NewScientist.com news service "Pain really is all in the mind"

22:00 23 June 03

Andy Coghlan

Doctors and nurses have known for many years that some people are more sensitive to pain than others. Now brain scans of people experiencing the same painful stimulus have provided the first proof that this is so. But the scans also suggest that how much something hurts really is "all in the mind".

"We saw a huge variation between responses to the same stimulus," says project leader Bob Coghill of the Wake Forest University School of Medicine in Winston-Salem, North Carolina. "The message is: trust what patients are telling you."

Coghill tested the pain tolerance of 17 healthy volunteers by applying heat to the back of their calves. He varied the heat from around body temperature to 49 °C, the temperature of very hot washing-up water. Volunteers asked to rate the pain on a scale of zero to 10 showed huge variations. One resilient volunteer rated pain at the hottest temperature at just over one, whereas another could scarcely bear it at all, rating it at almost nine.

Stark differences

Then Coghill repeated the experiment when the volunteers were in MRI brain scanners. The scans revealed stark differences that reflected each individual's sensitivity to pain. The volunteers least able to bear pain showed more activity in the cerebral cortex, the region of the brain associated with higher cognitive function. Specific areas activated included the prefrontal cortex - linked with attention, working memory and emotion - and the anterior cingulate cortex, a region already linked with pain. Finally, the "leg" region lit up on the primary somatosensory cortex - a pain "map" of the body.

None of these areas lit up in the resilient individuals. But an area called the thalamus, which receives pain messages from the spinal cord and peripheral nerves, was active in all 17 volunteers. This suggests that the pain signal was not dampened on its way to the brain in any of the volunteers, so all the differences must be down to what happens in the brain itself.

"Once the signal arrives, the cerebral cortex interprets and colours the information based on prior experience, emotion and expectation, and that's when the differences kick in," says Coghill.

Journal reference: Proceedings of the National Academy of Sciences (DOI: 10.1073/pnas.1430684100)

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