

### Why do we feel pain?

Pain can start for a number of reasons. It may be the result of tissue damage, for example, after an injury or because of a medical condition. Sometimes there isn't always an obvious reason. Pain is normal and helps us in situations of potential danger. For example, if you put your hand on a hot iron you would quickly remove it. Pain that lasts less than three months is usually called acute pain. This is shown as the lighter line on the diagram below. In acute pain, it is useful for the brain to identify a threat and give us the experience of pain so we can take action to help healing. For example, by walking less for a short time after twisting your ankle. Most often, acute pain settles with time, although it can be up and down and come and go. Sometimes pain doesn't get better, even after the injury has healed, leaving you with persistent or chronic pain. This pain serves no useful purpose and affects the lives of many people, their family and friends.

### Persistent pain

Persistent or chronic pain is pain that has continued for more than three months. This is shown as the darker line on the diagram. It is caused by the nervous system 'not resetting itself back to normal' after an injury or persisting when there is no obvious injury or disease. For example, in 'non-specific' low back pain or fibromyalgia. In chronic pain, it is not useful for the nervous system to produce pain as there is usually no threat or no new threat.



## How we used to think pain worked

Years ago, it was thought that the amount of tissue damage (for example, from an injury or disease) determined the amount of pain you had.

But this doesn't explain why: Some people can have a fairly normal examination in the clinic and normal or near normal x-rays and scans but have genuine pain. This may have happened to you. It can be confusing and make you feel that your physiotherapist or doctor doesn't understand your pain.

- Some people have lots of changes on x-rays and scans but don't feel much pain. These age-related changes are a part of life, just like getting wrinkles. Sometimes the changes are given worrying names like 'wear and tear' or 'degeneration'.
- Some people have changes on x-rays or scans but they don't match their symptoms or explain their pain.

**It is possible to have pain without tissue damage or disease and it's also possible to have tissue damage without pain. Even if there is tissue damage, this doesn't always seem to match with the amount of pain someone is feeling.**

**It seems that pain is much more complicated than we used to think and investigations are often not that helpful in telling us why someone hurts.**

## What we now know about pain

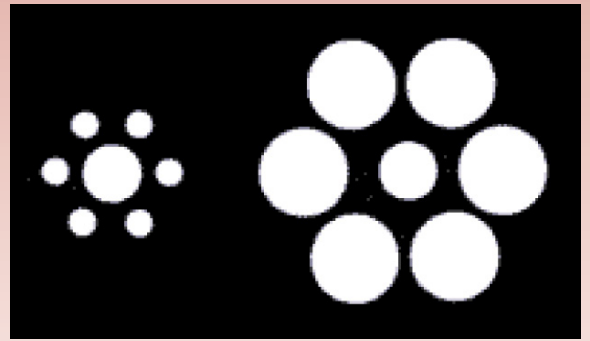
The problem isn't so much in the tissues, but in the nervous system. Research has taught us that the nervous system gives us the experience of pain in response to a perceived threat.

It can be hard to believe that pain is not in the part that is 'hurting' but is actually 'produced' by the nervous system. An example that illustrates this is phantom limb pain. This is when a person who has had a leg amputated feels pain in the foot, even though they no longer have a foot.

Different parts of the nervous system are involved when we experience pain, including the nerves, spinal cord and brain. The brain processes a huge amount of information including sensations from the body, thoughts and feelings. It 'weighs up' all of this information and if it identifies a threat, it gives us the experience of pain. This creates a very personal experience of pain, which is different for each person. As part of this, there might be some potential tissue damage messages coming from the body, although there doesn't need to be in order for someone to feel pain. Sometimes the brain gets it wrong, and there is no threat. Look carefully at the centre circles on both the left and right.

## What middle circle is bigger?

Did you say the circle on the left? They are actually both the same size. This is an example of how the brain sometimes gets it wrong. Here, the brain is telling us that we are seeing the left circle as bigger when, in fact, it isn't. Similarly, the nervous system can tell us that there is a serious problem or tissue damage, when there isn't.



Scientists have found that many of the chemicals involved in pain are the same as those released when we are anxious, stressed, worried, feeling a bit down and sleeping poorly. Even just thinking about pain or the memory of pain can cause the same areas of the brain to light up as when you are actually experiencing pain.

So the nervous system is quite complicated. It's tied up with emotions, how you feel and what the pain means to you. All pain, short or long-term is real. Long-term pain hurts just like short-term pain.

## So how does this happen?

Chemical and electrical changes in the nervous system (nerves, spinal cord and brain) mean the nervous system becomes extra sensitive and responsive to certain messages in the body. This process is called sensitisation.

A number of different changes take place as part of this process, including:

- The nerves that transmit potential tissue damage messages start to be very sensitive and carry a lot more of these messages to the spinal cord and brain, even though there is no tissue damage. After receiving all these additional messages the brain produces more pain in return. It's a bit like turning the volume up on the radio. This is why someone lightly touching your skin or normal movement can be painful.
- Messages and nerves can fire off randomly with no stimulation at all. This is why you can sometimes experience pain when you haven't even moved.
- Nerves that don't normally send potential tissue damage messages start to do so and the area covered by each nerve increases. This is why over time, it can feel like the pain is spreading. All these changes help explain why someone can feel pain in response to normal touch or movement and why treatments directed at the tissues (bones, muscles, nerves) might only provide limited or short-term relief.

Difficult life events, anxiety, stress, worry or low mood can be perceived by the brain as threatening. This results in pain or they can 'wind-up' the nervous system, resulting in the nervous system producing more pain.

Research has shown that what we think, feel and do are very important in explaining how much pain we feel. This is because many of the same chemicals and electrical activity involved in pain are involved in emotions and thoughts, as are the same areas

of the brain. However, this does not mean that pain is imaginary or psychological. It is very real. Of course, as a result, having persistent pain often results in low moods and worries.

The things we do or don't do in response to pain can also make our pain experience greater or lesser. The good news is that there is a lot we can do about this.

As a result of these changes, the nervous system and brain become 'wound up' or on 'high alert'. Even the slightest thing can be identified as threatening, when it isn't. It could be compared to your house alarm system going off. The alarm thinks there is a burglar in the house, when in fact, it's the cat. In the same way, the brain can perceive a threat and respond by producing pain, when in fact there is no new or ongoing tissue damage.

### **So pain does not mean that there is any new damage in my body?**

That's right. The end result of all of these changes is that the nervous system generates and maintains pain even though there is no ongoing damage and even after any original injury, if there was one, has healed.

### **What does this all mean for me?**

What we have tried to explain is that pain is much more complicated than we used to think. It's produced by the nervous system. The brain 'weighs up' lots of different things including any potential tissue damage messages, your thoughts, feelings and previous experiences. If your brain identifies a threat, it gives you the experience of pain.

Although it is usually not possible to get rid of chronic or persistent pain, with help, there is much that you can do to lessen its impact on your quality of life.

The other information sheets in this series will give you reliable, evidence-based advice to support you along the way to improving your function and quality of life, with pain.

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### **Further information is available from:**

**NHS Ayrshire and Arran MSK Service:**

<https://www.nhsaaa.net/musculoskeletal-service-msk/>

**NHS Ayrshire and Arran Pain Management Service**

<https://www.nhsaaa.net/pain-management-service/>

**These websites have an excellent video called Understanding pain (What to do about it in less than five minutes)**

**Pain Association Scotland [www.painassociation.com](http://www.painassociation.com)**

**Pain Concern [www.painconcern.org.uk](http://www.painconcern.org.uk)**

 Visit our website: [www.nhsaaa.net](http://www.nhsaaa.net)

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