



Weekly Safety Tip

Why Do Heat Index and Wind Chill Temperatures Exist?

WEEKLY SAFETY TIP for the Week of August 8, 2022

Courtesy of David Varwig



Why Do Heat Index and Wind Chill Temperatures Exist?

Unlike *air temperature* which tells how warm or cool the actual air around you is, *apparent temperature* tells you how warm or cool your body *thinks* the air is.

The apparent, or "*feels-like*" temperature, takes into account the real air temperature plus how weather conditions, like humidity and wind, can modify what the air feels like.

Not familiar with this term? More than likely, the **two types of apparent temperature** – **wind chill** and **heat index** – are more recognizable.

The **Heat Index**: How Humidity Makes Air Feel Hotter

During the summer, most people are concerned with what the daily high temperature will be. But if you really want an idea of how hot it will get, you'd do better to pay attention to the **heat index temperature**. The **heat index** is a measure of how hot it *feels* outdoors as a result of air temperature and relative humidity combined.

If you've ever stepped outside on a fair 70-degree day and found that it feels more like 80 degrees, then you've experienced the heat index firsthand.

Here's what happens.

- When the human body overheats, it cools itself by perspiring, or sweating; heat is then removed from the body by evaporation of that sweat.
- *Humidity*, however, slows the rate of this evaporation. The more moisture the surrounding air contains, the less moisture it's able to absorb from the skin's surface through evaporation. With less evaporation occurring, less heat is removed from the body, and thus, you feel hotter.
- For example, an air temperature of 86°F and a relative humidity of 90% can make it feel like a steamy 105°F outside your door!

The **Wind Chill**: Winds Blow Heat Away From the Body

The opposite of the heat index is the **wind chill temperature**. It measures how cold it feels outdoors when wind speed is factored in with the actual air temperature.

Why does the wind make it feel cooler?

- Well, during the wintertime, our bodies heat (through convection) a thin layer of air just next to our skin. This layer of warm air helps insulate us from the surrounding cold.
- But when the cold winter wind blows across our exposed skin or clothes, it carries this warmth away from our bodies. The faster the wind blows, the faster the heat is carried away. If the skin or clothes are wet, the wind will lower the temperature even more quickly, since moving air evaporates the moisture at a quicker rate than still air would.

Apparent Temperatures Can Have REAL Health Effects

Although the **heat index** isn't a "real" temperature, our bodies react to it like it is.

When the heat index is expected to exceed 105-110°F for 2 or more consecutive days, the NOAA National Weather Service will issue excessive **heat alerts** for an area.

At these **apparent temperatures**, the skin essentially can't breathe.

If the body overheats to 105.1°F or more, it is at risk for heat illnesses, such as heat stroke.

Similarly, the body's response to a loss of heat by the **wind chill** is to move heat away from the internal areas to the surface is able to maintain an appropriate body temperature there. The drawback to this is if the body is unable to replenish the heat being lost, a drop in core body temperature occurs.

If the core temperature drops below 95°F (required for sustaining normal body functions) frostbite and hypothermia could occur.

When Does **Apparent Temperature** "Kick In?"

Heat index and **wind chill temperatures** only exist on random days and at certain times of the year. What determines when this is?

The **heat index** is activated when...

- the air temperature is 80°F (27°C) or higher,
- the dew point temperature is 54°F (12°C) or higher, and
- the relative humidity is 40% or more.

Wind chill is activated when...

- the air temperature is 40°F (4°C) or less, and
- wind speed is 3 mph or greater.

Heat Index and **Wind Chill** Charts

If the **wind chill** or **heat index** is activated, these temperatures will be shown in your current weather, alongside the real air temperature.

To see how different weather conditions mix to create heat indices and wind chills, check out the [heat index chart](#) and [wind chill chart](#), courtesy of the National Oceanic and Atmospheric Administration (NOAA).

Based on an article by [Tiffany Means](#) for *Thought Company*

Updated April 05, 2019

Your brain "wakes up" more than 100 times each night.



Safety & Health Share for the Week of August 8, 2022

Courtesy of David Varwig

Your brain "wakes up" more than 100 times each night.

That's normal — and maybe good because — it might be good for your memory.



5 Key Takeaways

1. *Researchers have discovered that levels of norepinephrine in the brain fluctuate as mice sleep, resulting in repeated awakenings during the night.*
2. *It appears that this rhythm is key to getting a good rest.*
3. *Mice whose norepinephrine oscillations had greater amplitudes scored higher on measures of memory.*
4. *The findings, provided they translate to humans, suggest that fine-tuning norepinephrine levels in sleeping brains can lead to more restful sleep.*
5. *The findings also suggest that fragmented sleep is completely normal.*

It's common for humans to bemoan a night of fragmented sleep and prize one that's completely uninterrupted, but a new study conducted on mice — which share basic sleep mechanisms with us — suggests that brief, repeated "wake-ups" during sleep are completely normal, and may actually augur well for one's memory.

The [research](#) was recently published in *Nature Neuroscience*.

Sleepy head

Sleep is a complex neurological process characterized by shifting brain patterns, fluids flushing in and out of the skull, and a drop in body temperature, all with the apparent aim of restoring the brain as its waking functions are disabled.

In this process, the hormone *norepinephrine* appears to play a significant role, even though it's released at lower levels during sleep compared to when we're awake.

Observing the brains of mice as they slept, University of Copenhagen scientists watched norepinephrine (also called *noradrenaline*) levels rise and fall in a steady, oscillatory pattern, and noticed that this rhythm coincided with frequent, fleeting spurts of arousal in the brain.

"We've learned that **noradrenaline causes you to wake up more than 100 times a night**," said co-first author Celia Kjærby, professor - Center for Translational Neuromedicine.

"Neurologically, you do wake up, because your brain activity during these very brief moments is the same as when you are awake. But the moment is so brief that the sleeper will not notice," Mie Andersen, the other co-author of the study, added.

Furthermore, the researchers noticed that when norepinephrine's oscillation had a greater amplitude — meaning a larger disparity between peak levels of the hormone and the lowest levels — it led to more complete awakenings but also increased the frequency of **sleep spindles**, *brain wave patterns experienced during sleep associated with learning and memory processing*.

"You could say that the short awakenings reset the brain so that it is ready to store memory when you dive back into sleep," Maiken Nedergaard, Professor of Biology at the University of Copenhagen, speculated.

When the researchers artificially reduced the amplitude of norepinephrine's oscillation in mice's sleeping brains, either through genetic engineering or pharmaceuticals, they found that the mice performed worse on memory tests compared to unaltered controls.

Of mice and men

Though mice studies rarely translate perfectly to humans, the researchers think that theirs should as similar biological sleep mechanisms are observed among mammals.

Creating a technique in humans to fine-tune norepinephrine oscillations as we sleep "might provide a powerful therapeutic tool in promoting the memory-enhancing segments of sleep," the researchers write.

Another takeaway from the study is that we shouldn't expect our sleep to be seamless.

Brief wake-ups, whether noticed or unnoticed, seem to be quite normal and are generally not a cause for concern unless triggered by a disorder such as *sleep apnea*.

"Of course, it is not good to be sleepless for extended periods, but our study suggests that short-term awakenings are a natural part of sleep phases related to memory. It may even mean that you have slept really well," first author Kjærby stated.

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