Pain and the Brain

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QUALIFICATIONS:

- ✓ Naturopathic Nutrition and Health Coaching: *Diploma-College of Naturopathic Medicine (CNM)*
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MEMBERSHIPS:

- ✓ National Council for Integrative Psychotherapists (NCIP)
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Specialises in Environmentally-Acquired Illness

Disclaimer

- This talk is for information and educational purposes only.
- It is not intended to diagnose or treat any illness.
- Always seek medical advice for chronic, unexplained pain

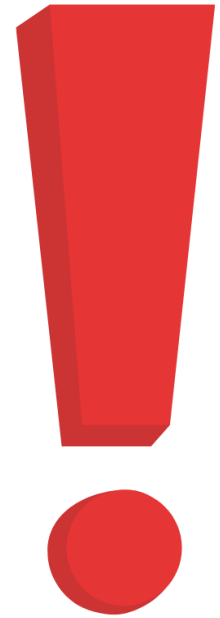
Caution

I recognise that talking about pain and the brain may feel triggering

I want to be very clear, non of this is suggesting in any way that pain or illness are not ‘real’, or that they are psychological.

This is NOT TRUE!

This is about understanding the physical mechanisms that cause pain signals to be generated by the brain, and the tools that we can use to help us modify pain.



Talk Overview

Part 1 – My Story

Part 2 – Understanding Pain

Part 3 – Tools to help with Pain

- Hypnosis for Pain
- Mindfulness for Pain
- Neuroplasticity

Part 1

My Story

Pain

I've been in pain all my life, from the age of 2

Multiple doctors, specialists, tests

Nothing wrong – no cause for the pain
Dismissed, ignored, disbelieved

Eventually, aged 25 they found I had been born with an abnormality in my pelvis which was compressing my pudendal nerve and I had 2 operations, but left with permanent nerve damage

Aged 35 couldn't walk without a stick

Excruciating back pain, off sick for weeks at a time unable to stand
Discovered I had 2 huge ruptured discs, and I was losing the use of my leg. I had 2 surgeries and a metal clip in my back

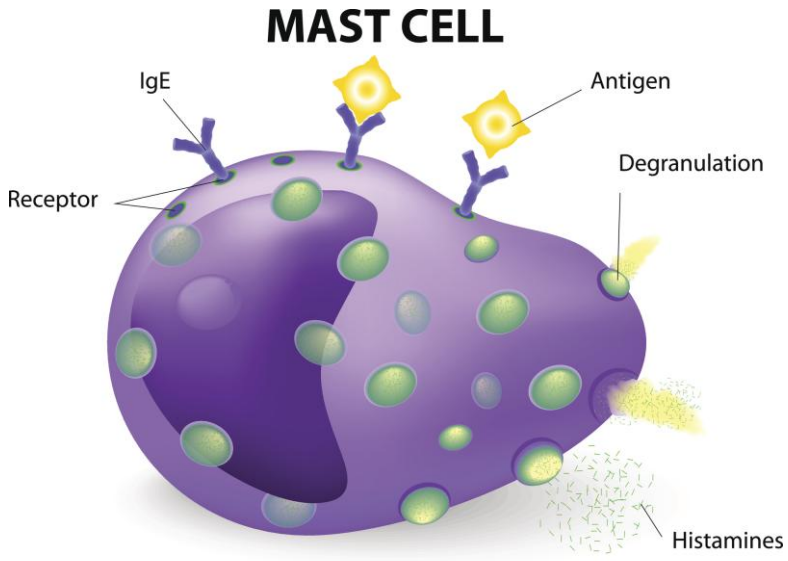
Hypnotherapy

MCAS and Lyme Disease

Looking back, I've always been 'unwell', and can see I had MCAS.
I had a lot of pain from that.

In 2018, I contracted Lyme Disease, which was more pain!

The Lyme triggered severe MCAS.



Limitations

These experiences have shaped my own understanding of the science around pain and the brain.

It's very fashionable at the moment to focus on psychological treatments for pain without known causes

My own experiences have taught me that the medical system is not currently advanced enough, and the systems not joined-up enough, to be able to confidently state that someone's pain is psychogenic.

There is still so much we don't yet know.
The medical system often misses things

The medical model is not infallible.

Always seek answers for pain. Never give up hope.

But the fact remains that there ARE ways we can use our brains to help us when living with pain, whatever the cause.

Part 2

Understanding Pain

Chronic Pain in Context

Chronic pain is generally defined as pain that persists or recurs for more than three months

Roughly 40-43% of adults in the UK are affected by chronic pain
Around 28 million people

Chronic pain is more prevalent in women and increases significantly with age.

Chronic pain is higher in ethnic minorities

Low back and neck pain - leading causes of disability Worldwide

- Numbers are predicted to grow by 32% by 2040
- Severe pain that prevents daily activities, affects around one in eight adults in England.
- About 41% of people who attend pain clinics report their pain has prevented them from working, and 13% have had to reduce their working hours.

https://www.britishpainsociety.org/media/resources/files/UK_pain_messages_infographic_April_2024.pdf

Causes of Pain

Causes of pain

- Acute injury – broken bones, burns, sprains, wounds
- Medical procedures - surgery, tests
- Life-threatening illness – tumours, cancer
- Chronic Inflammation
- Hormonal imbalances
- Hypermobility - EDS
- Immune system malfunction MCAS, autoimmunity
- Undiagnosed infections – Lyme Disease
- Potentially undiagnosed structural abnormalities
- Central Nervous System hypersensitivity
- Limbic brain hypersensitivity
- Learned pain – neuroplasticity
- Trauma and ACE – increases risk

CNS hypersensitisation

Our nervous systems can become hypersensitive as a result of many factors
Exposure to :

- Toxins
- Infections
- Histamine/inflammation
- Chronic pain
- Trauma
- Chronic stress
- Pain

The load of ‘stressors’ exceeds the body’s ability to cope. This alters the stress response, affecting endocrine, neural, and immune systems.

Can all cause the central nervous system to become hyper-aroused and hyper-sensitive

So, it produces pain when there is only ‘sensation’

It ‘over-reacts’ to normal sensory input
Possibly Fibromyalgia

https://pmc.ncbi.nlm.nih.gov/articles/PMC4677120

https://pmc.ncbi.nlm.nih.gov/articles/PMC8317266

https://www.nature.com/articles/nrn2297

https://pmc.ncbi.nlm.nih.gov/articles/PMC9540824

https://pmc.ncbi.nlm.nih.gov/articles/PMC6051899

https://pubmed.ncbi.nlm.nih.gov/20961685/

Pain and Trauma

According to Peter Levine 4 types of trauma involved in pain

1. A trauma that causes the pain – accident, illness, an assault etc, trigger CNS to become hypersensitised
2. The emotional and physical pain itself becomes traumatising – the pain is a stressor, and is traumatic
3. Unresolved trauma that preceded the trigger, but gets stirred up by the pain situation, that is pattern-matched to this situation. Eg childhood illness trauma, hospitalisations, etc, triggered by their current experiences.
4. Early childhood trauma – esp abuse or neglect. Never had the tools to comfort yourself.

https://pmc.ncbi.nlm.nih.gov/articles/PMC4316402/

Pain and ACE

Adverse Childhood Events/Experiences

Traumatic events in childhood lead to :

Endocrine dysregulation and upregulation of the HPA axis, which leads to increased production of cortisol/adrenaline

This also eventually leads to immune dysregulation and neuroinflammation

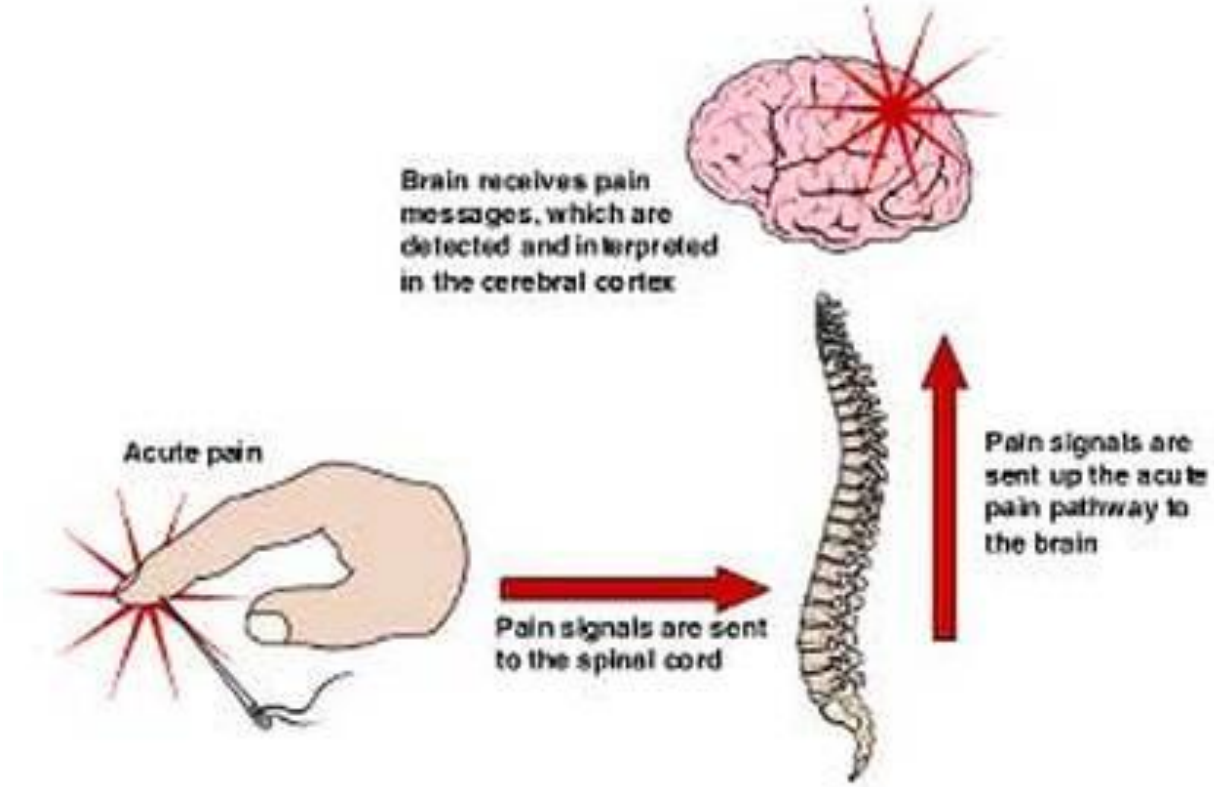
People who have experienced trauma in their childhood are therefore at increased risk of experiencing chronic pain and chronic illness.

The prevalence of chronic pain in adults with ACEs is high, with 84% having ACE vs the general population only 61.6% of people report at least one ACE, much lower than those living with pain.

https://www.frontiersin.org/journals/pain-research/articles/10.3389/fpain.2022.923866/full

What is Pain?

Descartes' original model Developed in the 1600s



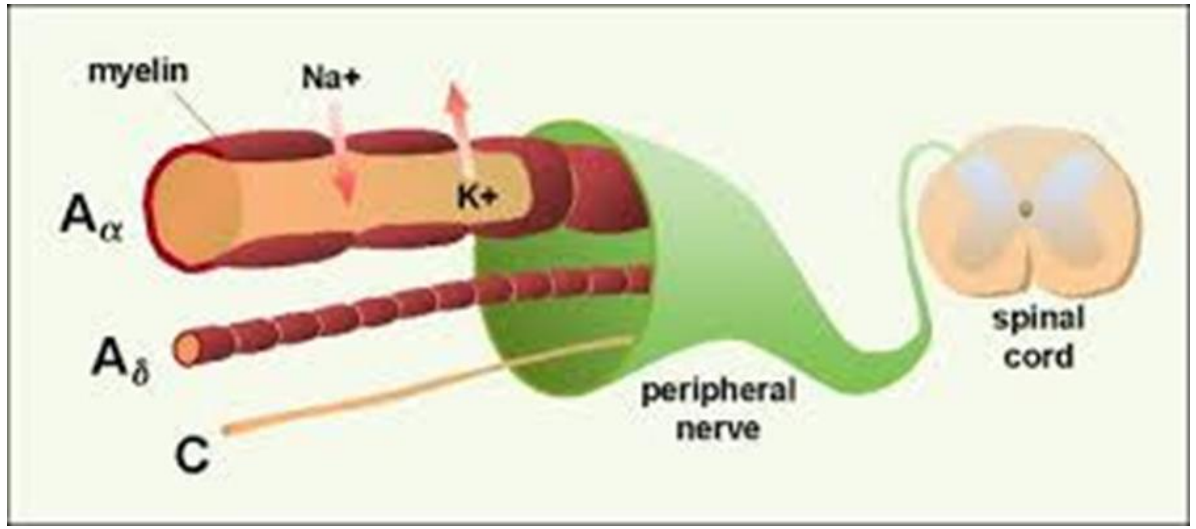
Pain and the Nervous System

1960s, 2 pain specialists, Ronald Melzack and Patrick Wall

Identified 3 different nerve fibres.

Thin A delta and C fibres carry pain sensations, no myelin sheath, travel slowly

Thicker A Alpha fibres carry non-painful sensations, comfortable sensations, have myelin sheath and they travel fast.



Survival mechanism

Nociception – the information that is transmitted via these nerve fibres (not pain)

Becomes pain only when received and processed by the brain.

https://www.physio-pedia.com/Gate_Control_Theory_of_Pain

Pain is an experience generated by the brain

All pain is generated by the brain

Pain does not occur in the area of the body where we feel pain!

Our peripheral nerves, in our finger, say, detects a sensation, and sends a message to the brain, via the spinal cord.

This means that ALL pain is equally real, and equally valid

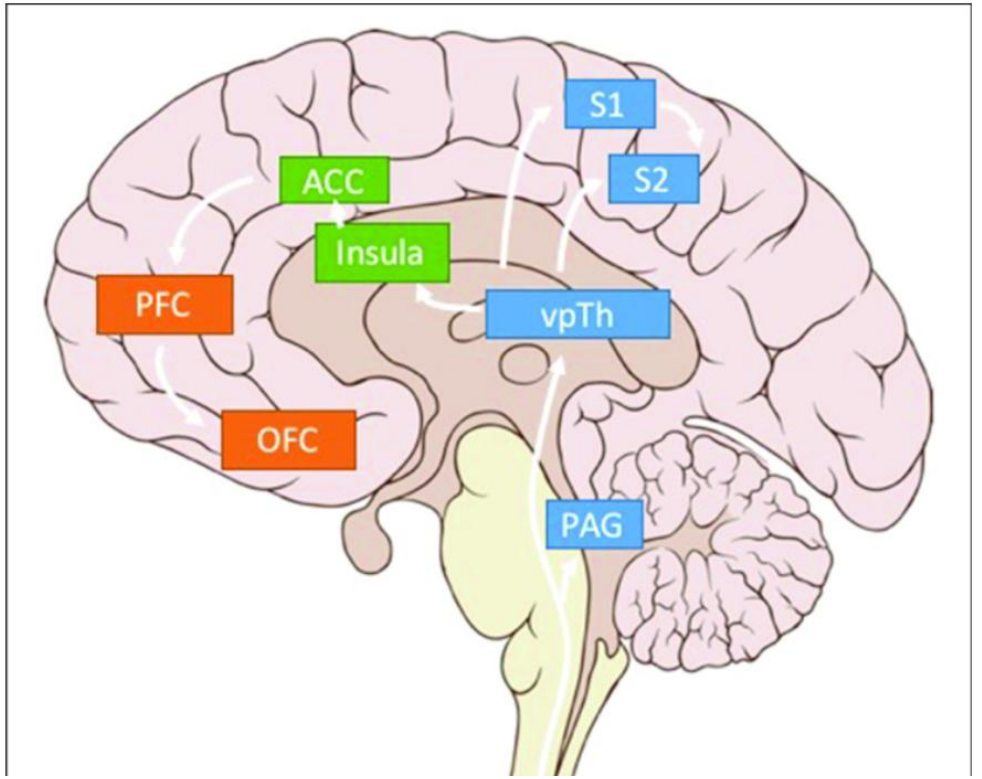
“If the brain creates pain, the brain can change pain.”

Pain and the Brain

https://www.researchgate.net/figure/Pain-related-brain-regions-Key-brain-regions-related-to-somatosensory-blue_fig2_324010291

Areas of the brain involved in pain creation and processing

- **Thalamus** – located just above brain stem. Primary relay station receiving nociceptive signals – sends them on to the brain's cortex for processing. No sensory signal, apart from smell, can reach the brain without passing through the thalamus
- **Somatosensory cortex** – spatial information – where in the body the sensory signals are occurring, plus *intensity, and quality* of pain.
- **Insula** – what our needs are compared to what we have (oxygen levels, hunger, thirst, pain etc). The subjective experience of pain.
- **Anterior cingulate cortex** – part of the limbic system, affective/emotional component of pain, and the need to take action and do something about the pain
- **Pre-frontal cortex** – memory of pain, meaning of pain and executive decisions about what to do about pain.
- **Brainstem & Periaqueductal Gray (PAG)** – central in *descending pain inhibition* and modulation



Pain is a subjective experience

If/when and how much pain is generated by the brain depends on a number of factors

- How upregulated our CNS is
- How sensitive our Limbic brain is
- How safe we feel - how much danger we perceive we are in
- What similar memories we have experienced
- What mood we are in
- How lonely we feel (safe, supported or not)

The Pain Onion

Pain is a complex and multi-layered experience

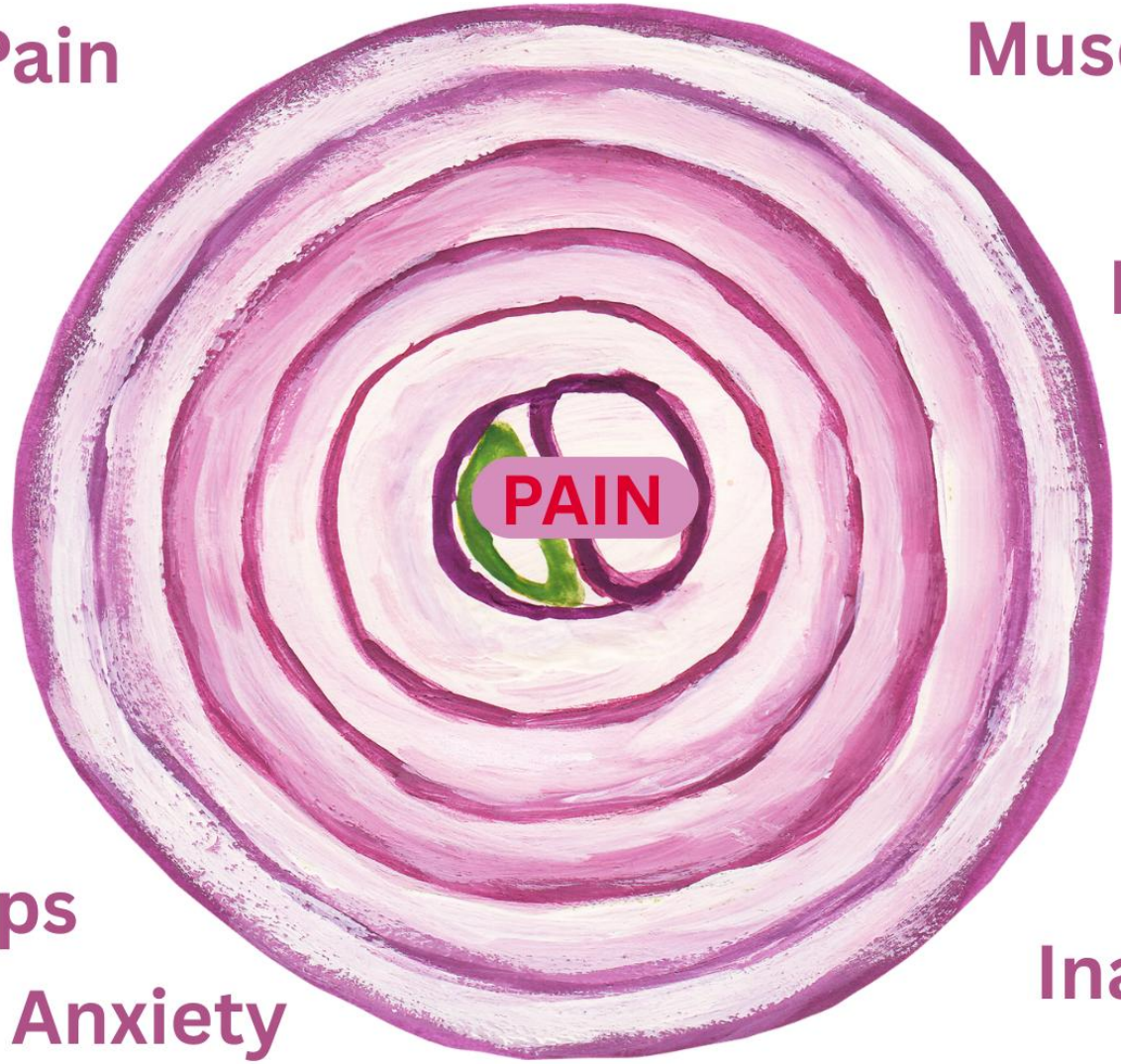
Pain is different for everyone

The sensation of pain is only a small part of the pain experience

Around the original pain, many other factors build up, which each affect how we feel, and how much pain impacts us.

I call this the ‘pain onion’.

The Pain Onion



Fear of Pain

Loss of Income

Poor Sleep

Isolation

Relationships

Anxiety

Muscle Spasm

Low Mood

Anger

Low Self-Esteem

Inactivity

Part 3

Tools for Pain

Tools for pain

- Pain medications- paracetamol, aspirin, opioids
- Physiotherapy (EDS and pain specialists)
- Exercise - tailored movement – caution
- Anti-inflammatory diet – high in natural antioxidants
- Avoidance of pro-inflammatory chemicals/foods
- Heat/cold therapy
- Red Light Therapy
- Far Infra Red Sauna
- Frequency machines (ARC, TENS)_
- Anaesthetic injections
- Surgery
- Somatic Body Tools

- **Brain-based tools**
  - Hypnosis
  - Mindfulness
  - Neuroplasticity/brain retraining

Part 3.1

Hypnosis for Pain

Hypnosis for Pain

- Research reports show effects of hypnosis on acute and chronic pain and on pain during medical procedures.
- Randomised trials (e.g., Montgomery et al.) and other studies report that brief presurgical hypnosis reduces sedative/analgesic requirements, postoperative pain, anxiety, and recovery time in many surgical contexts
- One study showed significant improvements in quality of life for IBS patients after hypnotherapy
- Hypnobirthing – studies show compared with controls, fewer mothers having hypnosis required analgesia, and rated their pain as lower

https://www.sciencedirect.com/science/article/abs/pii/S1744388125000246

https://chatgpt.com/c/68fa6b40-6f0c-832c-b3c5-a4c94eb066ae

https://academic.oup.com/bja/article-abstract/93/4/505/304478

https://www.sciencedirect.com/science/article/abs/pii/S0149763418304913

How Hypnosis Helps

Based on Dr Mark Jensen

- Pain reduction – noticing less and less uncomfortable sensations. Modifying pain sensations.
- Decreased pain unpleasantness – noticing sensations and not being bothered by them. Disconnecting sensations and emotions- we can feel sensations without emotion.
- Sensory substitution – identity comfortable or neutral sensations, and focus attention on them.
- Deep relaxation – reducing muscle pain
- Improving sleep – increased refreshing sleep
- Reduce inflammation – studies show reduced mast cell activity and allergies, and decreased inflammatory markers like cortisol and TNF-α receptor II

https://pmc.ncbi.nlm.nih.gov/articles/PMC3257832

https://pubmed.ncbi.nlm.nih.gov/16404678 /

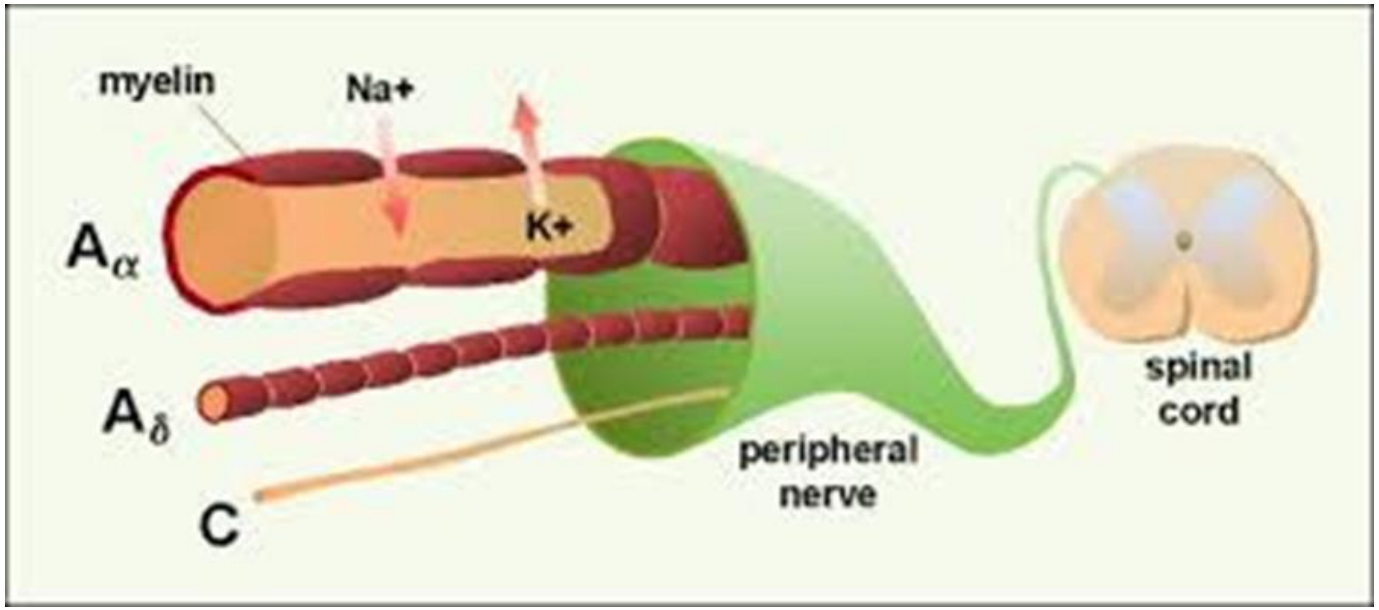
https://www.mayoclinicproceedings.org/article/s0025-6196%2811%2963203-5/fulltext

Sensory Substitution

Earlier, we talked about Melzack and Wall identifying 3 different types of nerves

Thin A delta and C fibres carry pain sensations, no myelin sheath, travel slowly

Thicker A Alpha fibres carry non-painful sensations, comfortable sensations, have myelin sheath and they travel fast.



https://www.physio-pedia.com/Gate_Control_Theory_of_Pain

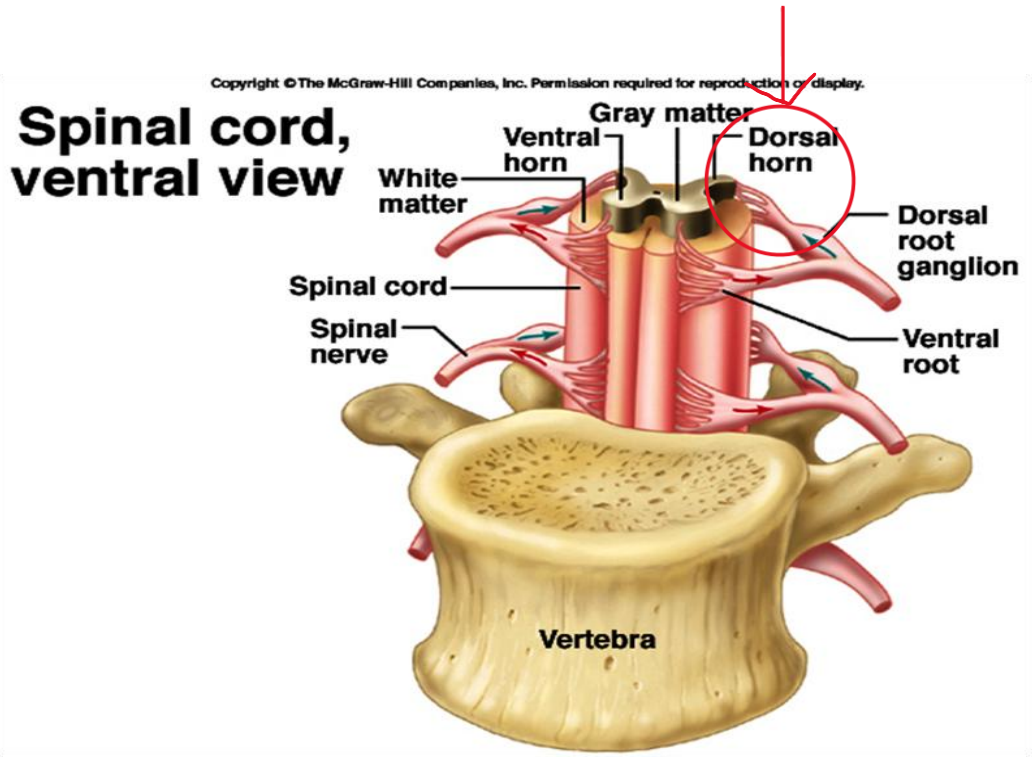
The Pain Gate

Melzack and Wall also identified a part of the spinal cord called the Dorsal Horn, which they named ‘The Pain Gate’.
The sensation signals from all 3 types of nerves enter the spinal cord on their way to the brain through the dorsal horn.

The faster, non-painful signals get there first, and when they reach the dorsal horn, they close the pain gate, So when the slower, pain signals arrive, they can’t get through.

Eg rubbing a painful injury

Also the same principle that the TENS machine is based on – Melzack and Wall developed the TENS system based on their research into the pain gate.

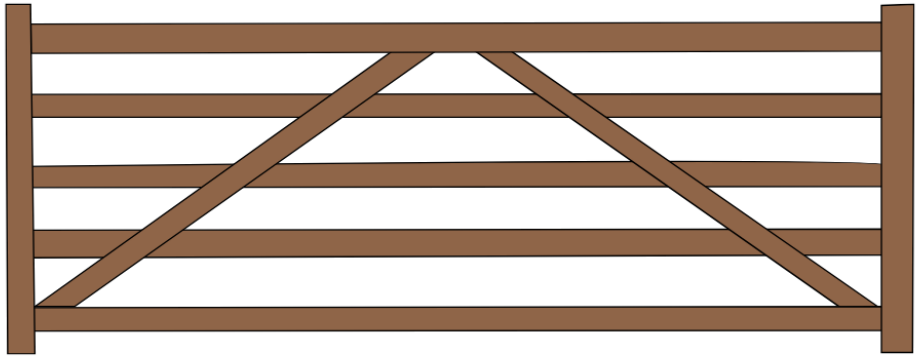


If someone experiences a painful (noxious) stimulus, the application of a non-noxious (soothing or light rubbing) stimulus can help activate the gate control mechanism, and reduce the pain. https://www.physio-pedia.com/Gate_Control_Theory_of_Pain#cite_note-:2-2

Sensory Substitution Exercise

The really interesting thing is that you can trick your brain into thinking this is happening using just the power of your mind!

You can imagine comfort, and focus your attention on comfort, and block the pain signal to your brain.



Part 3.2

Mindfulness for Pain

What is Mindfulness?

Mindfulness – the act of becoming aware of our present moment experience, and welcoming what we find with a kind and open heart.

Stepping out of autopilot
Becoming fully present in our minds and bodies
Being – not doing

Practicing Mindfulness Attitudes like

- Non-judgement
- Acceptance
- Trust
- Gratitude
- Compassion
- Kindness

Neuroscience of Mindfulness for Pain

Research Study showed that Regular daily Mindfulness practice (20 mins a day for 4 days)

Thalamus – disengaged and downregulated

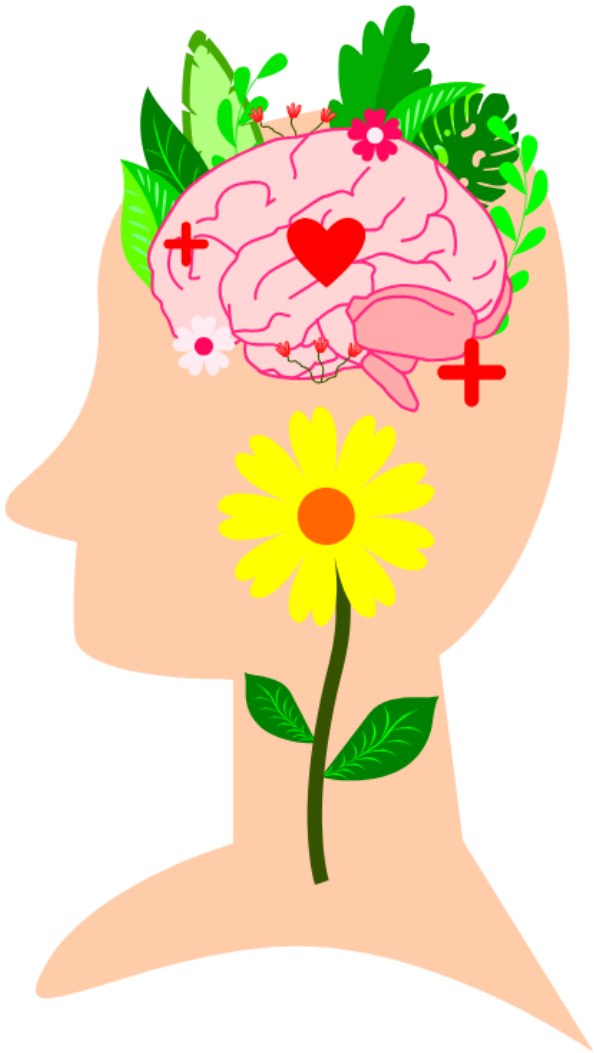
Primary somatosensory cortex - Associated with processing intensity and location of pain – also downregulated during Mindfulness

Amygdala – associated with the emotional component of pain, and how upsetting we find the pain. Meditation alters amygdala responsivity. Experienced meditators showed decoupling of emotional processing from sensory processing

Pre-Frontal Cortex. Activity is increased. The more activity in the PFC, the less pain we feel. PFC sends info to 'close the gate' in the dorsal horn, and limit amount of nociception that is allowed through. (Jensen)

https://pubmed.ncbi.nlm.nih.gov/21055874/
https://academic.oup.com/scan/article/14/11/1147/5716281
https://pubmed.ncbi.nlm.nih.gov/21471390/

Exercise



Part 3.3

Neuroplasticity

Neuroplasticity

Persistent pain input over time sensitises the nervous system causing an increase in excitability signalling of neurons — which underlies learned pain hypersensitivity.

Chronic pain is also associated with structural brain changes, reducing grey matter in prefrontal cortex and thalamus.

However, this is reversible.

There are tools that use plasticity to help us to rewire our brains to reduce pain

Sensory retraining, CBT, brain retraining, brain rewiring, etc can reduce pain using brains plasticity to change the neural pathways in the brain that contribute to the pain experience

Pain can be learned by the brain, but also unlearned.

https://pmc.ncbi.nlm.nih.gov/articles/PMC3268359

https://pubmed.ncbi.nlm.nih.gov/15548656/

Negativity Bias

When we are in pain, our limbic brains and nervous systems are hyper aroused, and we don't feel safe.

Our negativity bias goes into overdrive.

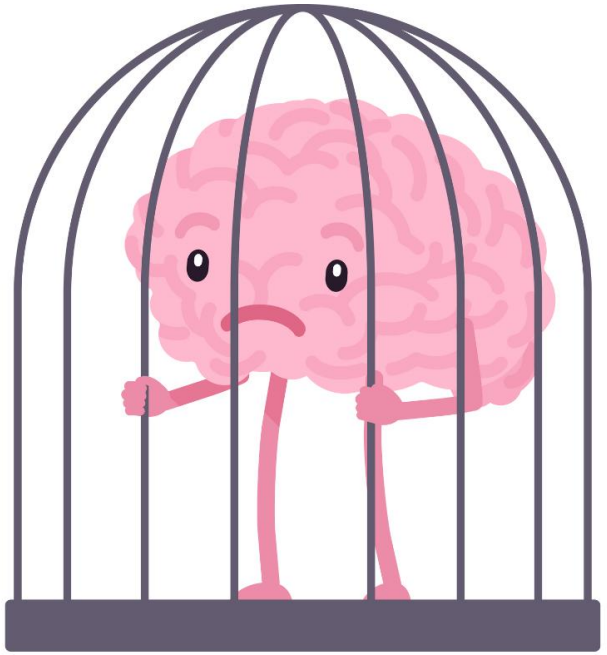
Our brains hyperfocus on the pain sensations, and magnifies them
The brain also hyper focuses on negative experiences
Even 'good' and 'happy' events are seen through a negative filter.
We lose touch with happy feelings.

This actives 'Flight or Fight' and makes pain worse.

We also worry a lot about pain all the time.
Studies show when we worry about pain, we upregulate the pain centres in the brain, making pain worse.

We need to rebalance the negativity bias, calm down the worrying brain, and teach the brain that things can be good as well as bad – duality. That joy can exist with pain.

This is NOT the same as toxic positivity.



https://pubmed.ncbi.nlm.nih.gov/10373114/

Joy

Happy feelings of joy engage reward and safety circuits and release endorphins/dopamine, and that reduces activation in pain-related brain regions and lowers the experience of pain.

Dials down the negativity bias

Studies show that feeling joy and pleasant experiences downregulate the pain centres in the brain.

We need to find joy alongside pain

Duality – both are possible.

Looking for glimmers

Noticing good things

Feeling gratitude

Find practical ways to keep doing what's important to you and live the life you want to live despite the pain.

https://pubmed.ncbi.nlm.nih.gov/18354400/

Connection to the Body

The work can't all be done with our brain – we need to connect brain and body together

When we live with pain, we tend to disconnect from our bodies.

According to Dr Peter Levine, we must involve the body – no one can heal without using the body.
We can learn how to reconnect with your body's resources
Self-regulation is wired into the nervous system and capacity for resilience exists within all of us.

Various practices can gently encourage us to become 'embodied' and reconnected to our physical resources once again.

We must befriend the body, lean to trust it even when it feels bad.

We have to re-recruit the body to be on our side.

Body an ally in healing, not an enemy

– Peter Levine

Summary

None of this magically makes pain go away

But can modify pain signals and improve our quality of life

- Help with improved sleep
- Improved muscle relaxation
- Reduce nervous system sensitivity
- Reduced pain hypervigilance
- Rewire the brain
- Give us a sense of empowerment and regaining a sense of control over pain

Keep In Touch

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The End

Thank you for Listening

Any Questions?