

# Why we feel persistent pain: The relationship between persistent (chronic) pain, stress and anxiety.



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## Introduction

In private practice we see patients with persistent pain that are frequently told there is nothing wrong with them. Alternatively, patients have had a X-ray or MRI scan that has shown something wrong but no further action has been taken because the severity of changes on the imaging is not bad enough. This leaves the patient asking 'if the X-ray (or scan) is not that bad why am I in so much pain?'

Sometimes when these patients present in clinic the cause of the pain has been simply misdiagnosed over the years.

However, sometimes, no injury can be found even though the patient still acutely feels their pain. In these cases, the disorder can be attributed to solely how the brain and nerves, for no good reason, feels pain rather than the presence of a particular injury.

An example of how the brain and nerves spontaneously sense pain in the absence of an injury is 'phantom limb pain'. This condition occurs when a limb has been amputated but the brain continues to feel pain in that limb. For example, an individual may experience severe foot pain, even though the whole of that leg has been removed.

This example illustrates the basic premise of chronic (persistent) pain outlined in this booklet. The injury is not necessarily where the patient feels their pain e.g. in their back or neck, or in the case of phantom limb pain the limb that has been removed; the 'injury' is in how the brain and the nerves, for no good reason, sense and feel pain.

If a patient experiences pain as a result of a misdiagnosed condition, an illness (pathology) or from how the brain and nerves feels pain is in some, but not all respects, irrelevant.

What is relevant is how the brain and nerves either generates pain when there is no injury, or amplifies pain in the case of an illness (pathology) or minor injury.

This booklet outlines the very real biological changes in the brain that determines why an individual feels their pain and the related stress and anxiety that accompanies it.

It also outlines how these biological changes in the brain not only hamper recovery but effects quality of life.

Lastly, it illustrates recommended treatment strategies to undo the biological process that generates and maintains chronic (persistent) pain.

This work is largely based on the academic paper by Timmers et al (2019).



## What is chronic (persistent) pain?

- Your brain can feel pain when there is no injury.
- Alternatively, your brain can feel a lot of pain even when an injury is very mild.
- Therefore, our brain can spontaneously feel a lot of pain because it thinks there's a really bad injury when in fact there isn't one.
- In chronic (persistent) pain the brain is overly sensitive to feeling not only pain but also anxiety and danger.



Acute pain is like spraining an ankle. You go over on the ankle and this induces damage to your ankle ligaments. Acute pain in this instance is useful as it serves as a warning to stop you doing things that could further tear the already damaged ligaments.

Chronic pain is defined as pain lasting longer than the expected healing time for an injury, which is usually three to six months. Therefore, when the ankle ligaments have healed up, any ankle pain you continue to experience from then on is 'chronic (persistent) pain'.

Just as pain can scream about an injury that's not there, chronic illnesses (pathology), such as arthritis, can produce extreme levels of persistent pain that is disproportionate to the level of damage.

Acute pain is productive; it produces pain, anxiety and a series of learnt behaviours to protect an injured area from further injury.

In contrast chronic (persistent) pain is counter-productive. If there is no real injury to protect, or the pain being felt is disproportionate to the illness (pathology), it serves no purpose.

In other words, if things aren't that bad there's no need for pain to provide such a big "warning shot" to stop us injuring ourselves further. Something's gone wrong.

What's gone wrong is similar, in principle, to an allergic reaction.

If you get a bee sting your body responds to it productively in terms of pain and launching a response to heal up any damage that has been done. This is akin to how your body responds to an acute injury (e.g. sprain, strain, muscle spasm, etc).

However, with an allergic reaction to a bee sting, something goes wrong and your body's response is excessive. Your body's response is out of control and can cause a swollen throat and tongue, vomiting and difficulty breathing. In this case it is your body's 'over kill response' to the bee sting that creates all the problems. This is more like chronic (persistent) pain.

Much like with an allergic response, with chronic pain, your body and brain over reacts and creates a lot of unnecessary problems i.e. it becomes overly sensitive ('sensitised'). Your brain gets better at feeling pain as well as all the ensuing emotional responses that are associated with it.



# What produces chronic pain?



In the absence of a physical injury, or in the presence of a lot of pain from a minor injury, chronic pain is considered to stem from a 'faulty alarm system' in the brain. This faulty alarm system, for no good reason, warns us of pain. It involves the inappropriate activation of the brain, nerves and certain hormones and chemicals.

Using the analogy of an alarm system sensing and alerting us to the threat of persistent pain the things to consider are:

- Different alarms can be used for different things e.g. a smoke alarm alerts us to fire and a burglar alarm alerts us to an intruder.

Similarly, one part of the brain is an alarm system alerting us to pain, another part of the brain is an alarm system alerting us to potential threat, fear, anxiety, etc.

- Alarm systems don't alert us to different levels of threat. For example, a smoke alarm isn't quieter when there is just a bit of smoke from cooking and deafening in the case of a raging inferno. Regardless of how much smoke there is the smoke alarm will always sound deafening.

Similarly, in persistent pain even where there is no, or very little injury in the body part that's painful, the noise of the alarm systems in our brain feeling pain and anxiety are deafening. There's no moderation (e.g. 'it's only a bit of a pull in the back I wouldn't worry about it') everything is screaming on high alert.

This means the brain's alarm system can go berzerk in response to what *should* be a weak stimulus e.g. a slight stretching sensation, a slight change in temperature or a bit of stress. These alarm bells make the brain feel disproportionately high levels of pain and anxiety in response to these otherwise understated sensations.

Therefore, the aim of treatment is to 'reboot' this faulty alarm system in order to change its sensitivity and volume control. This can, in part, be done by understanding why our brain's alarm system goes off inappropriately.

In chronic pain, through heightened sensitivity, the parts of the brain inappropriately activated are those related to feeling:

- Pain. This is why chronic pain patients feel a lot of pain in the absence of an injury, in the presence of a very minor injury or can feel more pain than other people who have a similar illness (pathology).
- Catastrophising. This is why chronic pain patients feel disproportionate fear and that the worst is happening whilst feeling helpless.
- Excessive worries and fears.

This is why chronic pain patients have a disproportionate level of pain-related fear as opposed to patients experiencing pain from a more recent sprain or strain.

This disproportionate level of pain-related fear re-enforces the association of certain movements or activities with threat and harm; consequently, it also associates other movements or activities with safety and protection.

Fear towards situations or movements associated with pain is of course normal, but in chronic pain, it can become excessive. This excessive fear makes our brain learn things in a very blinkered, inflexible way.

For instance, an individual may have once bent down at a funny angle to pick something up which aggravated their back pain. A natural hesitancy to injuring oneself again is of course normal. However, with excessive fear the brain will not only feel back pain even when no back injury is present but can associate simply any bending forwards as impending doom leaving the individual experiencing a disproportionate level of fear and anxiety.

Patients report that pain-related fear and avoidance behaviours can be more disabling than the pain itself.

## *“I feel like something’s out of place”*

Obviously if you have a tight muscle in your neck pulling your head over you’re going to feel out of alignment. Much like if you sprain your ankle or back your body weight will naturally shift to compensate for the pain and injury. This will make you feel, correctly so, that things are twisted.

However though in persistent pain there is a grossly disproportionate feeling of misalignment. Elaborate postural twists and torsions are felt even though these anomalies are no more severe than that of the general population.

In other words, people can feel their posture is “abnormally abnormal” when in fact they should feel, indifferently, like the rest of us, “normally abnormal”

This again relates to the sensitivity of the brain and how the brain controls movement.

From this perspective, the brain can be thought of as a map. Instead of a map that details your external geography e.g. roads, towns and rivers this map details your internal geography e.g. how your shoulders, pelvis and hips are sitting.

The better your map the better you can navigate and control where you are. With persistent pain, the map has been distorted by having paint tipped all over it. All of a sudden the borders, the relationships of things are ill-defined and difficult to see. This is why you can feel out of alignment, disjointed or locked up disproportionately to what you actually are.





*"I have found it helpful to think of patients with chronic pain as people who are forced into an unwanted and unwelcome egocentrism, dragged into the present with a focus on one's body, alarmed to danger, with no options, techniques or methods at their disposal to achieve escape".*

*Christopher Eccleston  
(2011)*

This all makes movements, that are controlled by the brain, harder to perform as your brain's map of your body is all distorted making you feel 'cack handed'.

Performance athletes that use visualisation techniques before events know about the concept of the brain controlling movement.

During the visualisation process athletes will not only visualise in their mind (brain) their physical performance (e.g. a diver will visualise their dive before they approach the diving board) but also the emotions they want to feel such as confidence, strength and positive aggression.

This is because movement and emotions starts in the brain. It is why visualisation, as well as performing, not avoiding, movement with a positive mental attitude can not only reboot your brain's alarm settings but make you feel straighter and stronger.

An example of how to perform a visualisation exercise is detailed in the section 'treatment options'.



# The link between pain and emotion in the brain

The parts of the brain associated with stress and pain interact and influence each other.  
Pain = threat

The parts of the brain that are associated with pain interact with parts of the brain associated with emotions. This is why psychological problems associated with chronic stress are similar to psychological problems associated with chronic pain. These problems are:

- Depression.
- Anxiety.
- Impaired learning and memory.

This is why mental health problems influence the brain's sensitivity to pain. Specifically, these problems are:

- Depression and anxiety.
- Deeply thinking about where you are with your symptoms.
- Fear of movement.
- Low sense of control.
- Not engaging with activities that fulfil your own emotional needs.
- Poor coping strategies.

When the parts of the brain that control emotions influence the parts of the brain that control pain patients commonly notice their pain is effected by:

- Stress levels.
- Sleep patterns.
- Levels of anxiety.
- Changes in their life.

Pain, due to its very nature, is emotionally processed in the brain as a threat. This is because pain can be a threat to our safety, a threat to our general physical well-being and a threat to our emotional state of mind.

A major contributing factor in causing and maintaining chronic pain is how our brain processes this threat. This determines not only how much pain we physically feel but the emotional fall out from this pain.



# How stress effects our body and determines how we 'learn' about pain.

- Chronic (persistent) pain is associated with negative emotions.
- These negative emotions release a stress hormone.
- This stress hormone effects how our brain learns about our individual pain and our overall response to the pain.
- This negative learning re-enforces the brains tendency to amplify sensations of pain and anxiety and cements the validation of unhealthy habits.

Chronic (persistent) pain is associated with catastrophising worries and fears as well as feeling helpless. The stress associated with this can be uncontrollable and leave individuals feeling they maybe negatively judged by others. The body's response to all this is to release a stress hormone called Cortisol.

In chronic pain Cortisol increases the sensation of pain. It directly makes something feel painful in the absence of an injury, more painful in the presence of a relatively minor injury or makes an illness (pathology) feel more painful than it should. It effects how the brain feels pain and adapts to chronic (persistent) pain.

As a stress hormone Cortisol helps our brain remember how to respond to threat and harm. This is useful because if we find ourselves in a potential threatening fearful situation again our brain can remember what to do in order to protect ourselves.

In response to chronic pain and stress the brain once again has an excessive response. It 'over eggs the pudding' in processing and learning about the threat of potential harm.

This excessive processing about potential harm maybe, for example, from a particular activity creating unnecessary fear of pain ('even just bending forward a little bit will make my back go') or the implications of a particular diagnosis (someone might perceive their condition as being the 'beginning of the end' when other people with a similar condition manage it just fine).

Stress not only creates these unnecessary grave feelings but enables the brain to learn about them with a matter of urgency so they are hard-wired into the individual's psyche.

Whilst this can be comforting in that it validates a relatable belief it can lead to avoidance of activities based on fear, anxiety and faulty perceptions. This is of course different from a rational decision making process about whether a movement or activity is right or wrong to do in light of experiencing a potential injury.

To make matters worse, just as stress facilitates the parts of the brain that make us over anxious and protective it dampens down other parts of the brain that might challenge or contradict this overly anxious protective behaviour.

This serves to not only really drive home the threat of, for instance, a movement or activity causing pain, but also stops this threat from being diluted down by hearing any challenging or contradictory thoughts.

This leads to an inflexible behaviour that is blinkered and unnecessarily focuses on 'high threat' pain control.



### Example:

Our example earlier was of an individual that bent forward at a funny angle without bracing themselves which caused their back pain.

In response to the disproportionate stress, anxiety and fear of experiencing the pain, or of inducing a permanent catastrophic injury, the brain will be overactive in the areas that:

- Sense pain. Your brain will physically feel more back pain and for a longer period of time in the absence of an injury.
- Learn new associations. The brain learns not only to feel disproportionately anxious and fearful of back pain but also of bending forward as a general movement.

Just as parts of the brain that support these views become overactive and well ingrained, the parts of the brain that challenge, or put these views into a broader context, become underactive i.e. they are silenced. This is why persistent pain patients can constantly have the feeling of impending doom or that 'the axe is hovering'. This results in:

- Parts of the brain being silenced that accurately and rationally isolate and gauge the severity and location of any symptoms. By silencing this part of the brain, the brain doesn't accurately gauge the location and severity of symptoms it just feels severe pain everywhere.
- Parts of the brain being silenced that remember day to day movements. By silencing this part of the brain it forgets day to day movements that involve bending forwards whilst not thinking about it where symptoms were less severely felt.
- Rational parts of the brain being silenced that assess future risks in bending forwards. By silencing this part of the brain, the brain selectively forgets or doesn't place sufficient emphasis on the fact, the initial back pain event was caused by bending forward whilst being mechanically disadvantaged.
- Rational parts of the brain being silenced that assess the relative likelihood of bending forwards leading to severe spinal damage. By silencing this part of the brain, the brain doesn't recall or doesn't place enough emphasis on stories from other people who injured themselves in a similar way and made a full recovery.

The net result of all this is that by overusing the parts of the brain that sense pain and anxiety, the individual, unsurprisingly, feels lots of pain and anxiety. Conversely by underusing the parts of the brain that rationalise and contextualise our symptoms and feelings the individual lacks a broader context for their intensely felt pain and emotions.

## What can be done?



In chronic (persistent) pain catastrophising is defined as “the tendency to magnify the threat value of pain and feel helpless in the context of pain”. This can lead to a relative inability to control pain-related thoughts in anticipation of, during, or following a painful episode.

Catastrophic beliefs and misinterpretations of the threat of pain can make people fearful of movements or activities that can result in the brain triggering or worsening their pain. This is obviously not the same as using non-emotional logical thought to determine whether a potential activity is a cause of concern.

However, an appraisal of a potential harmful activity, e.g. “I better be careful when I do that or I could tweak my back” when driven by anxiety can be misinterpreted as being highly threatening “I’m not doing that or I could ‘slip a disc’ and require surgery”.

This is called kinesiophobia, defined as a disproportionate fear of movement.

If your appraisal of a task or movement is driven by fear and anxiety stress will cause your brain, during this movement, to create pain in the absence of a physical injury and create unnecessary high levels of pain in the presence of an illness (pathology) or minor injury.

This is why the areas of the brain that control expectations, appraisal, anticipation of threat and mood can influence the parts of the brain associated with persistent pain.

Under conditions of threat and uncertainty, our brain should be anxious. Being anxious places our brain on high alert so it can identify any dangerous threat. Anxiously anticipating and avoiding this dangerous threat enables us to seek safety.

But what if the decision making process that we use to assess the level of dangerous threat or uncertainty is wrong? What if, in an anxious state, our brain is paranoid, seeing everything as being dangerous? What if our brain, in this “dangerous world” is trying to scramble to safety when it simply doesn’t need to?



This anxiety driven paranoia that needlessly predicts dangerous threat is not only why we can feel persistent pain, but also why we can't tickle ourselves but other people can.

When you try to tickle yourself you are safe and in control. Your brain isn't anxious because it knows there's not going to be any nasty surprises. With your brain in this relaxed, safe state of mind it feels the light stroke of being tickled, simply as what it is, nothing more than a light stroke.

However, when someone else tickles you you have no control and are vulnerable. This anxiety places the brain on high alert, so it can anticipate "a nasty surprise". Being on tenterhooks, sensing danger, the brain is unnecessarily sensitive. This needless sensitivity means the brain feels the tickle, not as a simple, non-threatening, light stroking movement, but as a heightened sensation with all the accompanied emotional responses.

For this reason Moseley & Butler (2017) coined the phrase DIMs and SIMs.

A DIM means "Danger in Me" and a SIM means "Safety in Me".

When you perceive more DIMs than SIMs i.e. you perceive more danger than safety your brain will be on tenterhooks feeling pain, threat and anxiety at a drop of a hat. Conversely when you perceive more SIMs than DIMs i.e. you perceive more safety than danger your brain is more relaxed feeling less or no pain and anxiety.

An analogy can be being on tenterhooks e.g. walking down a dark alleyway fearful of danger and someone unexpectedly taps you on the shoulder. Because you are sensing high levels of danger (DIMs) your brain's alarm systems fire at full blast leaving you anxious in response to a simple tap on the shoulder.

Conversely if you are relaxed and enjoying yourself at a party and someone taps you on the shoulder because you are experiencing a high level of safety (SIMs) you don't over react to the tap on the shoulder.

DIMs and SIMs doesn't have to be directly pain or condition related, it can also relate to other areas of your life such as job satisfaction or disputes with a neighbour.

Here is an example of someone that would feel pain from having more DIMs than SIMs.

DIMs: a lot of danger associations maybe e.g. you've envisioned your pain as being due to some crumbling, degenerative illness and that you have marked postural misalignment. You may also be sleep-deprived, stressed and associate activities and movement as having catastrophic consequences. That all adds up to a lot of severe DIMs.

SIMs: consequently, you may have very little safety associations e.g. you think some anti-inflammatory gel may help but hardly at all.

In this case there is an excessive amount of potent danger signals (DIMs) and a shortage of safety signals (SIMs). Even in the absence of no, or very little physical injury, it won't take much sensation (e.g. a bit of a chill or a slight stretch on a muscle) for the brain to feel severely debilitating symptoms.





# Treatment options

Below is a recommended list of treatments to reboot our brain's alarm system so it can respond in a more measured way proportionate to what is physically happening in our body:

## 1. List all of your DIMs and SIMs.

By being aware of your conscious and subconscious 'Danger In Me' signals (DIMs) and 'Safety In Me' signals (SIMs) you regain some ownership of your perceptions calming down your body's responses to them.

Moseley & Butler (2017) listed the categories of different DIMs and SIMs. As you read through the list try to think about how you can reduce danger (DIMs) and increase safety (SIMs). Included are some examples with each one:

- Things you hear, see, smell, taste & touch.

DIMs examples: reading too greater importance into a x-ray or MRI scan result that shows normal changes e.g. disc bulge, wear and tear, that are not severe enough for further treatment.

SIMs examples: hearing that the X-ray or scan is all clear and requires no further action. Understanding that your X-ray or MRI results are similar to other people of a similar age that go on to make a full recovery.

- Things you do.

DIMs examples: take pain killers unnecessarily and stay at home all the time.

SIMs examples: gentle exercise and learn about the pain process.





- Things you say.

DIMs examples: "it's old age my back is crumbling".

SIMs examples: "there's a bit of wear and tear, nothing that no one else has, and I understand what's happening when I feel pain".

- Things you think and believe:

DIMs example: this pain is forever, there's no way out.

SIMs examples: a broken bone would've healed by now the injury is functionable and fixable. The level of pain I experience is not proportionate to the injury.

- Places you go.

DIMs example: going to hospital when there is a negative connotation to going.

SIMs example: enjoyable social events.

- People in your life.

DIMs examples: people who intentionally, or unintentionally perpetuate faulty belief systems that hold you back. People who are destructively antagonistic.

SIMs examples: consulting up to date healthcare professionals and positively supporting friends.

- Things happening in your body.

DIMs examples: mental health problems and other physical health problems.

SIMs examples: acknowledging positive strides in weight loss, physical fitness and emotional well-being.

**2. Learning to in any given movement or social situation to differentiate between feelings of blinkered anxiety driven threat and rational safety precautions to avoid pain.**

**3. Learn not to overgeneralise. The individual should differentiate between activities that can trigger pain and other, similar activities, that doesn't produce pain or to a much lesser degree.**

#### **4. Start moving**

Reducing the threat of pain can be achieved by avoiding certain activities or engaging in safety-seeking behaviours e.g. using crutches, supports or just taking things slowly.

However, in some situations, especially in relatively safe situations, avoiding activity or engaging in safety-seeking behaviours has a negative effect.

When inappropriately applied, avoiding activities and the over-reliance on safety precautions re-enforces the threat value that the brain places on pain and movement. This can instigate a vicious cycle characterised by disuse and disability.

For this reason, movement should not only be gentle and engaging but definitive and done with clear intent.

To perform a definitive movement with clear intent some people visualise the movement in their mind's eye (brain) with the strong confident emotions they want to feel.

If when you're visualising the movement if you don't feel strong and confident keep on visualising it until you do. Once you've successfully completed the visualisation task physically perform the movement trying to keep in your head the strong confident emotions you had during the visualisation exercise.



Example of a visualisation exercise for someone with low back pain that is painful going from a sitting to standing position.

Firstly visualise the movement being performed effortlessly. Now visualise the movement again but this time place emphasis on the fact that your back is strong, your stomach muscles are tight and your feet are firmly pushing down into the floor as you stand up. As you visualise the movement imagine your facial expression as being strong and stoic. Keep on repeating this exercise.

The more clearly you can visualise this so you can almost 'feel' the movement and power in your body the more effective the process will be. If you perform the visualisation exercise in a nonchalant manner with no degree of interest or passion it obviously won't have the same effect.

Now it's time to put theory into practice. When you perform the sitting to standing movement for real, rarely do people, on their first attempt, rocket up out of a chair as they visualised it. It's a process of re-education and desensitisation.

Before you try the sitting to standing movement envision the sense of strength and power you felt in the visualisation exercise and keep that with you when performing the movement.

After time, and practice, your brain will get better at putting into practice what it felt during the visualisation exercise.

This may not make all the pain from sitting to standing disappear, but it will take away all the pain that the brain feels from being oversensitive. If there are any symptoms left it will either be from a lack of physical conditioning (e.g. strength) or any tightness or tension.

**5. Fully savour the rewards of a flexible, goal orientated behaviour that is not limited by fear anticipated behaviour around chronic pain.**

Achievement by reaching physical and emotional milestones should be rewarded with a personal sense of internalised satisfaction. Or alternatively just get yourself some chocolate as a well done.





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