A key neurological hub is involved in attributing pain to others, finds study

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The right temporo-parietal junction is causally involved in how we perceive and understand other people's pain, according to a new study published in the journal *Social Cognitive and Affective Neuroscience*

When you see someone else fall off their bike, you can feel the other person's pain yourself. Human empathy can be understood as our ability to understand and share the affective states of others. Empathy is crucial to our everyday social interaction and a fundamental component of social intelligence.

Typically, research distinguishes two complementary parts of empathy: cognitive empathy (when you understand what someone else is feeling) and affective empathy (when you actually feel what someone else is feeling). Cognitive and affective empathy appear to operate at least in part independently in the brain.

"What intrigued us," explains Prof. Christian Keysers, one of the senior authors of a new study on this topic, "is how these two functions interact in conditions in which what you know influences how you feel. For instance, if I watch a football match, and know a player always fakes being in more pain than he is to influence the referee, and see him in pain, what I know reduces what I feel. On the other hand, I know my wife is really tough, and doesn't show her pain easily, so if I see her wince in pain, what I feel for her is the stronger for what I know. How does that work in the brain?"

A key hub of cognitive empathy is the right temporo-parietal junction (rTPJ), whose important role in social cognition is widely recognized through an abundance of research. We know that this region is active when someone shows empathy, but how do we know if this region is actually needed and causally involved in influencing what we feel based on what we know about someone's tendency to show or hide their pain?

Silencing the brain

To investigate this question, Helena Hartmann and her colleagues from the group of Christian Keysers and Valeria Gazzola used a method called

repetitive Transcranial Magnetic Stimulation (rTMS). Hartmann explains, "With this technique you can temporarily silence a specific part of the brain. You interfere with typical activity in a certain region for a short time to see what happens to people's behavior. It is a causal way to confirm whether a specific region is involved."

"We asked people to watch videos of a woman experiencing pain at different intensities. The actress got electric shocks on her hand and the video displayed her getting these shocks. The only thing participants had to do was to rate the pain they thought the actress was feeling. In half of the trials, people's cognitive empathy hub was inhibited by the rTMS stimulation while they watched this video, and in the other half, people received a 'sham stimulation' as a control condition."

Suppressed versus openly shown emotions

"To examine if the rTPJ was critical for altering what you feel based on what you know, we told the participants that the actress was freely showing her pain and other times they got the instruction that the actress was suppressing her pain. It turns out that the stimulation influenced both the participants' empathic perception of others' pain and their reaction time," continues Hartmann.

"Active stimulation lowered participants' empathic ratings. This means that when they saw a painful facial expression, with their rTPJ disturbed, they reported perceiving the other person as experiencing less pain. However, it did so whether they thought the actress was showing or hiding her pain, pointing to the conclusion that the stimulated region is not only important when you think a person is suppressing their emotions.

"Furthermore, active stimulation led these participants to be slower for openly shown emotions and faster when they looked at suppressed

emotion videos. This supports the idea that the cognitive empathy hub plays a role in the speed in which people give social judgments."

This study shows that the rTPJ is important in how we perceive and understand other people in pain. This could be an interesting target for treatment of people with fewer abilities to empathize with others.

Hartmann concludes, "Stimulation of this region or training people to use the region more efficiently could possibly help them empathize better, but we need to do more research to find out exactly how we can achieve this."

More information: Helena Hartmann et al, Cognitive Control: Exploring the causal role of the rTPJ in empathy for pain mediated by contextual information, *Social Cognitive and Affective Neuroscience* (2024). DOI: 10.1093/scan/nsae057

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