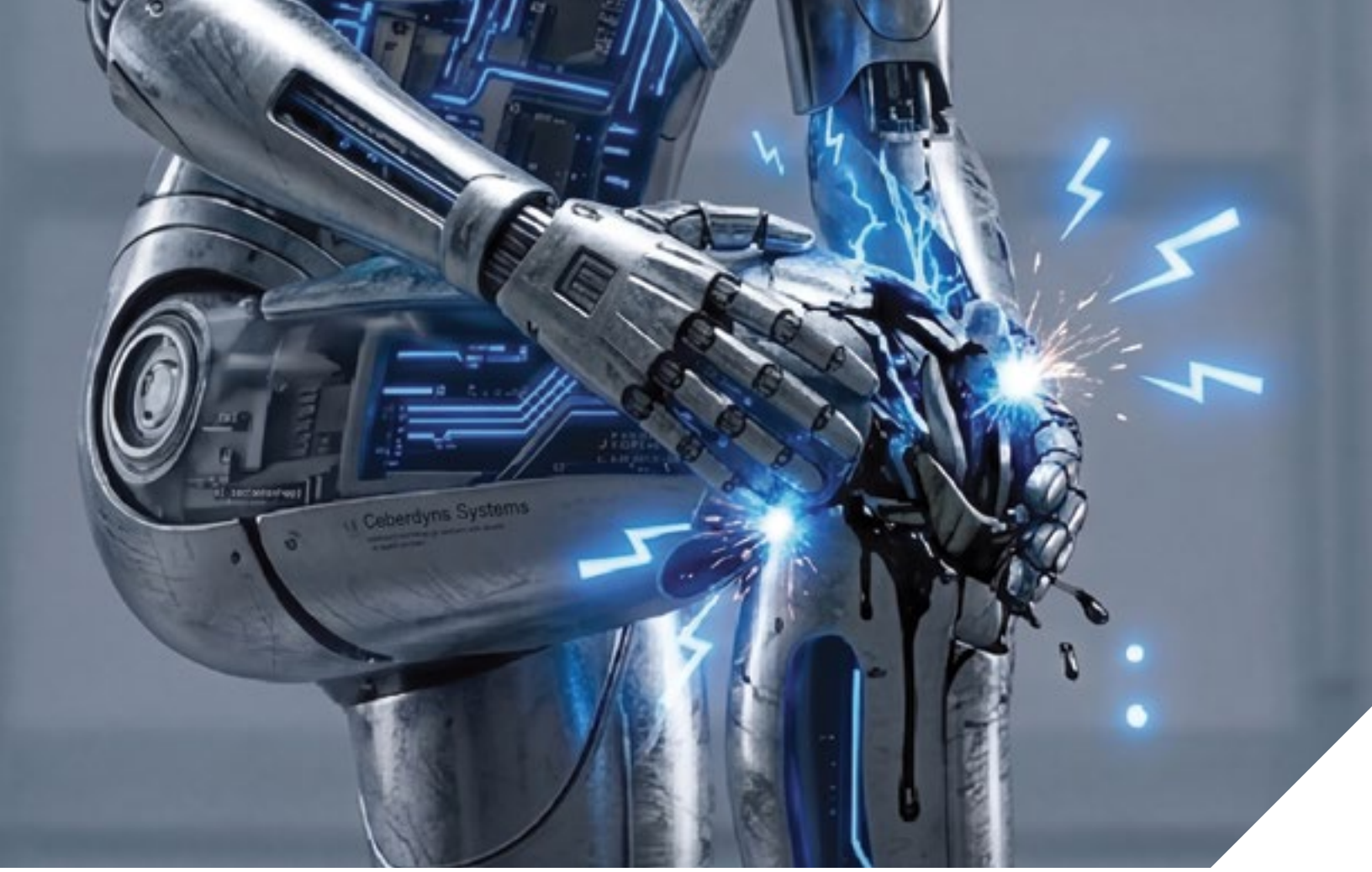


WHAT IS PAIN?

The Mechanics of Pain

Written By: Brandi La Bonte

"By definition pain is an unpleasant physical and emotional experience."

Pain is an enigma. This very real, but very mysterious thing that is impossible to understand completely. It is both big and small, loud and quiet, short and long, a black bottomless pit, a red hot fire, and a blink and you'll miss it conundrum. It is everything and nothing all at once. And, making it even more enigmatic -- pain isn't pain until your brain decides it is! (Remember the Tale of Two Nails from the Cover Story?) Trying to understand pain is no easy feat; let's start by explaining the mechanics of it.

By definition pain is an unpleasant physical and emotional experience. It is one of the most important signals our body gives us to keep us alive and/or stay safe. A multi-stage survival mechanism designed to protect our body from damage. Pain helps us learn how to avoid harm (think slipping on ice or touching a hot stove). And alerts us to harmful changes happening to or in our body (think arthritis, migraines, or cancer). Unfortunately, there is also pain (chronic) that exists or continues with no known cause or benefit.

Like Parkinson disease, or life itself, everyone experiences pain differently, even if the cause for their pain is the same. Many factors contribute to an

individual's approach to pain, including social determinants of health which are the non-medical, environmental, and socio-economic conditions in which people are born, grow, live, work, and age. Examples of social determinants of health include housing, education, income, discrimination, and equitable access to healthcare and physical and mental health supports.

There is also an ageing factor to pain, with things becoming more painful as a person ages. Bone density decreases, metabolism slows, and we begin to lose muscle mass – as much as 3 to 5 percent per decade, beginning in our 30s, and for men, up to 30 percent of total muscle mass over a lifetime. And, thanks to the wear and tear of daily life, as well as the effects of any injuries or illnesses, we can start to feel more pain as we get older.

Types of Pain

There are various classification systems of pain. Pain is most commonly classified by duration, its cause, and/or the pathophysiology (more on this later) underlying the pain.

Let's start with duration, where the pain is named based on how long the pain lasts and its frequency.

- **Acute pain** starts suddenly and ends when its cause is treated or healed. The feeling of acute pain is usually sharp because it tends to act as a warning signal about a threat to the body from an injury, disease, overuse, or other environmental stress. Common causes for acute pain are strained muscles, broken bones, dental work, surgery, childbirth, infections, and/or burns.
- **Episodic/Transient pain** happens from time to time and may be at irregular intervals. It may be associated with a long-term medical condition, like arthritis. Painful menstrual periods and chronic migraine are examples of episodic pain. It can happen out of nowhere or may be caused by known triggers.
- **Chronic pain** lasts for longer than three months or the expected healing time. In some cases, an acute pain condition might persist and become chronic pain. In other cases, chronic pain happens for no known reason. People might experience one or more chronic pain conditions, or chronic and acute pain, at the same time.

Next up, cause. Cause or etiology refers to the origin, underlying sources, event, or condition that produces the pain. This is the physical injury, medical condition, disease, or emotional experience that is responsible for the pain. For example, bacteria that is causing a sore throat, a fall that results in a broken hip, a diagnosis of a medical condition, illness, or disease, or an emotional event like a death, breakup or other loss. By determining the "cause" of the pain (when possible) medical professionals are better able to understand if the pain is acute, episodic, chronic, or stemming from a specific injury to determine the best treatment.

The final classification in pain is **pathophysiology**. Pathophysiology examines how normal body functions (physiology) change when disease occurs. A great analogy to better understand this is to think of the cause (etiology) as the spark that starts a fire; while the pathophysiology is the way the fire spreads and causes damage. There are three main classifications of the pathophysiology of pain according to the International Association for the Study of Pain (IASP):

- **Nociceptive pain** describes pain that is caused by tissue damage and/or inflammation. This is the most common type of pain. Nociceptive pain is a nervous system response that our brains use to not only prevent injury but also recover from an injury when we rest. The sensations associated with it can be sharp, pricking, dull, or aching, depending on what caused the damage or inflammation. Examples of nociceptive pain

include pain from a paper cut, an infection, a broken bone, or osteoarthritis.

- **Neuropathic pain** describes pain that is caused by nerve damage due to an injury or disease. Neuropathic pain is very often chronic pain. Neuropathic pain sensations are often described as burning, tingling, shooting, or like electric shocks. Examples of conditions that cause neuropathic pain include diabetic neuropathy, shingles, and sciatica.
- **Nociplastic pain** – This type of pain is a term adopted by the IASP in 2017 to describe a third, distinct category of chronic pain, complementing the existing classifications of nociceptive and neuropathic pain. It bridges the gap for patients whose pain arises from altered nervous system processing rather than a clear injury, tissue damage, inflammation, or disease. The sensations related to this kind of pain vary widely. Examples of nociplastic pain include tension headaches, fibromyalgia, irritable bowel syndrome, and chronic low back pain.

The Pain Process

So, we know what pain is and how it is classified, but how does pain happen? What is the process? Think of pain as a protective alarm system designed to prevent further damage or injury. The process involves four key steps: transduction, transmission, modulation, and perception, where physical injury is converted into an electrical signal, sent to the brain, adjusted for intensity, and finally interpreted as a real world experience. Let's break it down.

- **Transduction** is a fancy word for "detecting danger" and is the very first step our body takes to feel pain. The pain process begins at the site of injury, such as touching a hot stove or falling down. The greater the stimuli (injury or potential for injury), the more likely the brain is to interpret a more severe pain. Specialized nerve endings throughout our skin, muscles, and organs, known as nociceptors, act as "danger sensors" to detect this (or any) damage. Upon injury, these nociceptors activate and initiate a process called transduction, converting the physical pain—such as extreme heat or pressure—into a tiny electrical signal.
- **Transmission** is the act of sending that electrical signal. That signal travels a distinct path along nerves from the sight of the injury, through the peripheral nervous system, to the spinal cord, and on to the brain stem and other parts of the brain.
- **Modulation** adjusts the signal. In this stage our body (specifically our nervous system) can alter the intensity of that electrical signal to either reduce or increase the pain sensation.
- **Perception** is the stage where you feel the pain. In this stage the electrical signal reaches the brain, specifically the thalamus which acts as a sorting or relay station for information – an air traffic controller for our brain if you will. It is there that the information contained within that electrical signal is distributed to other parts of the brain. The somatosensory cortex identifies the location and intensity of the pain. The limbic system processes the emotional and unpleasant experience of pain, while the frontal cortex analyzes the information, assigns meaning and determines our reaction.

Even more fascinating, the speed at which this all takes place. Pain processing is fast. Incredibly fast. Not quite instantaneous (even though it certainly feels like it is), our nervous system processes pain in a fraction of a second, often using a "reflex first, think later" approach.

What about Emotional Pain?

While emotional pain does not fall into the exact same formal medical classification system as physical pain, science increasingly recognizes that they share overlapping brain pathways and functional mechanisms. Overlapping, but not identical. The biggest differences in how the two pains are processed show up in localization and memory.

Let's start with **localization**. When it comes to pain, localization basically means "where" we feel it and if you can point to it. For example, at a doctor's appointment we may be asked to point to where it hurts on ourselves or a picture. When dealing with an emotional pain, that is certainly harder to do. In terms of localization the main difference is that physical pain has a precise, specific spot, while emotional pain feels scattered, heavy, and hard to pinpoint.

PHYSICAL PAIN		EMOTIONAL PAIN
Specific – if we burn a finger, we know exactly which finger hurts	**Location**	Widespread and abstract, with no physical location to heal
Its a sharp, burning, or throbbing feeling on the skin, muscles, or bone	**How it feels**	It may feel like a heavy weight, an empty hole, or a constant aching sensation.
Usually goes away once the injury heals	**Duration**	It can last much longer than a physical injury and often comes back when we think about the memory

And speaking of **memory**; we all have memories of both physical and emotional pain. Who among us hasn't had a papercut, or experienced other physical pain like a broken bone or childbirth? Who among us hasn't experienced the loss of a loved one, bullying, a breakup, embarrassment, etc.? These are universal life experiences that our brain stores but remembers in very different ways. The biggest difference is that we can remember physical pain without re-feeling it, but you **CAN** re-live emotional pain just by thinking about it. In short, your brain forgets the sensation of physical pain but loves to remind you of the sting of emotional pain.

PHYSICAL PAIN "It Happened" MEMORY		EMOTIONAL PAIN "It's Happening Now" Memory
No - If we broke our arm last year, we remember that it hurt, but we don't actually feel the pain in our arm again. Pain receptors are not reactivated.	**Re-Feeling/ Re-Living the pain**	Yes – Recalling a loss, a breakup, or a time we were maybe embarrassed, we may find ourselves feeling the exact same stabbing pain we felt at that moment. Memories of emotional pain can reactivate pain receptors and cause substantial pain in the present.
Physical pain memory is mostly about the "facts": *I was playing soccer, I tripped, I broke my arm, it hurt.* Once the injury is healed, the memory rarely triggers a repeat experience of the pain.	**Facts over feelings, triggers and associations**	Emotional pain leaves "echoes." For example, if a specific song was playing during a breakup, hearing that song months later can trigger the same emotional distress all over again.

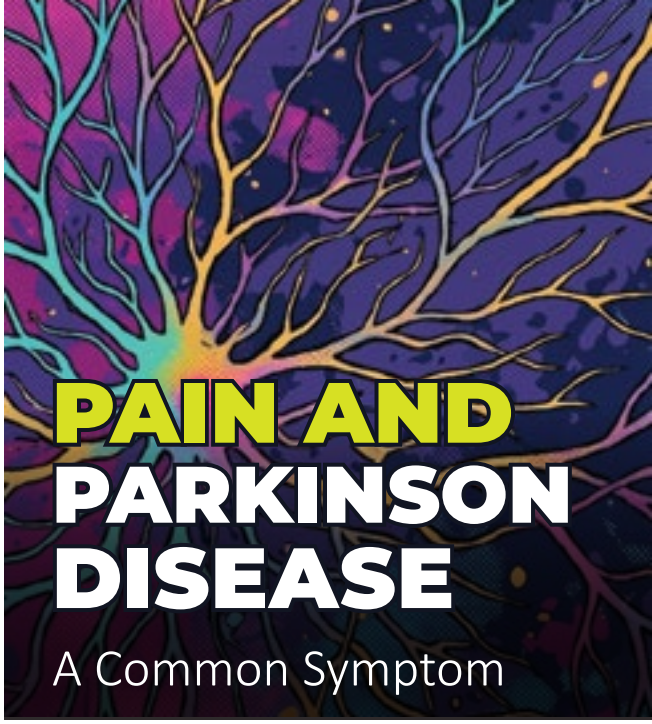
The Connection Between the Two

In addition to sharing the same brain pathways, physical and emotional pain are deeply interconnected. One of our brains' main jobs is to protect us and keeps us safe, it doesn't really distinguish between a physical and emotional pain, often treating them as nearly identical threats. This is why when we experience emotional pain, we may find ourselves also dealing with physical pain as a result – chest pains, tight shoulders, headache, stomach pains, etc. Psychological distress (can trigger stress hormones like cortisol, which can lower the pain threshold and intensify physical pain. The reverse is also true, physical pain can cause emotional pain. For example, a bad fall can cause anxiety, a medical diagnosis or illness can lead to feelings of frustration or sadness, and chronic pain can lead to feelings of hopelessness, isolation, and depression. These feelings can then intensify the perception of physical pain. Either can create what is known as a "pain loop" or chronic pain cycle where one pain (let's say emotional) triggers physical pain, which then intensifies the emotional pain, which causes more physical pain and so on and so on. It can be a very difficult cycle to break.

Dealing with Pain

There are two general approaches to dealing with pain – treatment and management. Treatment seeks to remove the pain (cure) by focusing on short-term reduction of symptoms to eliminate acute pain. Treatments often rely on medication, but can also include surgery, medical procedures or devices, massage, physiotherapy, and even the good old rest, ice compression, and elevation. The goal of pain management is to improve function and/or quality of life even if pain persists or is chronic. Management is often multidisciplinary and involves a combination of techniques including medications, physical therapy/rehabilitation, mental health support, lifestyle changes (including diet, meditation, exercise, etc).

Understanding the mechanics of pain – how the body and brain communicate – is a fundamental first step in managing both current and potential future pain. The ultimate goal of understanding pain is not to avoid it completely (which would be nice, but is highly unlikely), rather learn to be proactive in our approach to living well AND manage it so when it does happen, we have the knowledge, skills, and tools to keep it from interfering with daily life. ■



Written By: Brandi La Bonte

Did you know that, compared to the general population, people with Parkinson disease experience significantly more pain? Prevalence estimates for pain in Parkinson's is approximately twice as high as in the general population.1 In fact, pain is one of the most common issues reported by those with Parkinson disease. Clinical risk factors for pain in Parkinson's include (but are not limited to): being female, early disease (young) onset, and long disease duration.

It is important to note that not all pain is related to Parkinson disease; however, Parkinson's does affect the way your body moves both internally and externally, which can cause pain. Some of the more common types/ sources of pain that people with Parkinson disease may experience include, but are not limited to:

Musculoskeletal pain is the most common, accounting for 40%–75% of reported pain in Parkinson's patients2. Caused by the muscular, joint, and postural changes that lead to decreased/limited mobility overall.

It frequently presents as muscle pain and aching in legs, lower back, neck, and "frozen" shoulder.

Dystonic pain is the second most reported pain occurring in up to 50% of people with Parkinson's; frequently experienced by those diagnosed with Young/Early Onset Parkinson's (before age 50). Dystonia is a prolonged twisting or contracting of a muscle/muscle group that can cause severe pain and cramping. It can take place in the arms, hands, feet, legs, neck, jaw and even in the muscles around the eyes. It typically will affect the more severely affected side (the side that the PD started on). This problem is due to the medication (usually levodopa) wearing off or losing its effect.

Neuropathic pain affects up to 30% of people with Parkinson's. There are typically two types of neuropathic pain:

- **peripheral neuropathy which is caused by damage to peripheral nerves and can lead to numbness or tingling in one's toes or fingertips, and**
- **central pain which is a direct result of Parkinson's affecting the central nervous system and can present as a chronic, vague, or all-over aching pain that is often accompanied by a burning sensation.**

Other types of pain:

- **Constipation occurs in a majority of people with Parkinson's, can cause painful symptoms like abdominal cramping.**
- **Bruxism – the involuntary clenching or grinding of teeth – occurs due to rigidity or spasms that can happen in the jaw when a person is asleep or awake.**
- **Burning Mouth Syndrome (BMS) is a painful, burning sensation often affecting the tongue, lips, or entire mouth**
- **Vulvodynia is similar to BMS, it is a chronic, unexplained burning pain in the vulva.**

Diagnosing the source of pain in Parkinson disease is not always easy. The first step involves distinguishing between Parkinson's and non-Parkinson's pain, then between pain caused by motor symptoms and non-motor symptoms. Once the source of the pain has been determined, actions can be taken towards relieving some or all of the symptoms. These actions can include (but are not limited to) one or more of the following: medication, physiotherapy, exercise, massage and/or counselling. By addressing pain in Parkinson disease with your healthcare provider, you are taking positive steps towards living a healthier, pain-free (or reduced pain) life. ■

References:

1 Dung Thi Hoang, Frank Xing, Daniel Truong, Characteristics of pain symptoms in Parkinson's disease, Clinical Parkinsonism & Related Disorders, Volume 13, 2025, 100404, ISSN 2590-1125,

https://doi.org/10.1016/j.prdoa.2025.100404.