

# Seven Things You Should Know About The Pain System



Brain and Pain Science has learned a great deal in the last fifty years and this information is growing exponentially. As always there is a lag in what the scientists know and the treatments provided for those with pain.

If you have pain there is a benefit to keeping up with new developments. After reading this you will know more than most health practitioners. Research shows that self education is an important step in managing pain.

## **1. The purpose of the pain system is to protect the body.**

The pain system is designed to deliver warning signals to the brain and spinal cord to alert you to do something to protect body parts that the brain "thinks" are damaged. The brain does not know if or if not there is damage. It responds as if every signal was a signal from a damaged part. Being able to experience pain and respond is essential for survival.

## **2. The experience of pain is shaped in the brain.**

When a body part is stressed by pressure, temperature or inflammation, nerve endings are stimulated and send a signal to spinal cord and then it is relayed to the brain containing information about the nature of the stress or potential damage. The brain "interprets" this information and "decides" if these signals are "dangerous" and a response is necessary. Many parts of the brain, forming a network of communication ( the pain matrix) process the signals to determine the level of danger. Every brain is unique and therefore no two brains will respond in the same thing. Many different parts of the brain help process the pain response. The relay station in the spinal cord is called the dorsal horn. Brain signals either block ( descending inhibition) or facilitate the passage of signals through the spinal cord to the brain. This all happens in less than a blink of the eye.

The pain matrix includes areas of the brain that govern emotions, past memories, and future intentions. These areas are linked to those parts of the brain that receive signals for the body that could be perceived as pain. Therefore the experience of pain whether high or low is not an accurate measure of the amount of tissue damage in any area. How we experience pain is the result of an integration of information from all areas of the brain. An example of this process in action is to observe the pain experience of women during childbirth. Emotions, past experience and memories impact and alter the pain experience which is unique to each woman.

## **3. Xrays, ultrasounds, MRIs do not measure pain.**

Taking an xray or MRI to determine if the cause of pain is like taking a photo of a car to determine how much petrol is in the tank. There are numerous research studies that have proven there is no association between the appearance of a body part on an xray or MRI and the pain that is experienced. An individual can have a very abnormal looking spine on a scan and yet have no pain. Another individual can have a very normal scan appearance yet experience high levels of pain and disability.

How can you have a very abnormal looking spine on xray and no pain? Because the brain does not register this change in the shape of the spine as a threat or a warning signal. Perhaps the changes occurred so slowly over time that the brain did not register any need for urgent action".

Another example is phantom limb pain. In this condition even though a part of the limb is missing, the brain still registers the pain in that part. It is as if the brain and or the spinal cord relay station has "its wires crossed" and this literally might be true.

#### **4. The brain often "thinks" the body is in danger even when It Is not**

An example of this situation is with a condition called fibromyalgia. Individual can feel whole body pain when there is no injury or damage. Sometimes this pain experience can be eliminated by hypnosis and meditation which is a demonstration that the true target for pain relief is often the brain, not the body. This does not mean the pain is as a result of psychological process and is not "real". This is an example of a malfunction in the way the pain matrix functions. It is likely that the descending inhibitory pathways to the dorsal horn ( see no 2) is defective. There are many other examples of this maladaptive brain/pain matrix response including some forms of headache, bladder pain and abdominal pain. These maladaptive processes are thought to be the cause of many chronic painful conditions.

#### **5. Having pain can sensitise the brain to experience more pain.**

If you exercise a muscle, it grows and becomes stronger. If you practice playing a musical instrument ..., "practice makes perfect". The brain neurones are the same the more they are used the better they perform. **It is no different with pain.** If the brain pain pathways are reinforced and used, they grow, resulting in an exaggerated and faster response.

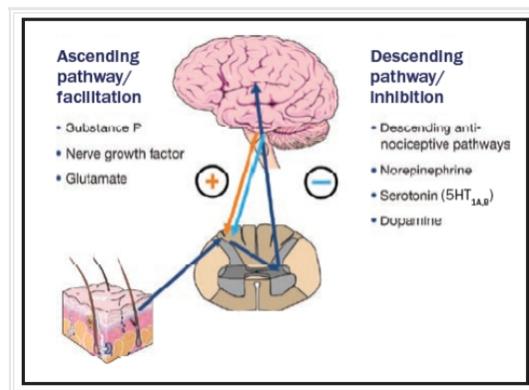
The longer pain goes on, the easier it becomes to feel the pain. It's like water flowing down a hillside – the more times the water follows down the same path the deeper the ruts form. This is the same process by which we learn habits or develop skills. In the context of pain, it means that the more times we feel a certain pain, the less stimulus is required to trigger the pain.

#### **6. Pain can be triggered by factors unrelated to physical harm**

The understanding of pain has increased due to the use of a new technology called functional MRI scans. From this research it has been discovered that " neurons that fire together wire together". The most famous example of this principle is Pavlov's experiment. Everytime his dogs ate dinner Pavlov

would ring a bell. The dogs on hearing this familiar sound would start to salivate and prepare to eat even when there was no food present. What is happening is that in the brain the neurons for hearing the bell became wired to the neurons for salivating. The more this is repeated the faster the response. The same thing can happen with pain. It is well known that one of the most painful experiences is having the dressings changed in someone who has had burns to their body. The dressings need to be changed regularly. It is well recorded that individuals have increased pain immediately they hear the dressing trolley being wheeled into the room. The brain relates the sound of the trolley to pain. Just thinking about the procedure can increase the pain. In an individual who has back pain and experiences stress at work, just having stress can increase the pain experience.

Further, it has also been shown that emotional states such as anger, depression, and anxiety will reduce the tolerance to pain. Although it is hard to believe, research provides strong evidence that a significant portion of chronic back pain is caused more by emotional and social factors than actual physical damage to tissues. Once pain has gone on for more than 3 months it is more likely to be due to brain pain processes than ongoing damage to the tissues.



## 7. The brain can alter its sensitivity level to pain

The brain can increase or decrease its sensitivity to a painful stimulus from the body in many ways. In an emergency situation the brain is so focused on survival the pain signals are inhibited and do not get through to conscious awareness.

Most of the time an injury will influence the brain to be more sensitive so that it can more easily protect an area that is now known to be damaged. When an area becomes sensitized, the pain will be felt sooner and more strongly, so that even normally innocuous mechanical pressures can cause pain. There is a lot known about how the brain adjusts the level of sensitivity but there is much more to discover. This process is not static and there are adjustments being made to the brain/pain "volume switch", constantly.

For many individuals with chronic pain, the volume has simply been turned up too loud and left on for too long. This is called central sensitization, and it probably plays at least some role in many chronic pain states. It is another example of how chronic pain does not necessarily imply continuing or chronic harm.

It is now known that using [mindfulness and meditation practices](#) the brain can alter and reduce the pain

experience.

## **Conclusion**

The body has very efficient healing processes. Damaged tissues will heal within weeks or a few months. When pain continues for periods of time after the tissues have healed this is called chronic pain and represents a problem with the pain processing system, not an ongoing injury.

If you have chronic pain it is likely that the tissues have healed. Understanding this reduces anxiety and stress which generally makes pain worse. It also means that an essential part of treatment is to focus on adjusting brain pain system processes. This can be done with just a little effort.