

Does the brain really feel no pain?

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Credit: AI-generated image ([disclaimer](#))

The brain has no nociceptors – the nerves that detect damage or threat of damage to our body and signal this to the spinal cord and brain. This has led to the belief that the brain feels no pain. A belief that has entered popular culture.

In the 2001 movie Hannibal, there is a gut-twisting scene in which the eponymous Hannibal Lecter cuts out part of the [brain](#) of an FBI agent

who is fully awake, though drugged, and seated at a dinner table.

"See the brain itself feels no [pain](#)," Lecter tells an aghast Clarice Starling.

But if the brain feels no pain, what causes headaches?

Although the brain has no nociceptors, many of the other [structures in our head](#) do, including [blood vessels](#), muscles, and nerves in the neck, face and scalp. Headaches are caused by problems with these structures.

Different types of [nociceptors](#) are activated by pressure, damage, extremes of temperature and some chemicals, such as capsaicin (the active ingredient in chilli peppers).

"Brain freeze" or "ice-cream headaches" seem to be caused by sudden changes in blood flow in the veins that lie between the [back of the throat and the brain](#). Dehydration causes headaches by irritating the blood vessels in the head and is one reason for the throbbing head that many experience after a night of drinking. And any dentist can tell you that a headache could indicate [you over-exert your jaw](#), perhaps by grinding your teeth when you sleep.

The cause of pain during migraine is still not well understood but is thought to be [the activation of nociceptors in the meninges](#) – the cellophane-like wrapping that encases the brain and [spinal cord](#). What might cause this activation, though, is still unclear.

Even though the brain has no nociceptors, a [headache](#) can still signal a problem with the brain. Headaches that are prolonged and don't respond to drugs, or that are [sudden and extraordinarily severe](#), can be signs of a serious problem with the brain, such as a tumour, bleeding or infection. Although these problems cause pain, it is not by activating nociceptors in

the brain itself – because it doesn't have any – but because the brain swells and puts pressure on other structures in the head.

More than just a sensory experience

In a fundamental sense, Hannibal Lecter was wrong about the brain feeling no pain. Although the brain has no nociceptors, the brain "feels" *all* our pain. This is because our brain is the organ through which we interpret, evaluate and experience all the sensory signals from our body.

Scientists distinguish between *nociception* – the nervous signal of damage to our body – and *pain*, the unpleasant emotional and cognitive experience that normally results when our nociceptors are activated.

This means that pain is more than just a sensory experience, it is influenced by our thoughts, feelings and social relationships. For example, how we experience pain is affected by our thoughts, such as what we believe the pain might mean, and what we remember of previous painful experiences.

Pain is also an emotional experience: people with depression report that they [experience more pain in daily life](#). And inducing a low mood in otherwise normal people [increases pain ratings and lowers tolerance to pain](#).

It is also a social experience. In one experiment, students who were asked to hold their hand in painfully cold water for as long as possible [tolerated the pain for longer](#) if they thought the experimenter was one of their professors than if they thought the experimenter was a fellow student. This shows that who asks us about our pain is important.

The social influences on pain also show the benefits of having support from those who care about you. In another study that used the same ice

bucket method, people had a greater tolerance for the painful cold [when another person silently observed the experiment](#), compared with being alone with the experimenter. And if the "observer" was a friend of the same sex, the participants had higher tolerance even if the friend was not actually inside the room, but was merely nearby.

Given the many influences on how we experience pain, it is no wonder that finding relief from pain can be complex and frustrating. The good news is, each of these influences also represents a way to manage pain. Helping people change their thoughts and feelings about their pain are important parts of [pain management](#), as is maintaining social relationships.

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