of subjects. Larger studies of the relationship between arthritis pain and the medial pain system are critical, particularly for exploring the effect of variables from depression and anxiety to guided imagery, meditation, and other mind-based pain management techniques.

"Researchers should be moving toward more naturalistic studies in patients," Prof. Jones suggests, "in order to fully understand the perception of different types of clinical pain."

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