

# How weather can affect pain tolerance

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Can the weather affect pain from conditions like arthritis or migraine? It may sound like an old superstition—but on some standard quantitative sensory tests, weather-related factors do indeed affect pain tolerance, suggests a study in *PAIN*, the official publication of the International Association for the Study of Pain (IASP).

"Although observational, these findings suggest that weather has a causal, non-linear, dynamic effect on [pain tolerance](#)," according to the new research, led by Erlend Hoftun Farbu, Ph.D. student at UiT—The Arctic University of Norway, Tromsø. But it remains unclear if the link between weather and pain involves physiological or psychological factors, or a combination of factors.

## **Weather-related factors affect two standard pain assessments**

The study included participants in the Tromsø Study, an ongoing study of the health of people in that city in Northern Norway, located north of the Arctic Circle. About 19,500 participants, average age 57 years, were evaluated on two quantitative sensory tests, widely used in research studies. The pressure pain tolerance test (PPT) measured the subjects' ability to tolerate pain from steadily increasing pressure applied to the lower leg. The cold pain tolerance test (CPT) measured how long they could tolerate immersion of the hand in cold water.

Results of the pain tolerance tests were analyzed in relation to data on weather conditions—temperature, barometric pressure, precipitation, relative humidity, and wind speed. Associations between pain tolerance and meteorological factors were assessed, along with seasonal or shorter-term variations.

Overall, the PPT results showed no significant seasonal variation and were not strongly related to weather-related variables when considering the whole study period. However, the correlations varied depending on the [time period](#) studied. The data suggested "non-random short-term variation" in PPT outcomes—the time frame of short-term variations in PPT mirrored the time frame of the weather. Additionally, temperature and barometric pressure predicted future PPT values.

In contrast, the CPT results showed clear seasonal variation—subjects were able to tolerate cold-induced pain longer during colder times of year. Cold pain tolerance also varied with weather-related variables. "This fits nicely together with research on cold adaptation," Mr. Farbu comments. "As you get used to cold, you might be able to tolerate more cold."

He adds, "Temperature and [barometric pressure](#) seems to be most strongly related to CPT and PPT, and they predict future PPT. However, the effect of temperature is likely influenced by humidity and wind, as they might alter the heat loss."

Many people, particularly those with chronic pain, believe that weather or weather-related factors can cause or aggravate episodes of pain. While some studies have supported associations between weather and pain, others have reached conflicting results.

"If we are correct about that the relationship is dynamic and non-linear, it might very well explain why many studies find small effects and conflicting results," Mr. Farbu comments. "If an effect is changing over time and you average it over time, you might end up with no effect."

The findings, especially for CPT, "should be considered when planning future studies on pain tolerance," the researchers write. They discuss some ways in which weather might affect pain tolerance. One possible explanation is "central mechanisms," with weather-related variables affecting parts of the brain involved in pain processing. Alternatively, [weather](#) might affect people's mental status—as in seasonal depression, for example—which could affect their capacity to endure pain.

"In summary, it is unlikely that one singular mechanism can explain the variations in [pain tolerance](#) observed," Mr. Farbu and coauthors conclude. *"t is more probable that this is the net result of many, possibly*

*antagonistic, mechanisms."*

**More information:** Erlend Hoftun Farbu et al, To tolerate weather and to tolerate pain, *PAIN* (2021). DOI: [10.1097/j.pain.0000000000002437](https://doi.org/10.1097/j.pain.0000000000002437)

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