

Catastrophizing can lead to heightened pain as measured by cardiovascular readings, research shows

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Our ability to manage pain varies from person to person. So what may be somewhat painful to one can be agonizing to another, even if the cause

of the discomfort they are experiencing is the same.

That's the topic of a new paper published by a Concordia research team in the journal *Applied Psychophysiology and Biofeedback*. In it, they examine the reported levels of pain test participants felt when placing their hand in ice water and the relationship of their reported pain to heart rates and blood pressure.

They found that respondents who exhibited pain catastrophizing—a negative orientation toward pain and a tendency to magnify pain sensations—reported higher levels of pain. They also had more pronounced changes to cardiovascular measures than those who did not, even though the water temperature was consistent across the study.

"People who are catastrophizing pain are having a physiological response to pain, even though the stimulus was the same between all our respondents," says Geoffrey Dover, an associate professor in the Department of Health, Kinesiology and Applied Physiology and the study's supervising author.

Not all pain is equal

The researchers conducted individual cold pressor tests on 24 healthy people. The test procedure for all the participants, including the temperature of the ice water used in the cold pressor test, was uniform. During the test, participants rated their pain levels on a scale of 0 to 10 while cardiovascular measures were continually monitored using a finger-pulse analysis.

On the day of the test, the participants arrived in a consultation room 45 minutes beforehand, where they were fitted with a finger cuff and had baseline cardiovascular readings. They then completed a pain catastrophizing scale, consisting of 13 self-rated questions categorized in

one of three subscales: Rumination, which evaluates the level of worry potential pain brings to a person; magnification, which describes the exaggeration of the severity of a painful situation; and helplessness, which measures the feelings of incapacity to deal with a painful situation. The answers helped the researchers determine the level of pain catastrophizing for each individual. The researchers also administered two standard tests to measure individual [anxiety levels](#).

The water bath was brought into the consultation room two minutes before the test. (The cardiovascular data taken during this time was discounted due to increased levels of anxiety and anticipation.) The participants then plunged their hand into the water for three minutes and wrapped it in a towel and remained quietly seated for 10 minutes. After their hand returned to a normal color and there were no feelings of residual pain, they were allowed to leave.

"We found that catastrophizing mediates how much pain you feel, not only in perception but also physiologically," Dover explains. "It's one thing to say 'I'm in a lot of pain,' but when they have a big change in heart rate and blood pressure, we can conclude that they are actually experiencing more pain."

This novel finding provides some insight into the psychology of [pain](#) response, the researchers say, and could be used in fields such as dentistry to build profiles of patients ahead of complex procedures such as root canals.

Gabriel Kakon was the study's lead author, along with Amir-Arshiya Kaffash Mohamadi. Natalie Levtova, Meagane Maurice-Ventouris, Emilie-Anne Benoit, Florian Chouchou and Peter Darlington, associate professor of health, kinesiology and applied physiology, are co-authors.

More information: Gabriel Kakon et al, Elevated Heart Rate and Pain

During a Cold Pressor Test Correlates to Pain Catastrophizing, *Applied Psychophysiology and Biofeedback* (2021). [DOI: 10.1007/s10484-021-09520-4](https://doi.org/10.1007/s10484-021-09520-4)

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