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Why pain seems worse at night

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Credit: AI-generated image (disclaimer)

As the song from the musical "Les Miserables," based on the novel by Victor Hugo, says, "But the tigers come at night, with their voices soft as thunder." We've all been miserable at night, when we find ourselves tossing and turning in bed, staring at the ceiling because of an unbearable backache; or toothache, or earache, or kneeache.

It was there during the day, but now it won't let us rest and gnaws at us.

The question is: why do we feel the pain more intensely at night? What does science have to say about it?

Pain is not a strange phenomenon to anyone. But defining it is complicated. After numerous modifications over the years, the International Association for the Study of Pain (IASP) agreed in 2020 to narrow it down as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage."

What is pain for?

We tend to think of this feeling as something negative, since it is, by definition, an unpleasant experience. But the human being is a complex, finely tuned machine that rarely has functions that are there "just for the sake of it."

The purpose of pain is to warn us that something is wrong; it is a survival mechanism that helps to keep us safe from dangers that may threaten our physical integrity. To use a simile: it is an alarm system that our brain has to tell us that we are at risk and that urges us to get to safety. And it is unpleasant so that we feel the need to avoid it.

However, it is not a response to a stimulus, as was thought in Descartes' time (eg. I touch something burning and the pain saves me from burning because it makes me withdraw my hand). The modern conception understands it as a product of our brain: it is this organ that tells us where, how much and in what way it hurts.

The Gate Control Theory

So why does sensation increase at night and how might that help

survival?

The explanation has to do with our brain's processing systems and the science of perception. In the 1960s, Roland Melzack and Patrick Wall proposed their Gate Control Theory. According to this, there is a gate in the spinal cord that allows or disallows painful stimuli to pass through to the brain.

In other words, there will be certain things that cause the gate to close and we feel less pain, and other things that cause the gate to open and we feel more pain. An example is the mechanical act of rubbing our skin if we have been hit: the sensation of friction competes with the sensation of pain and causes it to be felt less.

In the silence of the night, the voices of those tigers are heard more, often as we remember some uncomfortable situation we experienced during the day and had almost forgotten. There is nothing to distract us and help us close the door: no images, no sounds, no interactions with others.

The worst time? 4am

Since the 1960s, new theories, new techniques and new findings have been nurturing the science of pain. A study published in *Brain* last September also points to circadian rhythms as a possible key player in the phenomenon of nocturnal accentuation.

Inès Daguet and her colleagues conducted a novel laboratory study in which they found that the time of day when pain (experimentally induced, in this case) is most intensely perceived is at 4am. One possible explanation is sleep deprivation, as it has also been shown to be influential, but in Daguet's model, the weight of circadian rhythms was much greater. These physical and mental changes we experience may be

related to the cyclical levels of hormones we have during the day, such as cortisol, which is related to the immune system and inflammation, and melatonin.

However, it should not be forgotten that this is an experimental study, in a laboratory setting, where participants are not in their natural environment (sleeping in their bed) and receive painful stimuli artificially via a heat-inducing machine.

Alerts to predator threat

Researchers Hadas Nahman-Averbuch and Christopher D. King have published a comment on the above study where they point out that from an evolutionary perspective, we are most vulnerable to predators at night, because that is when we sleep. It makes sense, therefore, that a lower intensity of stimuli would be sufficient to wake us up to potential danger.

Ultimately, further research is still needed to understand why we feel more pain at night, but it seems that our brains are still trying to protect us from being eaten by tigers (in this case real ones) while we sleep.

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