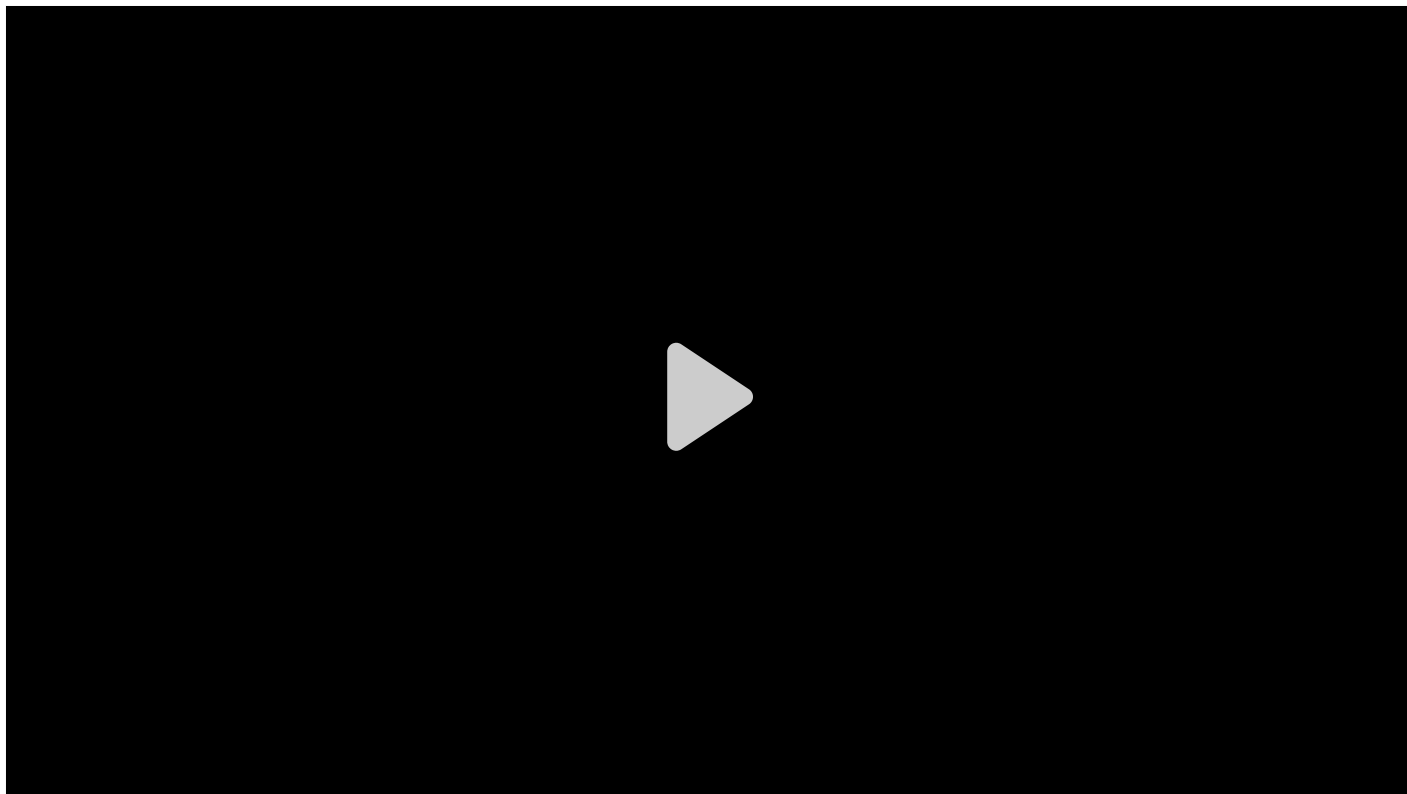


Hot under the collar? Heat can make you angry and even aggressive, research finds

By Jen Christensen, CNN

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(CNN) — If sweating through your shirt in summer's extreme heat makes you mad, you're not alone. In fact, research shows that there's a direct correlation between high temperatures and hot tempers, and that anger can sometimes lead to bad behavior.

Violent crimes like murder, aggravated assault and rape, terrorist attacks and mass shootings are much more likely when temperatures climb, studies show. There are higher rates of civil wars and riots. Even in controlled environments like prisons, a 2021 study found an 18% increase in violence between inmates on really hot days. People may also turn their anger on themselves; there's a higher risk of suicide on hotter days.



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There could be many reasons for these links, but recent research has confirmed that some people were angrier and lashed out more when they felt hot. One experiment found that people who were playing video games in a hot room, in certain circumstances, were consistently crueler to their gaming partners than those who were in a room with a more moderate temperature.

The experiment was done with 2,000 college students in California and in Kenya who were randomly assigned to play in a hot room or a more temperate one. The heat didn't seem to change the outcomes for those playing a game that involved general economic decisions, but when they played a game called "The Joy of Destruction," some students in the hot room in Kenya became more aggressive.

In that game, players earn points that can be cashed in for real gift cards. But points can also be taken away randomly by the computer or by a playing partner acting anonymously. The research found that the Kenyan players in the hot room were consistently more willing to hurt other players by reducing their earnings.



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“There was no personal benefit in doing this. It was just purely the ‘joy of destruction,’ as the name suggests,” said study co-author Dr. Ian Bolliger, a graduate fellow with the Energy and Resources Group at the University of California, Berkeley. “That was something that surprised us.”

Bolliger noted that heat didn't seem to change the students' behavior in Berkeley, so he thinks temperature alone isn't making people aggressive. Rather, the difference may have been what was happening outside the hot room in Kenya.

The experiment took place at the end of September 2017 and ran through the beginning of 2018. Kenya had just had a contentious election in which the vote was split along ethnic lines. Feeling cheated, the losing side accused the winners of stealing the election. The video game players who aligned themselves with the losing candidate had “significant grievances,” the study found.

“That was the group that exhibited all of this aggressive behavior whereas in Berkeley

that was the group that exhibited all of the aggressive behavior, whereas in Germany, and with the other ethnic group, we did not see an increase in aggressive behavior, even in the hot room,” Bolliger said.

It’s a finding the researchers said they’d like to investigate further.

“It may be that temperature itself is not a direct cause of aggression, but it really is a multiplier,” Bolliger said. “So if you are already feeling aggrieved for some reason, being in a stressed environment could allow those grievances to manifest.”



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A similar 2011 study found that when temperatures were high, Major League pitchers were much more likely to retaliate and intentionally hit a batter if someone from the pitcher’s team had been hit by a pitch earlier in the game.

Dr. Curtis Craig, a human factors research associate in the HumanFIRST Laboratory at the University of Minnesota’s Department of Mechanical Engineering, tracked temperatures and the number of penalties in NFL games for a 2016 study. The hotter it got, the more players committed infractions.

The home team got the most penalties, so as with the video game experiment, Craig believes that while heat was a factor, the circumstances during the game mattered too. In this case, players may have felt more support from fans, and that allowed them to give in to the aggressive feelings they may have had because they were hot.

“We don’t like being hot,” Craig said. “High temperatures increase discomfort. It increases negative emotions, particularly if one has a negative association with something else already.”

None of these studies can really explain why heat may make people more aggressive and makes them behave badly, but scientists have theories.

Dr. Joseph Taliercio, the coordinator of research and a licensed staff psychologist at Cognitive and Behavioral Consultants, believes that when it’s hot outside, the body may not have its usual defenses to keep aggressive impulses in check.



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The body needs to spend energy to cool itself down, and some of that may come from the part of the brain that consumes the most energy: the prefrontal cortex, which helps people self-regulate. It's the same part that turns off when people are drinking alcohol, he said, and that can lead to impulsive behavior.

"It's like when you watch a science fiction show or movie and they talk about how they have to reroute power to the forward shields. Our brain has to reroute power when it is hot, and as a result, we'll get more impulsive and act more without thinking," Taliercio said.

Dr. Susan Yeargin, who studies the connection between heat and behavior as an associate professor of exercise science at the University of South Carolina, said that like the body diverts blood to the skin to help release heat, it would make sense for energy to be diverted from the brain.

"Anything away from homeostasis, the brain is going to not be happy and react in some way," she said. With heat stroke, for example, one symptom is central nervous system dysfunction, "which just means the person is not making good decisions."

Heat also makes the body sweat and lose nutrients, which play a role in self-regulation and mental health. "It's like we're trying to run the machine using the wrong fuel, or at least using an improper balance of fuel," Taliercio said.



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Dr. Amruta Nori-Sarma, an [assistant professor](#) in the Environmental Health Department in the Boston University School of Public Health, found in a [2022 study](#) that many more adults went to the ER for mental health conditions in hot weather. That does not suggest that people with mental health issues are angry or violent but that heat can affect person's mental well-being.

"Initially, I think people were a little bit surprised that we saw increased rates of emergency department visits for mental health in the summer," Nori-Sarma said. With seasonal affective disorder and the isolation that comes with extreme cold, some scientists expected ERs to be full with mental health patients in the winter. "Now, though, with what we know about violence and aggression increasing as temperatures increase, this may make more sense."

High temperatures can raise anxiety levels, Nori-Sarma said. Even anticipating higher temperatures can cause anxiety. One reason may be that people don't sleep as well when it's hot, and a lack of sleep can cause irritation and impaired decision-making abilities.

"Sleep is one of the best things we can do to self-regulate emotions," Taliercio said.

Not everyone is going to be angry, aggressive or even violent in high temperatures, he said, and everyone will have a different level at which the heat may make them more aggressive. But, he said, "irritability will pop up for many people when it is hot out."

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As the climate warms, people may need to regularly check weather forecasts before they go out the door, Taliercio said.

"Ask yourself: Based on my own personality, do I need to be more alert to potentially being irritable today because it's hot outside?" Taliercio asked.

He likened it to checking whether masks were needed this summer as Canadian wildfires caused widespread air pollution.

"Maybe put less on the schedule when the temperatures are high, or hang out with people who irritate you less," Taliercio said. "Maybe even reschedule important meetings for cooler days. With the climate crisis and temperatures rising, this is certainly something more people will have to take into account."