

Understanding Pain

Pain needs no introduction. We will all have experienced it at one time or other. It can vary in its intensity (from mild to unbearable) and it can vary in how long it lasts. Musculoskeletal pain can affect the bones or soft tissues such as muscles, ligaments, tendons, and nerves. It may be localised to one specific area, or it may be more widespread.

What is meant by Acute and Chronic Pain?

Healthcare professionals often refer to pain as being “acute” or “chronic”. These terms refer to how long the pain has been present, not its intensity.

Acute pain

This term refers to pain of recent onset. For example, if you sprain your ankle you will experience acute pain.

What happens in acute pain?

There are free nerve endings located all over your body (in the skin, muscles, joints, bones, and internal organs). These free nerve endings are your “pain receptors” (sometimes referred to as nociceptors). The main purpose of a nociceptor is to respond to damage to the body by transmitting electrical signals along nerves to the spinal cord and brain.

The brain processes the electrical signals it receives from these receptors and interprets these signals as pain. The purpose of acute pain is to protect you. Let us look at the example of a sprained ankle in more detail:

- The immediate pain that you feel is designed to get you to move your ankle out of the position that is causing the intense stretch so that you don't cause the ankle any damage/further damage.
- If you have damaged some tissues in the ankle, chemicals released by the damaged/inflamed tissues may cause you to continue to feel pain and you may be reluctant to move your ankle or walk on it. This is your body's way of protecting your ankle to give the tissues time to heal.

- The sensation of pain should then dull before disappearing. If you have not damaged anything this usually happens quite quickly.

Key Message:

Acute pain usually has a useful purpose, which is to make you protect the injured tissues from further damage and to make you rest the injured area to promote healing

Chronic Pain

Once pain has been present for more than about three to six months, it is often described as chronic. In some cases, the pain persists because an underlying disease process is still present (e.g. osteoarthritis). However, many people develop chronic pain following an injury, even when it appears that the tissues originally damaged in the injury have healed.

If the original injury has healed, why can chronic pain develop?

When cells at the nerve endings in the spinal cord and brain receive constant pain signals, they can become over-sensitised as a result. This is sometimes referred to as “wind-up”. In other words, acute pain is designed to be a warning system in your body, but if pain persists then this warning system can become too sensitive and can produce an increased feeling of pain (we call this pain sensitisation) even though there may no longer be any damage. This happens because the nervous system isn't hard-wired for pain. The nervous system adapts (or more often maladapt) in response to pain by growing more neurones and pain receptors.

Since we are specifically considering musculoskeletal pain problems in this article, it is also worth highlighting that there can be secondary effects of persistent pain and these effects in themselves can be a further source of disability and/or pain: These secondary effects can be:

1. General deconditioning

If pain persists and prevents you from going about your daily activities and exercise, then there can be a general deconditioning. Skeletal muscles retain their strength and size only when they are being used. If pain dissuades you from using those muscles, then they will start to shrink and become weaker. Lack of exercise will also cause deconditioning of your cardiovascular health.

2. Compensatory changes

We have already said that pain causes you to protect an area. For example, if you have knee pain, you may be reluctant to bear weight through the painful knee. In order to get around this problem, you will start to rely more heavily on your non-painful knee and it is likely that this will affect the way you walk and use the various muscles in your legs. If this carries on then not only will you be under-using the muscles in one leg (because of the painful knee), you will be overusing muscles in the other (non-painful leg) and this can lead to muscle imbalances, which in turn can cause further pain problems in muscles that are being overused.

Although we have used the knee as an example, this can happen anywhere and the back is another common area where muscle imbalances can occur.

Particular problems with chronic pain

Chronic pain is one of the top causes of disability. Living with long-term pain can adversely affect a person's

- Normal daily activities and how they function.
- Ability to work.
- Sleep pattern.
- Emotions and psychological wellbeing. Chronic pain can cause emotional distress and lead to anxiety and depression.
- Relationships with family, friends and work colleagues (placing them under strain)

In summary, the effects of chronic pain can be overwhelming, vastly reducing a person's quality of life and can lead to a distressing vicious circle.

What difference does it make whether my pain is acute or chronic?

Because persistent pain can lead to a more complex picture, often with nervous system "wind up", deconditioning and adverse compensatory changes in posture and movement, chronic pain can be much more resistant to treatment than acute pain.

If you suffer a minor musculoskeletal injury, many of these can be successfully managed at home. However, if your injury or symptoms are severe, OR if symptoms of pain persist for a prolonged period, you should seek appropriate input from a trained healthcare professional.

Remember, that pain can start to become chronic at about the three to six month mark, so if pain persists do not ignore it but seek early intervention instead.

Key Messages:

- 1 Chronic pain can be more difficult to treat (and more resistant to treatment) than acute pain.
2. Pain starts to become chronic at about the three to six month mark.
3. Seek intervention before your pain becomes chronic
4. If the injured tissues have healed, then chronic pain does NOT serve a useful purpose.

I'm in pain do I need a scan of some sort to tell me what is wrong?

Imaging investigations such as x-ray, ultrasound or MRI are designed to look for structural abnormalities. In some cases, pain is caused by a structural abnormality. For example in osteoarthritis of the knees, an x-ray may show loss of joint space.

However, not all musculoskeletal pain is caused by abnormalities in structure. Sometimes, pain arises because of abnormal function of the musculoskeletal system.

Radiological investigations don't show abnormal function, they only show up abnormal structure.

Where pain has a musculoskeletal cause, this cause can be

- Structural or
- Functional or
- A combination of the two.

Even when a structural abnormality is suspected, imaging is not always helpful since in the first instance, it doesn't always change the course of clinical management and in some instances it can throw up "red herrings" . For example, if we were to perform MRI scan on 100 random people over the age of 40, a significant number of these people would have some abnormal findings, but would have no symptoms. In other words, the presence of a structural abnormality does not always mean that this is the reason for a person's pain.

Imaging can useful where

- A more serious possible cause needs to be excluded,
- When it is needed to narrow down two or more possible diagnoses
- When the extent of the findings will alter how the condition is managed

The most important aspect for any healthcare professional to consider is the **clinical history and the clinical examination**.

The Clinical History

This starts to try to identify any reasons for the patient's symptoms and to do this, the healthcare practitioner will ask a series of questions e.g.

- When did symptoms start?
- Were symptoms preceded by any trauma ?
- Was there any change in your activities or workload before the symptoms started? Did the pain come on suddenly or gradually?
- Where do you feel your pain?
- Does anything make your pain worse and does anything make it better?

The Clinical (musculoskeletal) Examination

Practitioners trained in musculoskeletal examination conduct a physical examination to try to identify the source of the pain and dysfunction. This can involve palpation (i.e. pressing on an area to identify painful areas or locate triggers for referred pain) as well as specific clinical tests which often involve certain movements to try to narrow down the diagnosis.

So what do we mean when we talk about structural versus functional abnormalities?

Structural Abnormalities:

Pain may result from structural changes e.g. damage or degeneration. Damage can occur to all parts of the musculoskeletal system, from the bones/joints, to the muscles, fascia, tendons, ligaments and nerves.

Functional Abnormalities:

When we talk about functional abnormalities, we are talking about musculoskeletal tissues functioning abnormally. Abnormalities in function can happen with chronic in the nervous system which starts to become hypersensitive to pain as it undergoes “wind-up” as described earlier. However, the most common functional abnormalities in musculoskeletal conditions are caused by abnormal/adverse postures and movements.

So what causes these abnormal/adverse postures and movements?

- They may be compensatory: e.g. a patient with longstanding right knee pain who adapts the way they move in order to cope with their knee pain may then also experience pain elsewhere because they are “overusing” their left side, leading to increased stress on other joints and muscle imbalances. Furthermore, because movement patterns tend to be “habit forming”, patients

may continue to walk/move abnormally even if the painful knee is treated and cured.

- A person's activities may place them at greater risk. Someone who (as part of their job or leisure activities) does a lot of repetitive movements or who stays for long periods in a static position can also be at risk of developing pain and needs to pay close attention to ensure that they do not increase their risk of pain by adopting prolonged poor posture or movement patterns.

Take a look at the sketch below.



Here we see someone who works full time in a desk-based capacity. Look at how he is sitting at his desk. His back and shoulders are rounded and his head protrudes forward as he leans in towards his screen.

This will be placing a lot of stress on his spine and muscles in his back.

Likewise people who suddenly increase their activities can find that they experience musculoskeletal symptoms as their body tries to adapt, e.g.

- a sudden increase in laptop/PC use because of an abnormally high workload, or
- a sudden increase in training intensity in a recreational runner who is aiming to run a marathon)

If my problem is suspected of being due to some functional abnormality rather than a structural abnormality, how will the functional problem be identified?

Dysfunction is something that is diagnosed by clinical examination e.g. by assessing the range of motion and/or through palpation skills e.g. to detect changes in a tissue texture such as a tight/painful band of muscle.

Key Messages:

1 Pain can be caused by structural abnormalities, functional abnormalities or a combination of both of these.

2. Imaging investigations are designed to identify structural causes for pain

3. Even where a structural cause is suspected, imaging is not always helpful since it doesn't always influence how the condition will be treated, and can in some cases

throw up "red herrings" which may lead to increased patient anxiety and at worst, inappropriate interventions.

4. Imaging can be helpful where a more serious diagnosis needs to be excluded, or when needed to narrow down the diagnosis, or when the results could influence how you manage and treat the issue.

What other factors influence the perception of pain?

To answer this, we need to understand how the brain interprets pain.

Previously we said that it is your brain which interprets signals from your pain receptors. The factors involved in how your brain does this can be quite complex which explains why the perception of pain is so individual.

The brain can choose to increase the sensation of pain, decrease it, or in some cases ignore it altogether.

What the brain decides to do depends on a number of things. Of course, this includes the strength of the pain signal coming from the pain receptors, but it also depends on other factors such as:

- **Whether the brain has any competing signals to process alongside the pain** e.g. sensations of heat or cold
- **Whether there are any other messages being given by the brain which would influence how the pain is perceived.** Emotions and memory are two very powerful factors here so we will consider how these affect pain below:

Emotions:

For example, a sports player who receives an injury during a big game may sometimes feel little or no pain at the time because all of their emotion and efforts are focussed on completing and winning the game.

Or in a rescue situation, a person may again feel little or no pain from their own injuries because all of their emotion and efforts are focussed on rescuing someone else.

Conversely, someone who is already anxious or depressed may find that they experience a heightened sensation of pain.

Memory:

This is best illustrated with an account of one man's experience which was shared in a TED talk on Youtube:

The speaker describes how he was trekking abroad and was passing through a forest. He was brushing past fallen twigs and branches when he suddenly felt a scratch on his leg. He didn't feel any intense pain. His brain had registered the twigs and branches and had processed the signal as a harmless scratch, so it decreased the amount of pain he felt.

A few days later, the man awoke from a coma in hospital. He had not been scratched by harmless tree debris. He had been bitten by a poisonous snake!

Some years later, he was trekking through a similar forest again. This time he felt an intense pain on his leg and fell to the ground in agony. His brain had again registered the fallen twigs and branches, but it also remembered that the last time he was in a similar environment, he had been bitten by a poisonous snake and had nearly died. So his brain wasn't going to take any chances this time!

It amplified the pain signal so that the pain was unbearable. This was a protective mechanism that would cause him to seek immediate help. However, when his fellow trekkers rushed to help him all that they found was a mild scratch caused by a fallen twig.

This story illustrates the power of memory in the perception of pain.

Another rather distressing and extreme example of how memory affects the perception of pain is "Phantom Limb Syndrome". This is a condition in which pain is still felt as if coming from a damaged limb even after the limb has been removed via amputation.

Key message:

The perception of pain can be influenced by a number of biological and emotional factors and also by past experiences. These combined factors cause the brain to send a signal back to the spinal cord to either increase the pain or reduce the pain or even ignore it altogether

SUMMARY

Pain is often poorly understood or over-simplified. Whilst this article by no means gives an in-depth explanation of the issues covered, it is designed to increase patient understanding and to dispel common myths about musculoskeletal pain. We hope you have found it helpful.