

# Pain Clinic

[www.painclinicplus.org.uk](http://www.painclinicplus.org.uk)

**Chronic Pain Support Group**

## **1: How Pain Works**

**Dr Chris Barker**

### **Acute & Chronic Pain – Different things**

Anyone who has experienced chronic pain will be able to tell how different it is from acute pain.

Some of the important differences are listed below:

<b>Acute Pain</b>	<b>Chronic Pain</b>
Predictable	Often worse or better for no reason
Usually from damage (e.g. a broken bone)	Damage usually has healed
Goes away	Stays
Often easier to treat	Needs complex treatment
Part of 'normal' warning for us	No warning anymore– pain centres have stopped working properly

We can see that chronic pain is not simply 'acute pain that stays longer'.

The pain centres in our brain & spinal cord stop working properly.

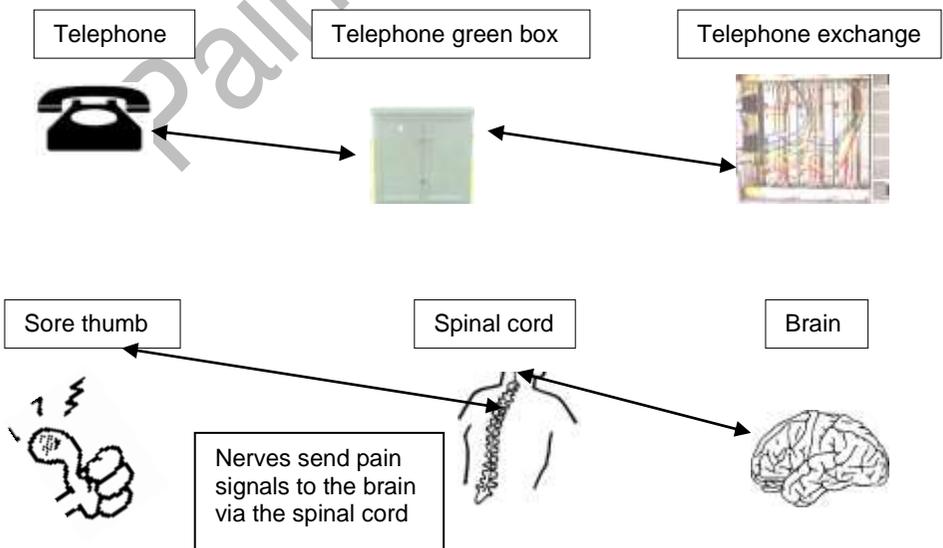
This means that even if the injury that started the whole thing off has healed up, we still feel pain. We will focus on this in more detail.

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## Phones & Brains..

Our nervous system is a massively complex bundle of connections and chemicals. If we imagine our phones at home, they are wired up to a green box in the street, which is then connected to a main system perhaps miles away. Our body is wired in a similar way. We can think about the phones in our homes as the sensors in the skin and muscles (which talk to our brain), and the cables joining the phones to the green box as the nerves in our body. The thing that makes our nervous system so much more complex is that the thousands of chemicals that work inside the nervous system *can change how the electricity flows along the nerves*.

This means that a pain impulse (starting off perhaps in the toe) can travel along the nerve (phone wire), reach the spinal cord (green box in the street) and once it gets there can either stop completely, or go on up to the brain (main system). If it does go up to the brain, the pain signal can be quieter, normal, or louder than before. We can start to see that the nerves are the important 'wires' for signals to get into the brain, but the balance of chemicals is somehow even more important as this *actually controls the loudness of the pain we feel* when it reaches the brain...



## DIY – when it all goes wrong..

We've probably all done it – a bit of DIY and the hammer hits something it shouldn't. It somehow happens in slow motion... What do we feel? Often we feel the impact *before* we feel the pain. There is a good reason for this. In our skin we have lots of different sensors to detect things like touch, pressure, temperature, pain and chemicals. Each sensor is attached to a nerve fibre, which gets switched on by something happening, and sends its own special information back to the brain (e.g. being pressed, burned, squashed, or hitting a thumb with a hammer!)

I'm going to use the cables under the road as an example (partly because they're always digging them up outside my house..). If we looked at a cable dug up from the street we can see bunches of wires of different sizes, some are thick and some are very thin. This is a bit like a typical nerve we would see in our arm or leg if we cut across it and looked at it through a microscope. The thick fibres in the nerve bundle have lots of insulation around them, which allows the electricity to speed along it very quickly (around 100metres per second). The much thinner fibres nerves look much smaller under the microscope and are much slower in sending their electrical signals (down to 10 or 20 metres per second).

The reason for mentioning this to do with what we said before about feeling the impact of the hammer before the pain. The sensors in the skin that will send a message of being squashed by the hammer hitting the thumb are different to the ones that will send a pain message. The squash message travels much faster than the pain one, so the brain feels squash first and then pain.

This is an important thought as it tells us that different senses get sent down different pathways to our brain.

## Nature helps us in acute pain

Let's wind the clock forward a second or two. We've hit our thumb with a rather large hammer. What do we do straight away?

Usually this involves a fair degree of cursing but we also do other things. When we talk about this in Pain Management Programme often the things people say include, squeezing the thumb, sucking it, shaking it, running it under a cold tap etc. All of these things are very common ways to deal with an acute injury like this, *but why do we do them?*

Let's go back to what we said about the skin and its sensors. There are lots of different types. Pain sensors are only one type – if we only had pain sensors active in our thumb at any one time, it would be pretty sore. By putting our thumb under a cold tap we activate the touch and temperature sensors. If we do this it gives our spinal cord and brains a whole set of signals to process as well as the pain ones.

You may have seen how a computer works when it's got lots of programs running at the same time. It grinds away very slowly and takes ages for anything to work. The computer's brain is being bombarded with things to handle. Think how this may affect our brain if we have lots of things to attend to at the same time. It's likely that the pain will only get a bit of attention – this is nature's in-built instant pain relief.

## Err - can you turn it down please?

There are other ways that nature has built in to reduce our pain. Our brain sitting on top of our spinal cord has a big part to play here. We naturally produce pain-killing chemicals, which are like Morphine (these are the ones that get released when we exercise). When we get lots of pain signals sent up to our brain, these pain-killing chemicals get released. These chemicals or 'Endorphins', mostly work in the spinal cord to reduce pain sent up to the brain. Part of their job is also to turn on our 'descending inhibition'. This is a special nerve pathway that connects from our brain right down into the part of the spinal cord where the pain signals are coming from. By using this special pathway

we change the chemical balance where the pain nerves connect into,  
and turn the loudness down on the pain.

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## Chicken Tikka Massala..

What we've said is our brain has a volume control for pain. The trouble is, it can be very difficult to control or even predict what it's going to do. Let's go back to our DIY, which is no longer like a scene from *ER*. The bleeding has now thankfully stopped, and things are starting to settle down. *What are we feeling in our thumb?* Probably a mixture of things, a bit of numbness maybe, it doesn't quite feel like our normal thumb, and of course there is still the pain. But the pain is now a bit different. It's not quite so loud and has some different qualities to it.

When we think about 'qualities' to pain we can think in terms of the different bits that make the whole pain. It's a bit like taste. If we said we ate a curry then the flavour is made up of lots of different spices. Our pain is in fact made up of lots of different signals. We are starting to understand more about how some of our tiny nerve fibres in the skin can work. It seems the pain signal is sent from our pain sensors in the skin, but some of the other nerve fibres send in different messages to give it different qualities like flavours to the pain. This is why my pain when I hit my thumb with a hammer will have slight differences to some-one else's; in the same way one chef's curry won't taste the same as another chef's. In our DIY example now, it's the end of the day and our pain has settled quite a bit.

## Inflammation – nature's protection (but sometimes trouble causer)..

It's now a new day and we've slept pretty well. Our thumb still looks a little like a horror film but it's under wraps so nobody can see it. *What do we feel?*



If we think about this for a minute and imagine rubbing first our 'normal' thumb, then our injured one what do we notice? Pretty obvious really – the normal one doesn't hurt, but the injured one does. It's a bit

*sensitive*. This is important as it shows another one of nature's amazing feats. How do you get someone to stop using something so it can heal better? Of course – make it hurt..! But it does this very cleverly. The swelling we see is because of inflammation. Inflammation is when the body detects what it thinks is an injury and releases a big soup-like mixture of special chemicals around that area. The different type of chemicals in the soup tells the injured bit which type of body cells it will need for the clear-up exercise, and also actually how to heal everything up.

But this soup also tells the pain nerve endings to be more sensitive. This means that they react to things that wouldn't normally be painful. This normally settles down when the injury is healed. There are times though when the nerves do not go back to normal and so they stay really sensitive. This can happen in certain types of nerve injury like shingles. The problem also continues further into the nervous system in the spinal cord and brain. This is because a pain nerve that goes on and on firing can start to *change the chemicals in the part of the spinal cord where the pain fibres connect in*.

This bit is really important. What we are starting to understand is that when pain becomes chronic or persistent, it's not because there is ongoing damage to the area where we feel the pain (in this case the thumb) - the injury may have healed and gone away. It's because there have been changes in the spinal cord to allow more and more pain signals through. It's like the spinal cord has now lost some of the control it had over the pain system. This can get out of hand to the point that pain signals are really poorly controlled and we have persistent pain.

**The doorbell keeps ringing but there's nobody there..**



Imagine having a doorbell that rings when it wants to. This would get pretty annoying after a while. We'd keep going to the door and not

finding anyone. It would have lost its warning function. This is a tiny bit like our pain system. We may have injured ourselves in the past, but the injury has gone away, but the pain still happens. Pain has now lost its usefulness in giving us a warning that we're injured. If we kept on listening to it, we would continue to think we needed to stop what we're doing and rest the area while nature heals it. This is very important as persistent pain does often make us think this way, which can stop us from doing things, lead to severe disability and contribute to us feeling very low.

When we know that there is no warning attached to our pain any more, we can start to try and do more. There's no way round the fact that this is difficult, and often will need expert help.

### **Can we change all this once it's happened?**

We are starting to understand some of these complex mechanisms a bit more. We do know how important the brain and spinal cord is in the way our volume control works. We know some of the impact that persistent pain has on mood, concentration, sleep, functioning and lots of other day-to-day things.

If we focus on mood for a minute what we do know is that when we are distressed this can worsen pain. This is not just a theory, but has been shown with lots of studies and special brain scanning. If we can find ways of reducing our distress through things like relaxation, meditation, certain types of exercise, or even medication, this can improve our pain.

It can be useful to think in terms of how our nervous system changes in response to things. It can evolve into a different, more sensitised pain state, but with concentration and focus on self management strategies, it can also evolve to a better place with less pain.

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## Chronic Pain Support Group

Is Based at the Ainsdale Centre for Health And Wellbeing  
164 Sandbrook Road, Woodvale,  
Southport. PR8 3RJ

### “Run by pain sufferers for pain sufferers”

We are a voluntary group made up from chronic pain sufferers with close links to health professionals.

Our aim is to unite and support pain sufferers by way of monthly informal meetings, light exercise classes, talks and discussions.

Visit our website for lots of useful information!

**[www.painclinicplus.org.uk](http://www.painclinicplus.org.uk)**

Don't be shy or nervous! please come along to our meetings, were you will be assured of a warm welcome. Remember, we all have one thing in common—**PAIN!**

Why not drop by for a tea or coffee? Between 10 and 12 most Fridays?

If you have any questions please contact:

[www.painclinicplus.org.uk](http://www.painclinicplus.org.uk)

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