Where does it hurt? Pain map discovered in the human brain

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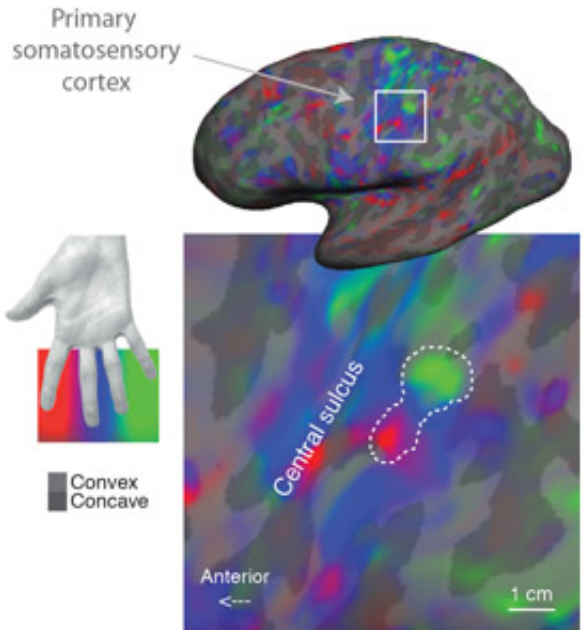

(Phys.org)—Scientists have revealed the minutely detailed pain map of the hand that is contained within our brains, shedding light on how the brain makes us feel discomfort and potentially increasing our understanding of the processes involved in chronic pain.

The map, uncovered by scientists at UCL, is the first to reveal how finely-tuned the brain is to pain. Published today in the Journal of Neuroscience, the study uses fMRI techniques in conjunction with laser

stimuli to the fingers to plot the exact response to pain across areas of the brain.

"The results reveal that pain can be finely mapped in the brain," said lead author Dr Flavia Mancini (UCL Institute of Cognitive Neuroscience). "While many studies have examined the brain response to pain before, our study is the first to map pain responses for the individual digits of the human hand."

Using an fMRI brain imaging technique originally created to map the visual field, the researchers were able to distinguish the brain's responses to painful laser heat stimuli on each finger in seven healthy participants, and to study their organisation in the brain.

This enabled the team to produce a fine-grained map showing how pain in the right hand results in certain parts of the brain being activated in the primary somatosensory cortex, an area in the left hemisphere of the brain which is involved in processing bodily information.

When comparing this pain map to ones generated by non-painful touch to the right hand, the researchers found that the two were very similar, with each map aligning with one another in each of the seven volunteers tested.

"The cells in the skin that respond to pain and the cells that respond to touch have very different structures and distributions, so we were surprised to find that the maps of pain and of touch were so similar in the brain," said Dr Mancini. "The striking alignment of pain and touch maps suggests powerful interactions between the two systems."

The pain maps could be used to provide markers for the location of pain in the human brain, enabling clinicians to see how patients' brains reorganise following chronic pain.

"We know that the organisation of other sensory maps in the brain is altered in patients with chronic pain," said Professor Patrick Haggard (UCL Institute of Cognitive Neuroscience). "Our method could next be used to track the reorganisation of brain maps that occurs in chronic pain, providing new insights into how the brain makes us feel pain. Therefore, measuring the map for pain itself is highly important."

Provided by University College London