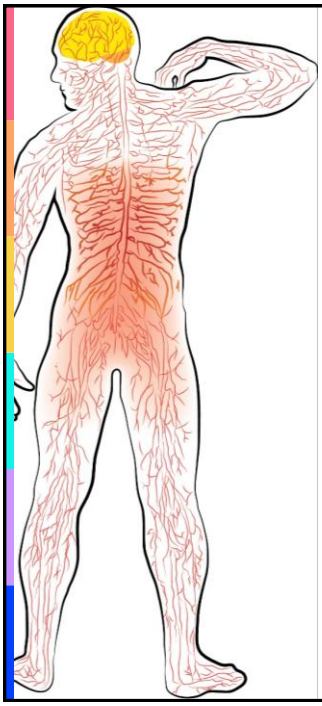

Do all patients need PNE?

← Look who you're asking!

Adriaan Louw, PT, PhD

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1

It (Obviously) Depends…

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2

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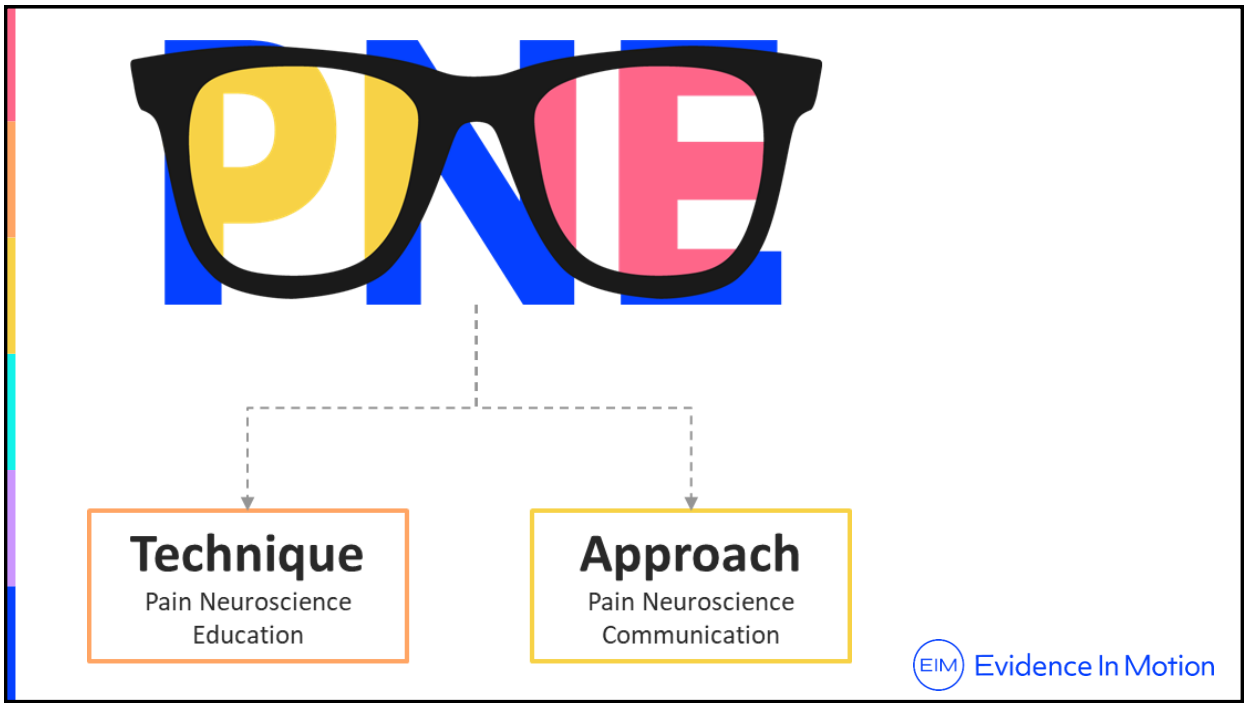

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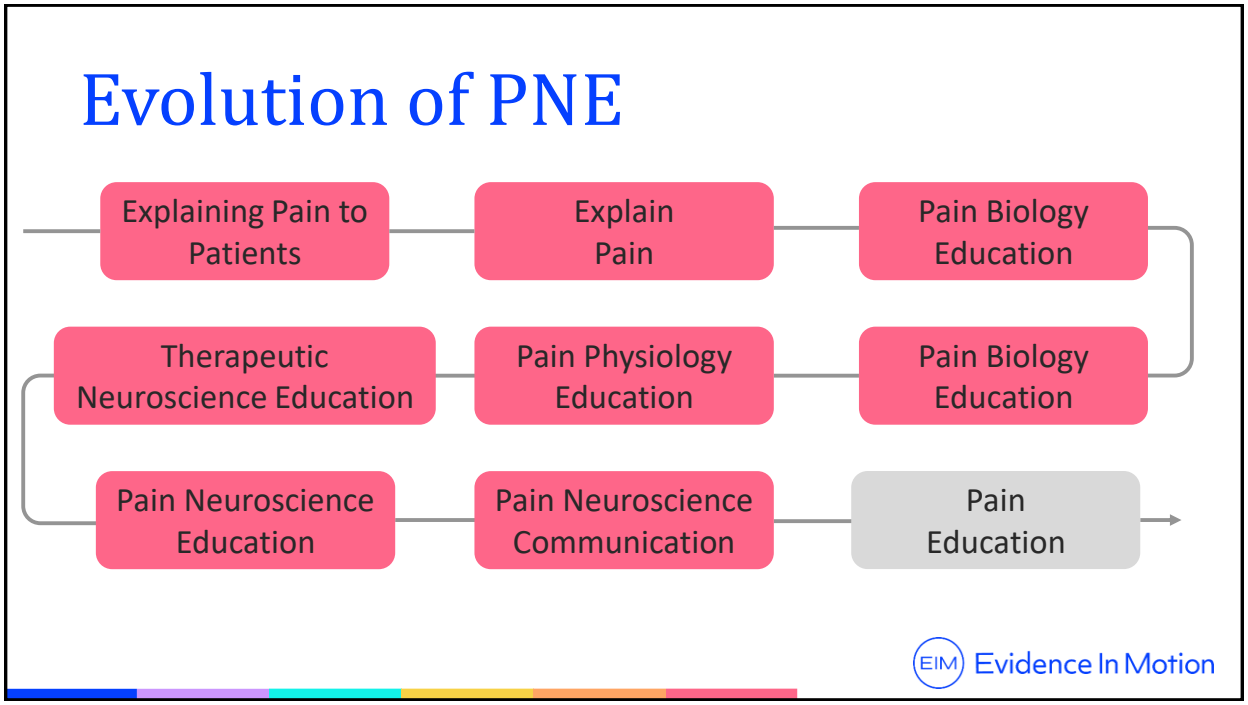

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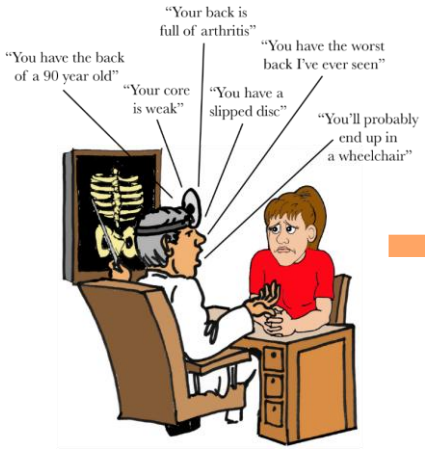
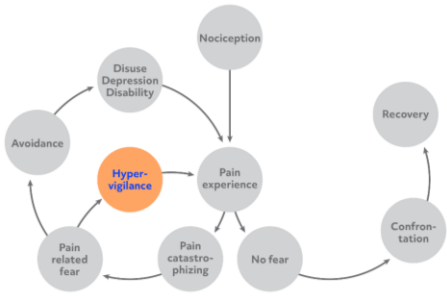
What is PNE?





van Meulenbroek, T., et al. (2021). "Exploring the underlying mechanism of pain-related disability in hypermobile adolescents with chronic musculoskeletal pain." Scand J Pain 21(1): 22-31.

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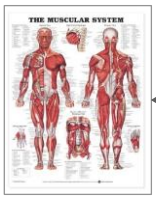
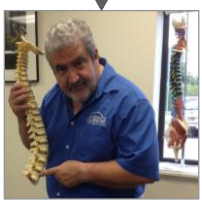
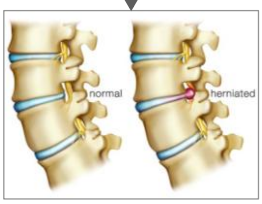
5

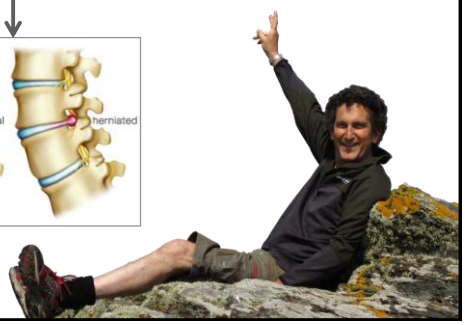
The "Ah-ha" Moment…(for us)



Low Back Pain







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Moseley, G. L. (2003). "Unravelling the barriers to reconceptualisation of the problem in chronic pain: the actual and perceived ability of patients and health professionals to understand the neurophysiology." J Pain 4(4): 184-189.

6

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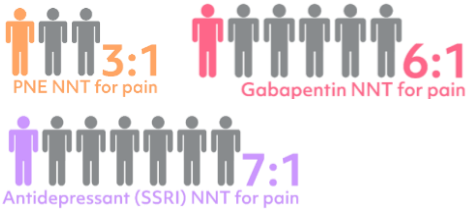
PNE Evidence

> 3 Dozen Systematic Reviews:

- ✓Pain ratings
- ✓Pain knowledge
- ✓Disability
- ✓Pain catastrophizing
- ✓Fear-avoidance
- ✓Attitudes, beliefs & behaviors regarding pain
- ✓Physical movement
- ✓Healthcare utilization/cost

PNE NNT superior to current "gold-standard" medication for chronic pain



Nunez-Cortes, R., et al. (2024). "The optimal dose of pain neuroscience education added to an exercise programme for patients with chronic spinal pain: a systematic review and dose-response meta-analysis." Pain 165(6): 1196-1206.

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Ordonez-Mora, L. T., et al. (2022). "Effectiveness of Interventions Based on Pain Neuroscience Education on Pain and Psychosocial Variables for Osteoarthritis: A Systematic Review." Int J Environ Res Public Health 19(5).

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Moore RA, Wiffen PJ, Derry S, McQuay HJ. Gabapentin for chronic neuropathic pain and fibromyalgia in adults. The Cochrane database of systematic reviews. 2011(3):CD007938.

Lynch ME, Watson CP. The pharmacotherapy of chronic pain: a review. Pain research & management. Spring 2006;11(1):11-38.

Moseley L. Combined physiotherapy and education is efficacious for chronic low back pain. Aust J Physiother. 2002;48(4):297-302.

7

PNE: Delivery Methods

Professionals: All HC providers

Duration and frequency: 10-15 minutes; 1-2x/week

Educational tools: Prepared pictures, **metaphors**, hand drawings and/or workbook with reading/questions and answers

Delivery:

- Verbal, one-on-one: More complex cases
- Groups: Less complicated
- Telehealth: Rural, cost and reach

Louw A, Diener I, Butler DS, Puentedura EJ. The effect of neuroscience education on pain, disability, anxiety, and stress in chronic musculoskeletal pain. Archives of physical medicine and rehabilitation. Dec 2011;92(12):2041-2056.

Moseley L. Combined physiotherapy and education is efficacious for chronic low back pain. Aust J Physiother. 2002;48(4):297-302.

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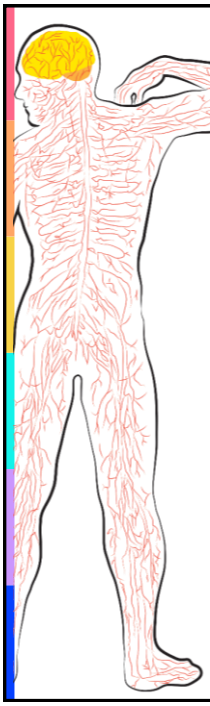

Pain Neuroscience Education

Persistent Pain	→	Sensitive Alarm Story
Spreading Pain	→	Nosy Neighbor Story
Fatigue/Sleep Issues	→	Lion Story
Mental Fog/Memory Loss	→	Brain Meeting Story
Cold/Stress Sensitivity	→	Nerve Sensor Story

Louw A, Butler DS, Diener I, Puentedura EJ. Development of a preoperative neuroscience educational program for patients with lumbar radiculopathy. American journal of physical medicine & rehabilitation / Association of Academic Physiatrists. May 2013;92(5):446-452.

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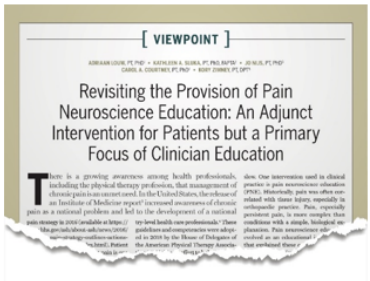
9

PNE+ (Physical Treatment)

This review presents moderate evidence that the **addition of PNE** to usual PT intervention in patients with CLBP improves disability in the short term.

The results of this systematic review support the conclusion that utilizing PNE strategies **in conjunction with** interventions provided by PT's demonstrates a moderate to large effect sizes on pain and disability constructs but lack pooled statistical significance


[VIEWPOINT]

Revisiting the Provision of Pain Neuroscience Education: An Adjunct Intervention for Patients but a Primary Focus of Clinician Education

Wood, L. and P. A. Hendrick A systematic review and meta-analysis of pain neuroscience education for chronic low back pain: Short-and long-term outcomes of pain and disability. Eur J Pain 23(2): 234-249.

Marris, D., K. Theophanous, et al. The impact of combining pain education strategies with physical therapy interventions for patients with chronic pain: A systematic review and meta-analysis of randomized controlled trials. Physiother Theory Pract: 1-12.

Louw, A., et al. (2021). "Revisiting the Provision of Pain Neuroscience Education: An Adjunct Intervention for Patients but a Primary Focus of Clinician Education." J Orthop Sports Phys Ther 51(2): 57-59.

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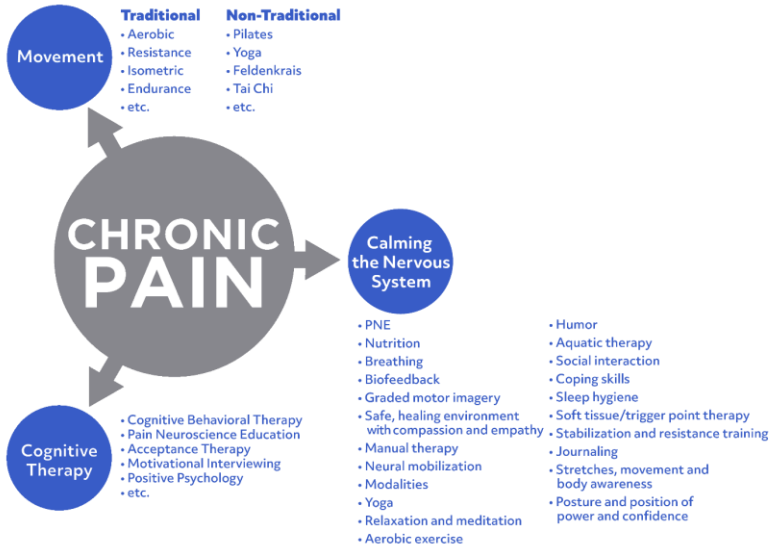
Bringing us to…

Current Best-Evidence

- ✓ Change cognitions – fear, catastrophizing, etc.
- ✓ Movement
- ✓ Calm the nervous system



Louw, A., et. al. Journal of No Need to Study Anymore 2024

11

Back to our Original Question

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12

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PNE

Who Needs PNE?

A. Central sensitization (Nociplastic Pain)
B. Chronic pain
C. Patients with high levels of fear
D. Patients displaying various pain catastrophizing characteristics
E. Patients ready to change

Louw A, Zimney K, O'Hotto C, Hilton S. The clinical application of teaching people about pain. *Physiotherapy Theory and Practice.* Jul 2016;32(5):385-395.

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Rocha, M. and E. G. Hapidou (2020). "Further Examination of the Pain stages of Change Questionnaires Among Chronic Low Back Pain Patients: Long-Term Predictive Validity of Pretreatment and Posttreatment Change Scores and Stability of Posttreatment Scores." Clin J Pain 36(2): 142.

Dysvik, E., et al. (2010). "The effectiveness of a multidisciplinary pain management programme managing chronic pain on pain perceptions, health-related quality of life and stages of change--A non-randomized controlled study." Int J Nurs Stud 47(7): 826-835.

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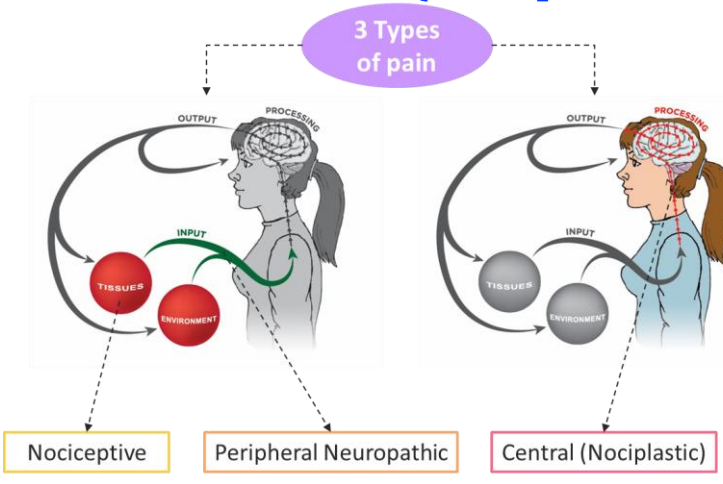
13

PNE

A. Central Sensitization (Nociplastic Pain)



Shraim, M. A., et al. (2020). "Systematic Review and Synthesis of Mechanism-based Classification Systems for Pain Experienced in the Musculoskeletal System." Clin J Pain 36(10): 793-812.

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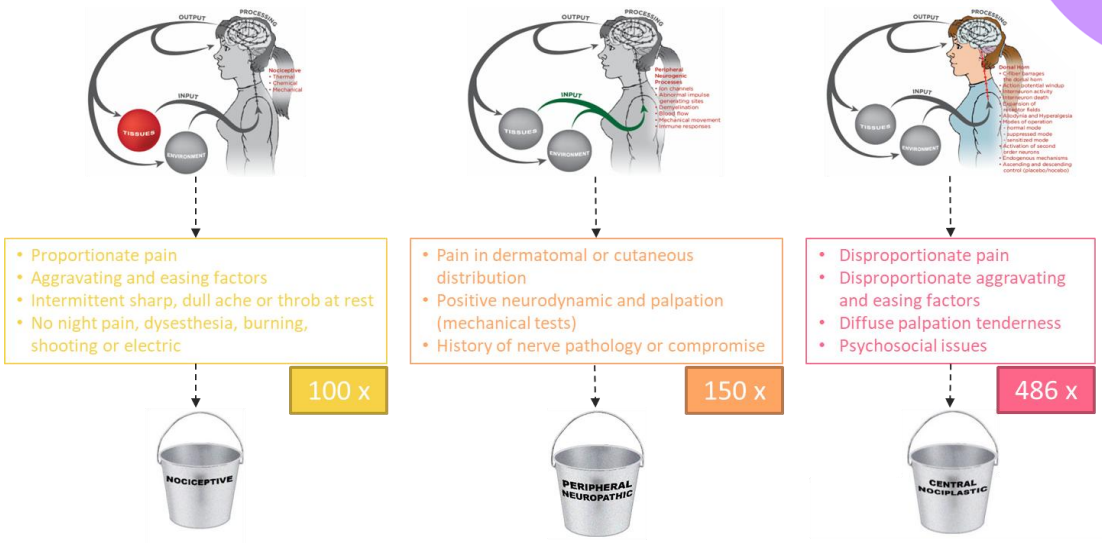
A. Central Sensitization (Nociplastic Pain)

PNE



Smart KM, Blake C, Staines A, Thacker M, Doody C. Mechanisms-based classifications of musculoskeletal pain: Part 1 of 3: Symptoms and signs of central sensitisation in patients with low back (+/-leg) pain. Manual therapy. Aug 2012;17(4):336-344.

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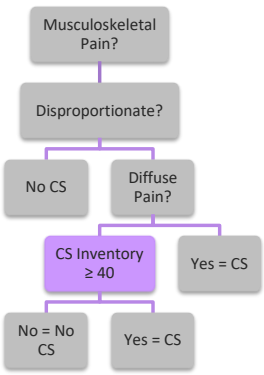
A. Central Sensitization (Nociplastic Pain)

PNE

Central Sensitization Inventory (CSI)



Scale range is 0-100
Answers and scoring method
- Never = 0
- Rarely = 1
- Sometimes = 2
- Often = 3
- Always = 4

1. I feel tired and unrefreshed when I wake from sleeping.
2. My muscles feel stiff and achy.
3. I have anxiety attacks.
4. I grind or clench my teeth.
5. I have problems with diarrhea and/or constipation.
6. I need help in performing my daily activities.
7. I am sensitive to bright lights.
8. I get tired very easily when I am physically active.
9. I feel pain all over my body.
10. I have headaches.
11. I feel discomfort in my bladder and/or burning when I urinate.
12. I do not sleep well.
13. I have difficulty concentrating.
14. I have skin problems such as dryness, itchiness, or rashes.
15. Stress makes my physical symptoms get worse.
16. I feel sad or depressed.
17. I have low energy.
18. I have muscle tension in my neck and shoulders.
19. I have pain in my jaw.
20. Certain smells, such as perfumes, make me feel dizzy and nauseated.
21. I have to urinate frequently.
22. My legs feel uncomfortable and restless when I am trying to go to sleep at night.
23. I have difficulty remembering things.
24. I suffered trauma as a child.
25. I have pain in my pelvic area.

Mayer TG, Neblett R, Cohen H, et al. The development and psychometric validation of the central sensitization inventory. Pain Pract. Apr 2012;12(4):276-285.

Nijs J, Van Houdenhove B, Oostendorp RA. Recognition of central sensitization in patients with musculoskeletal pain: Application of pain neurophysiology in manual therapy practice. Man Ther. Apr 2010;15(2):135-141.

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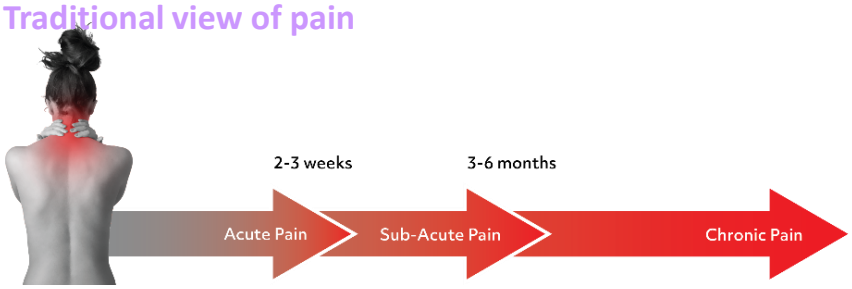
PNE

B. Chronic Pain

Traditional view of pain



Klyne, D. M., et al. (2019). "Are Signs of Central Sensitization in Acute Low Back Pain a Precursor to Poor Outcome?" J Pain **20**(8): 994-1009.

Woolf, C. J. (2007). "Central sensitization: uncovering the relation between pain and plasticity." Anesthesiology 106(4): 864-867.

Stavrinou, M. L., et al. (2007). "Temporal dynamics of plastic changes in human primary somatosensory cortex after finger webbing." Cereb Cortex 17(9): 2134-2142.

Moseley, G. L., et al. (2014). "Intense pain soon after wrist fracture strongly predicts who will develop complex regional pain syndrome: prospective cohort study." The journal of pain : official journal of the American Pain Society 15(1): 16-23.

Beggs, S., et al. (2010). "Peripheral nerve injury and TRPV1-expressing primary afferent C-fibers cause opening of the blood-brain barrier." Molecular pain 6: 74.

Archer, K. R., et al. (2014). "Early postoperative fear of movement predicts pain, disability, and physical health six months after spinal surgery for degenerative conditions." The spine journal : official journal of the North American Spine Society 14(5): 759-767.

Moseley, G. L. and J. W. Vlaeyen (2015). "Beyond nociception: the imprecision hypothesis of chronic pain." Pain 156(1): 35-38.

Traeger, A. C., et al. (2015). "Effect of Primary Care-Based Education on Reassurance in Patients With Acute Low Back Pain: Systematic Review and Meta-analysis." JAMA internal medicine 175(5): 733-743.

Williams, C. M., et al. (2014). "Predicting rapid recovery from acute low back pain based on the intensity, duration and history of pain: a validation study." European journal of pain 18(8): 1182-1189.

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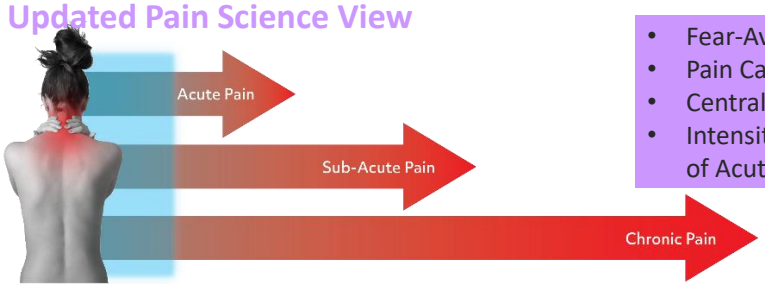
PNE

B. Chronic Pain

Updated Pain Science View



- Fear-Avoidance
- Pain Catastrophizing
- Central Sensitization
- Intensity and Duration of Acute Pain

Klyne, D. M., et al. (2019). "Are Signs of Central Sensitization in Acute Low Back Pain a Precursor to Poor Outcome?" J Pain **20**(8): 994-1009.

Woolf, C. J. (2007). "Central sensitization: uncovering the relation between pain and plasticity." Anesthesiology 106(4): 864-867.

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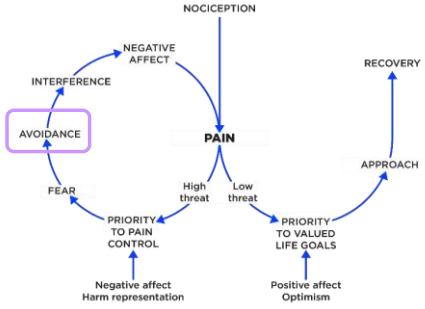
PNE

C. Fear Avoidance

2000

Vlaeyen JWS, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. Pain. 2000;85:317-322.



2016

Vlaeyen, J. W., et al. (2016). "The fear-avoidance model of pain." Pain 157(8): 1588-1589.

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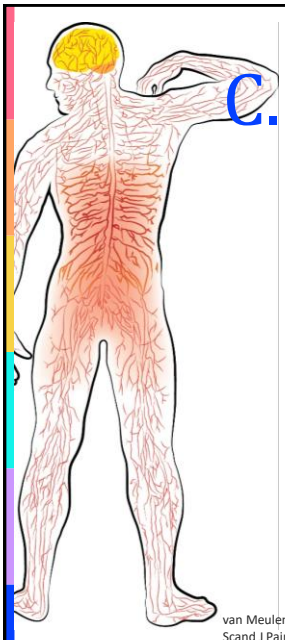
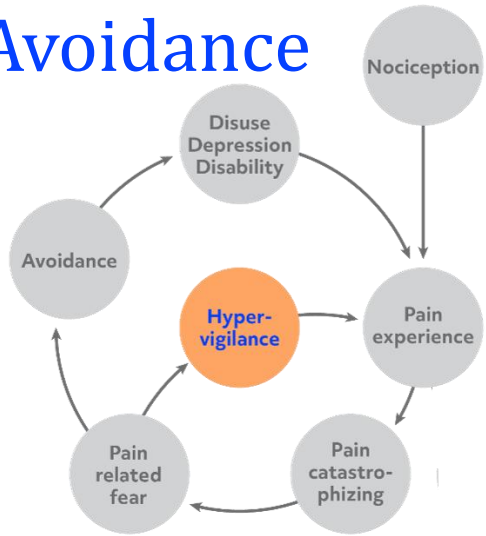


C. Fear Avoidance



van Meulenbroek, T., et al. (2021). "Exploring the underlying mechanism of pain-related disability in hypermobile adolescents with chronic musculoskeletal pain." Scand J Pain 21(1): 22-31.

Stewart M, Loftus S. Sticks and stones: the impact of language in musculoskeletal rehabilitation. journal of orthopaedic & sports physical therapy. 2018;48(7):519-522.

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PNE

C. Fear Avoidance

Fear-Avoidance Beliefs Questionnaire
- Low Back
- Non-Low Back

→ FABQ-PA > 15
FABQ-WS > 34

Tampa Scale of Kinesiophobia → TSK > 37

Multi-disciplinary and interdisciplinary care

Cognitive therapy i.e., CBT, PNE, MI, ACT, etc.

Fritz JM, George SZ. Identifying psychosocial variables in patients with acute work-related low back pain: the importance of fear-avoidance beliefs. Physical therapy. Oct 2002;82(10):973-983.
Vlaeyen, J. W., et al. (1995). "Fear of movement/(re)injury in chronic low back pain and its relation to behavioral performance." Pain 62(3): 363-372.

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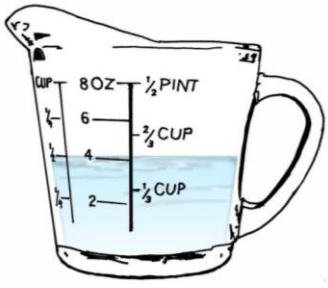
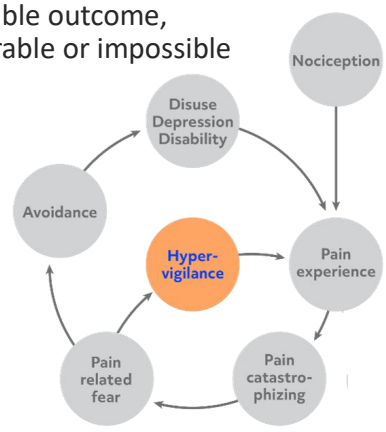
PNE

D. (Pain) Catastrophizing

Inability to foresee anything other than the worst possible outcome, however unlikely, or experiencing a situation as unbearable or impossible when it is just uncomfortable





Moseley GL, Hodges PW, Nicholas MK. A randomized controlled trial of intensive neurophysiology education in chronic low back pain. Clinical Journal of Pain. 2004;20:324-330.

Sullivan MJL, Bishop SR, Pivak J. The pain catastrophizing scale: Development and validation. Psychol Assess. 1995;7:524-532.

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PNE

D. (Pain) Catastrophizing

Impaired beliefs regarding pain:

- Pain is always bad
- All pain must be gone before engaging in normal activity and movement
- Passive treatment is the answer
- Pain will increase with any/all activity
- Work is potentially harmful

Sloan TJ, Walsh DA. Explanatory and diagnostic labels and perceived prognosis in chronic low back pain. Spine. Oct 1 2010;35(21):E1120-1125.

Mutsaers JH, Peters R, Pool-Goudzwaard AL, Koes BW, Verhagen AP. Psychometric properties of the Pain Attitudes and Beliefs Scale for Physiotherapists: A systematic review. Manual therapy. Jan 23 2012.

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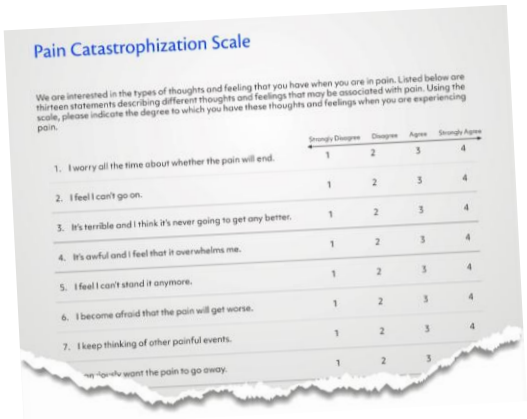
D. (Pain) Catastrophizing

Pain Catastrophization Scale (PCS)



Pain Catastrophization Scale

We are interested in the types of thoughts and feeling that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I worry all the time about whether the pain will end.	1	2	3	4
2. I feel I can't go on.	1	2	3	4
3. It's terrible and I think it's never going to get any better.	1	2	3	4
4. It's awful and I feel that it overwhelms me.	1	2	3	4
5. I feel I can't stand it anymore.	1	2	3	4
6. I become afraid that the pain will get worse.	1	2	3	4
7. I keep thinking of other painful events.	1	2	3	4
[illegible] want the pain to go away.	1	2	3	

PCS > 30

Multi-disciplinary and interdisciplinary care

Cognitive therapy i.e., CBT, **PNE**, MI, ACT, etc.

Sullivan MJL, Bishop SR, Pivak J. The pain catastrophizing scale: Development and validation. Psychol Assess. 1995;7:524-532.

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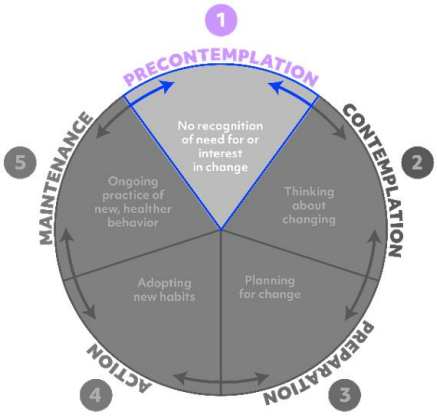
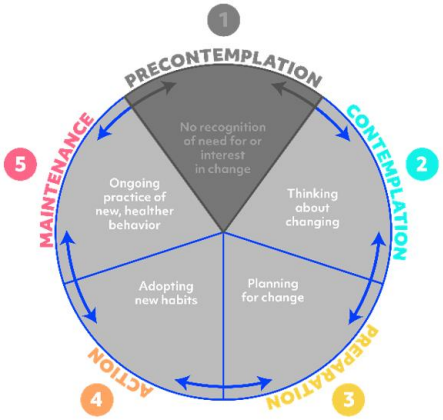
PNE

Who Needs PNE?





Prochaska JO, DiClemente CC. Stages of change in the modification of problem behaviors. *Progress in Behavioral Modification.* 1992;28:183-218.

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Dysvik, E., et al. (2010). "The effectiveness of a multidisciplinary pain management programme managing chronic pain on pain perceptions, health-related quality of life and stages of change--A non-randomized controlled study." Int J Nurs Stud 47(7): 826-835.

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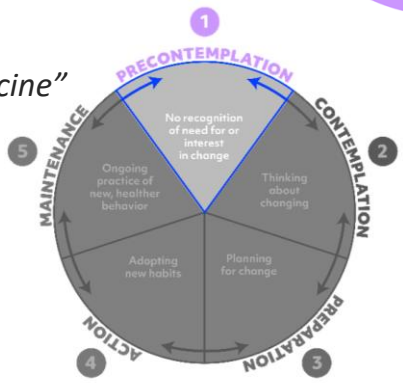
E. Ready to Change

Pre-contemplative:

- *"I am only here so the doctor will give me my medicine"*
- *"I am only her because work-comp sent me"*
- *"I am only here to get my wife off my back"*



Prochaska JO, DiClemente CC. Stages of change in the modification of problem behaviors. *Progress in Behavioral Modification.* 1992;28:183-218.

Rocha, M. and E. G. Hapidou (2020). "Further Examination of the Pain stages of Change Questionnaires Among Chronic Low Back Pain Patients: Long-Term Predictive Validity of Pretreatment and Posttreatment Change Scores and Stability of Posttreatment Scores." Clin J Pain 36(2): 142.

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PNE

E. Ready to Change

What do we do with pre-contemplators?

- Compassion, empathy respect and dignity
- Built therapeutic alliance and trust
- Non-cognitive interventions
  - ROM
  - Exercise
  - Movement

They're not bad people. We're just catching them at a different part of their (pain) journey

Prochaska JO, DiClemente CC. Stages of change in the modification of problem behaviors. *Progress in Behavioral Modification.* 1992;28:183-218.

Rocha, M. and E. G. Hapidou (2020). "Further Examination of the Pain stages of Change Questionnaires Among Chronic Low Back Pain Patients: Long-Term Predictive Validity of Pretreatment and Posttreatment Change Scores and Stability of Posttreatment Scores." Clin J Pain 36(2): 142.

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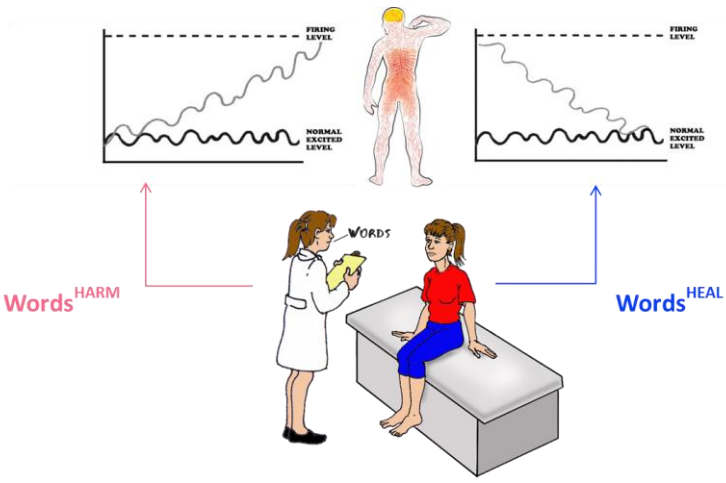
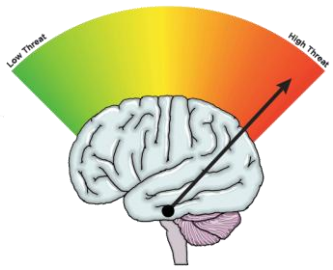
PNC

Words that Harm and Heal





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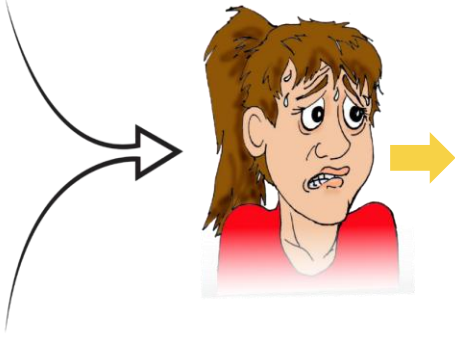
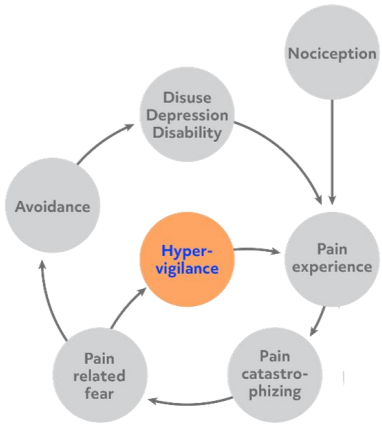
Words that Harm and Heal

Fear and fear-avoidance





van Meulenbroek, T., et al. (2021). "Exploring the underlying mechanism of pain-related disability in hypermobile adolescents with chronic musculoskeletal pain." Scand J Pain 21(1): 22-31.

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Words that Harm and Heal

(Pain) Catastrophizing

- ✓ Pain is always bad
- ✓ All pain must be gone before engaging in normal activity and movement
- ✓ Passive treatment is the answer

Anti-opioid and anti-cannabinoid result

Increased emotional circuits: decreased trust in healthcare providers

Mutsaers JH, Peters R, Pool-Goudzwaard AL, Koes BW, Verhagen AP. Psychometric properties of the Pain Attitudes and Beliefs Scale for Physiotherapists: A systematic review. Manual therapy. Jan 23 2012.

Benedetti F, Thoen W, Blanchard C, Vighetti S, Arduino C. Pain as a reward: changing the meaning of pain from negative to positive co-activates opioid and cannabinoid systems. Pain. Mar 2013;154(3):361-367.

Hashmi JA, Baliki MN, Huang L, et al. Shape shifting pain: chronification of back pain shifts brain representation from nociceptive to emotional circuits. Brain : a journal of neurology. Sep 2013;136(Pt 9):2751-2768.

Benedetti F. Placebo and the new physiology of the doctor-patient relationship. Physiol Rev. Jul 2013;93(3):1207-1246.

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"You're going to be OK"

Thomas KB. General practice consultations: is there any point in being positive? Br Med J. May 9 1987;294(6581):1200-1202.

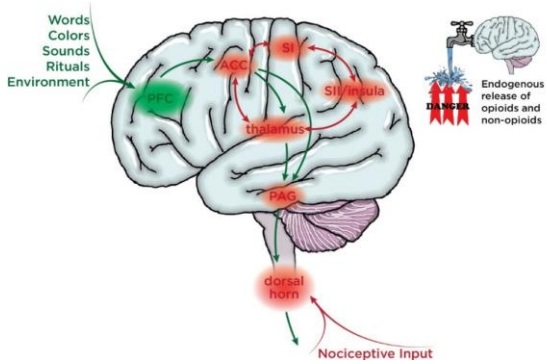
"Reassurance is analgesic"

Ronaldson A, Poole L, Kidd T, Leigh E, Jahangiri M, Steptoe A. Optimism measured pre-operatively is associated with reduced pain intensity and physical symptom reporting after coronary artery bypass graft surgery. Journal of psychosomatic research. Oct 2014;77(4):278-282.

Boselie JJ, Vancleef LM, Smeets T, Peters ML. Increasing optimism abolishes pain-induced impairments in executive task performance. Pain. Feb 2014;155(2):334-340.

Loss-to-gain:

Activation of opioid and cannabinoid systems



Benedetti F, Thoen W, Blanchard C, Vighetti S, Arduino C. Pain as a reward: changing the meaning of pain from negative to positive co-activates opioid and cannabinoid systems. *Pain.* Mar 2013;154(3):361-367.

Colloca L, Klinger R, Flor H, Bingel U. Placebo analgesia: psychological and neurobiological mechanisms. *Pain.* Apr 2013;154(4):511-514.

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Words that Harm and Heal

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Author	Year	Finding
Witherow	2022	Decreased prescription/ use of opioids
Fried	2018	Decreased spine surgeon referrals Decreased repeat imaging
McCullough	2012	Decreased use of narcotics
Ash	2008	No difference

Witherow, J. L., et al. (2022). "Characteristics and Effectiveness of Interventions That Target the Reporting, Communication, or Clinical Interpretation of Lumbar Imaging Findings: A Systematic Review." AJNR Am J Neuroradiol 43(3): 493-500.

Fried, J. G., et al. (2018). "Changes in Primary Care Health Care Utilization after Inclusion of Epidemiologic Data in Lumbar Spine MR Imaging Reports for Uncomplicated Low Back Pain." Radiology 287(2): 563-569.

McCullough, B. J., et al. (2012). "Lumbar MR imaging and reporting epidemiology: do epidemiologic data in reports affect clinical management?" Radiology 262(3): 941-946.

Ash, L. M., et al. (2008). "Effects of diagnostic information, per se, on patient outcomes in acute radiculopathy and low back pain." AJNR Am J Neuroradiol 29(6): 1098-1103.

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Words to Avoid	Alternatives
Chronic degenerative changes	Normal age changes
Negative test results	Everything appears normal
Instability	Needs more strength and control
Wear and tear	Normal age changes
Neurological	Nervous system
Don't worry	Everything will be okay
Bone on bone	Narrowing and tightness
Tear	Pull
Damage	Reparable harm
Paresthesia	Altered sensation
Trapped nerve	Tight, but can be stretched
Lordosis	Normal curve of your back
Kyphosis	Normal curve of your back
Bulge/herniation	Bump/swelling
Disease	Condition
Effusion	Swelling
Chronic	It may persist, but can be overcome
Diagnostics	X-ray or scan
You are going to have to live with this	You may need to make some adjustments

Stewart, M. and S. Loftus (2018). "Sticks and stones: the impact of language in musculoskeletal rehabilitation." journal of orthopaedic & sports physical therapy 48(7): 519-522.

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Answering Our Original Question

SOME (many) patients need PNE

ALL patients need PNC

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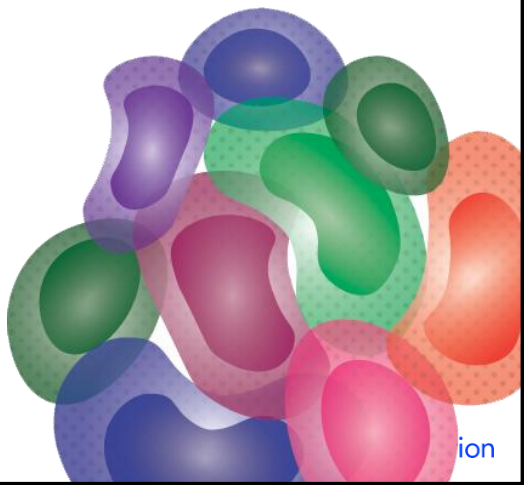
Pain ~~Neuroscience~~ Education

PE

Pain encompasses more than just neuroscience:

- Immunology
- Psychology
- Lifestyle medicine
- Social factors
- Etc.

Pain Education



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David Butler
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EIM staff and faculty

TNRG Therapeutic Neuroscience Research Group

UNLV University of Nevada Las Vegas

OPTP

Confluent Health

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Pain Science Courses at EIM

- Online, self-paced courses
- Online, faculty-led courses
- Live, in-person courses
- Pain certification
- Pain fellowship

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Patient Resources

OPTP
TOOLS FOR FITNESS. KNOWLEDGE FOR HEALTH.

- Free website with patient and clinician resources
- Interactive map to find Therapeutic Pain Specialists trained by EIM

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