

# Science of Pain

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Knowing why you feel pain can help you become better at managing your pain. This handout provides information about why your body feels pain and why pain can persist.

## Why do we have pain?

Have you ever had tissue damage but little or no pain?

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Have you ever had pain but little or no tissue damage?

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Pain is complex. Pain does not always mean that there is damage to the tissues. So, what is the purpose of pain?

- The purpose of pain is to protect your body—not to tell you how badly or where you are injured.
- Pain is important and we need it to survive. It is our body's natural alarm system and is needed to protect us and keep us safe.
- Our body uses other protective mechanisms such as: coughing, sneezing, moving our hand from a hot surface, vomiting, fever, or muscle spasms.

**To have a better understanding of pain, let us learn more about our nervous system. Our nervous system acts as our body's alarm system.**

Our nervous system is made up of our:

1. Nerves
2. Spinal cord
3. Brain

**Nerves:** nerves carry information from our surroundings to our spinal cord.

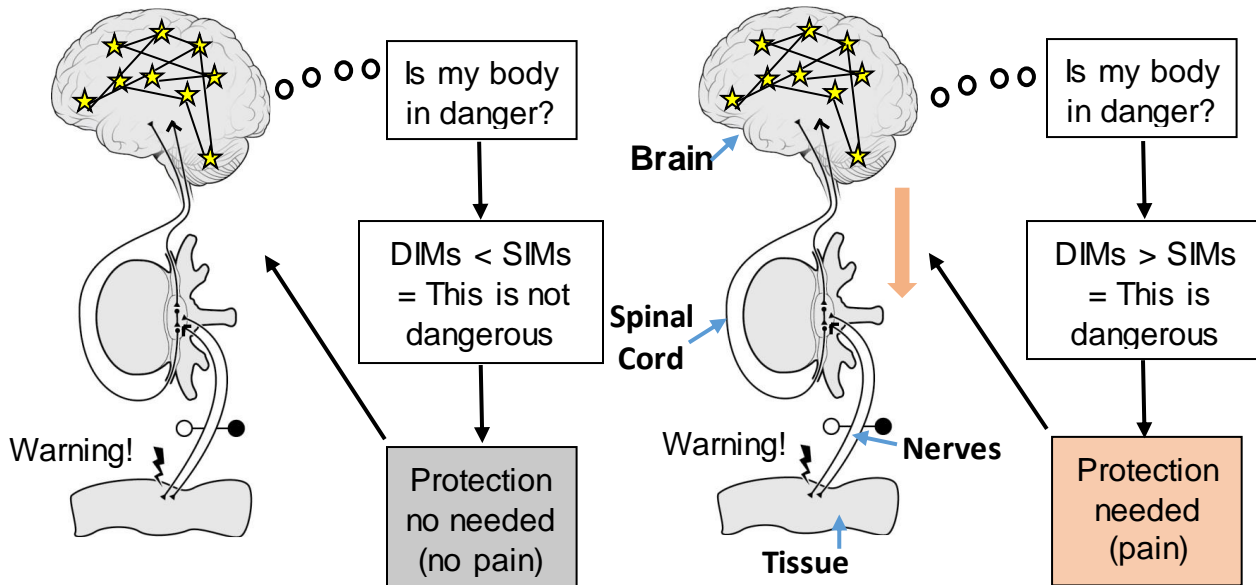
- Different nerves respond to different kinds of information (e.g. nerves in our eyes respond to light, nerves on our tongue respond to chemicals).
- There are special kinds of nerves that respond to extreme hot/cold, chemicals (inflammation), extreme pressure on your tissues (like hitting your thumb with a hammer). These nerves are called nociceptors and send warning messages to the brain. This warning message is a type of **excitatory** signal.

**Spinal Cord:** the spinal cord carries messages from the nerves to the brain.

- Messages can be blocked from being sent to the brain depending on the amount of **excitatory** and calming signals.

**Brain:** the brain gets information from the spinal cord

- Your brain uses this information and your past experiences to answer the question 'Is my body in danger?'
- Your brain decides if this information represents "**Danger in Me**" (DIM) or "**Safety in Me**" (SIM). DIMs are **excitatory** signals and SIMs are **calming** signals.
- If your brain decides there is a threat (DIMs are greater than (>) SIMs), it produces pain to protect you.
- If your brain decides there is no threat (DIMs are less than (<) SIMs), then pain is not produced.



We are learning more about the science of pain. We now know that threats are both:

- physical (movement, noise, light, smell, touch), AND
- non-physical (emotions, thoughts, past experiences)

Our brains cannot tell the difference between a physical and a non-physical threat – both can trigger the alarm system. For example:

- Even the thought of picking up a heavy box can increase pain
- Having a difficult conversation with a loved one can increase pain

Both physical and non-physical threats can impact the nervous system.

**What do you think your brain believes are threats that increase your DIMs?**

Physical: \_\_\_\_\_

\_\_\_\_\_

Non-physical: \_\_\_\_\_

\_\_\_\_\_

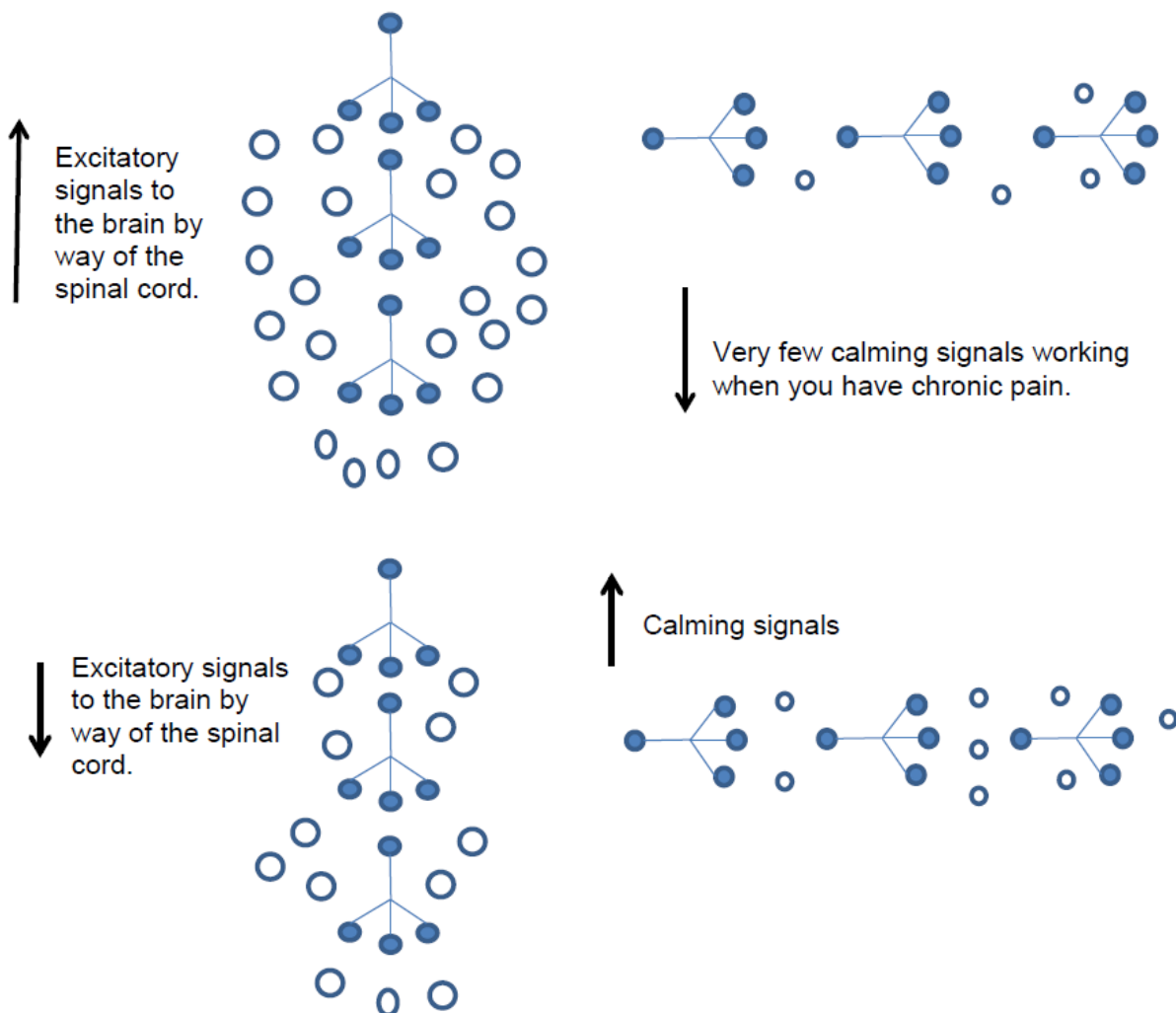
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## Chronic Pain

When your pain persists, changes can occur in your nervous system. Your nerves, spinal cord, and brain can change so that there are **more excitatory signals (DIMS)** and **less calming signals (SIMs)**.

Your brain also changes so that it is more likely to think that there is a threat, even if there isn't, and tries to protect you. This causes your brain to trigger the feeling of pain quicker and more often. This is called **central sensitization**.

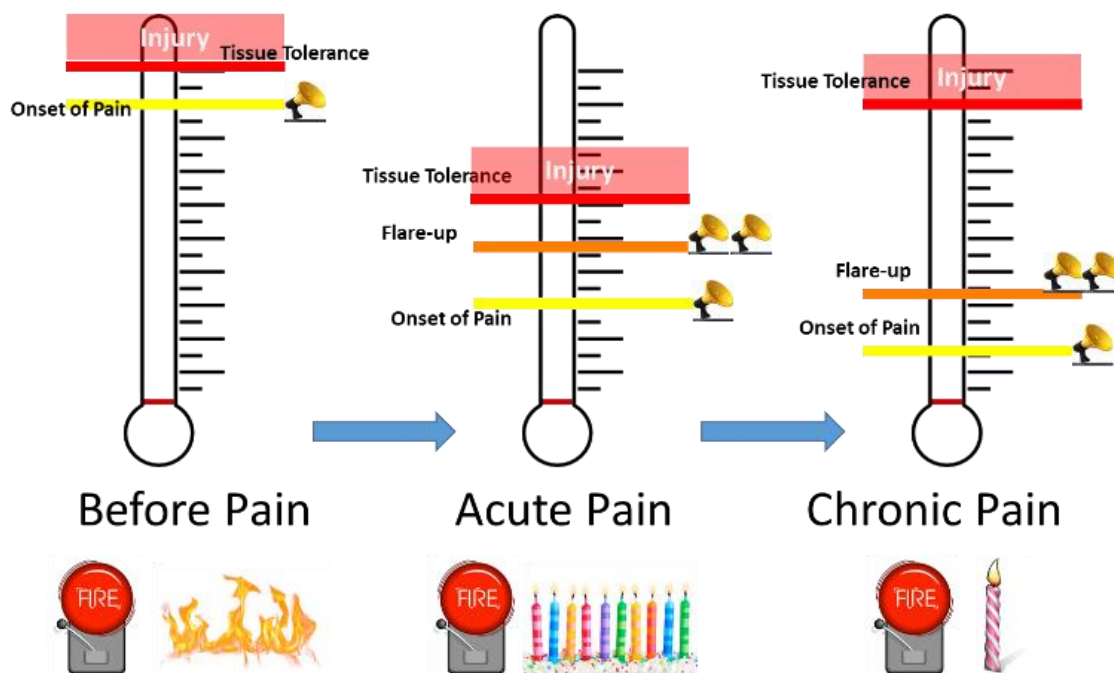
**Overall, your body's alarm system becomes more sensitive.**



How do I know if my alarm system is too sensitive?

- You find that your pain changes quickly with mood
- You find that your pain increases in response to bright lights or loud noises
- You find your pain is spreading
- You are more sensitive to touch on your skin that never used to bother you
- You find old injuries are starting to hurt again
- Your pain can come on without warning

The following diagram shows changes that happen with an alarm system that is too sensitive:



**Before pain:** it took a lot for your alarm system to be triggered

**Acute pain:** Your body is trying to protect you from reinjuring this area. It is normal for your alarm system to be more sensitive. For example, after a sprained ankle, small movements of the ankle hurt.

**Chronic pain:** Your alarm system stays sensitive, and in some cases it increases. Small movements may continue to hurt even though you are not close to injuring that area of your body. This is because of an overprotective nervous system.

For some people with chronic pain, these changes in sensitivity may not have even been triggered by a specific incident or injury. Emotional threats and stressors may have also caused changes to your nervous system.

## The Good News

Our nervous system has the ability to change. This is called **neuroplasticity**. Everybody's nervous system makes new connections and pathways. People living with chronic pain also make new pathways to learn to calm down the nervous system to make it less sensitive.

During this program, we aim to provide you with new strategies to help:

- (1) Increase your **calming** signals (SIMs), and
- (2) Decrease your **excitatory** signals (DIMs)

These strategies include:

- Pacing
- Relaxation
- Goal setting
- Changing self-talk messages
- Socializing with others
- Changing how you approach exercising and daily activities
- Managing your sleep and diet

## Different approach to exercise when you have chronic pain

You need to challenge your alarm and make it less sensitive before you can strengthen your body. Start exercises at your baseline and then gradually challenge that baseline with the progression of exercises.

## Take Home Highlights

What was one new thing you learned during this class? How will it change how you approach managing your pain?

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Watch the following 5 min video with a friend, family member, or partner:

**Tame the Beast:** <https://tamethebeast.org>

The best way to learn something new is to practice explaining it. Practice explaining what changes in your pain system when pain persists and how this program helps with those changes to the person you watched the video with.