

A modern understanding of

Pain

In athletes and non-athletes

Doha, Qatar | November 8th 2023

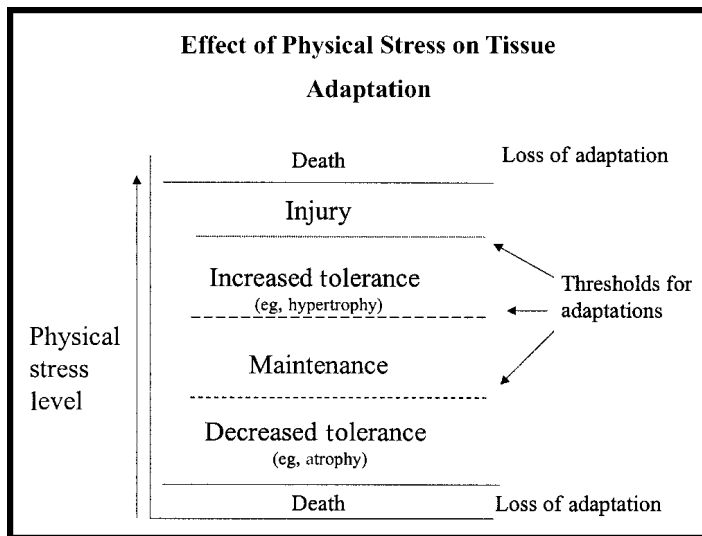
A/Prof **Morten Hoegh**, PhD MSc Pain
Specialist sports physiotherapist, EDPP RISPT DipMT

Why do we hurt?



How we have been told it is:

“...we do not know whether a tissue is about to be injured **until it begins to show signs of inflammation** (i.e., pain, heat, swelling, or redness)”

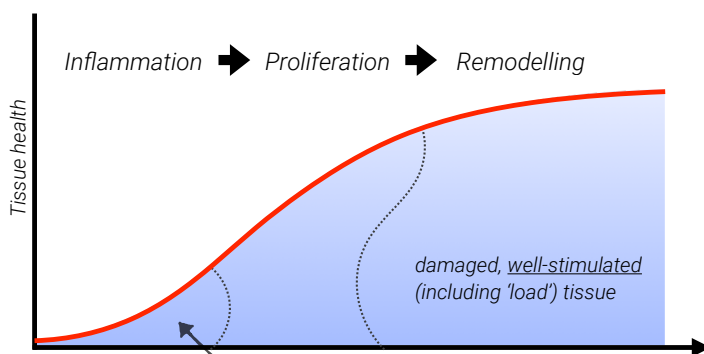


Mueller MJ, Maluf KS. Phys Ther. 2002 Apr;82(4):383-403. Tissue adaptation to physical stress: a proposed "Physical Stress Theory" to guide physical therapist practice, education, and research



Tissue healing and pain

Adapted from professor Tim Watson's website
<http://www.electrotherapy.org/modality/soft-tissue-repair-and-healing-review>



INJURIES LEAD TO INFLAMMATION, WHICH IS NOCICEPTIVE AND WILL LIKELY LEAD TO **PAIN**



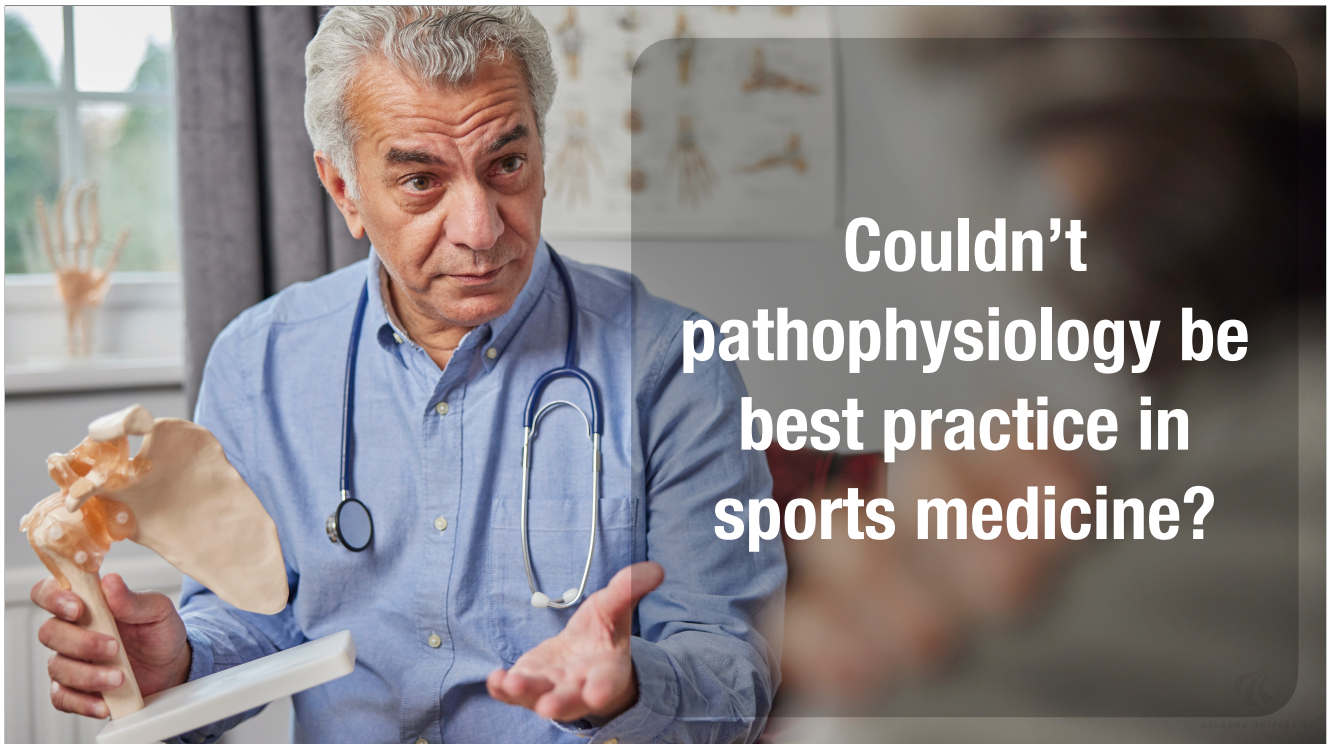
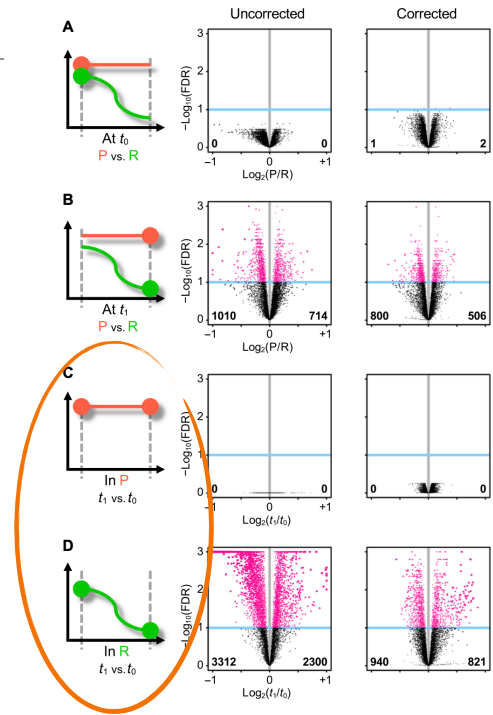
PAIN

Acute inflammatory response via neutrophil activation protects against the development of chronic pain

Marc Parisien^{1†}, Lucas V. Lima^{2†}, Concetta Dagostino^{3†}, Nehme El-Hachem¹, Gillian L. Drury¹, Audrey V. Grant¹, Jonathan Huising⁴, Vivek Verma¹, Carolina B. Meloto¹, Jaqueline R. Silva⁵, Gabrielle G. S. Dutra², Teodora Markova², Hong Dang⁶, Philippe A. Tessier⁷, Gary D. Slade⁸, Andrea G. Nackley⁹, Nader Ghasemlou⁵, Jeffrey S. Mogil^{2*}, Massimo Allegrì^{10,11*}, Luda Diatchenko^{1*}

“A total of **1700 genes** remained differentially expressed in those with resolved pain, whereas **in those with persistent pain**, there were still **no changes**”

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Diagnostic uncertainty

Soccer players with +6 weeks of groin pain

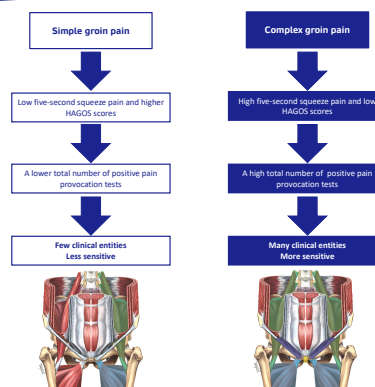
In male football players with longstanding groin pain, the **number of positive pain provocation tests and clinical entities** shows weak to strong correlations with pain intensity and disability”.

Nielsen MF, Ishøj L, Juhl C, Hölmich P, Thorborg K. Pain provocation tests and clinical entities in male football players with longstanding groin pain are associated with pain intensity and disability. *Musculoskelet Sci Pract.* 2023 Feb;63:102719

What do longstanding groin pain look like in the clinic?

Longstanding groin pain can be simple but can also be complex.

In our clinic, we see that patients with severe groin-related pain and disability (five-second-squeeze testing and HAGOS scores) have a higher number of positive pain provocation tests and several concomitant clinical entities of groin pain.



Take Home Message When groin-related pain and disability are severe, patients seem more sensitive to pain provocation tests, and have more clinical entities - this can be complex!

Scan the QR for combinations of clinical entities



Pain provocation tests and clinical entities in male footballers with longstanding groin pain are related to pain intensity and disability
Mads P. Nielsen, Louise Ishøj, Carsten Juhl, Per Hölmich, Kristian Thorborg
Published in *Musculoskeletal Science and Practice* (2023), available at <https://doi.org/10.1016/j.msksp.2023.102719>
Research Unit for Musculoskeletal Science and Practice, Department of Sports Science and Physical Therapy, University of Southern Denmark
Research Unit for Musculoskeletal Science and Practice, Department of Sports Science and Physical Therapy, University of Southern Denmark
Sports Orthopedic Research Center - Copenhagen



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Maybe **pain** is a separate **problem**?

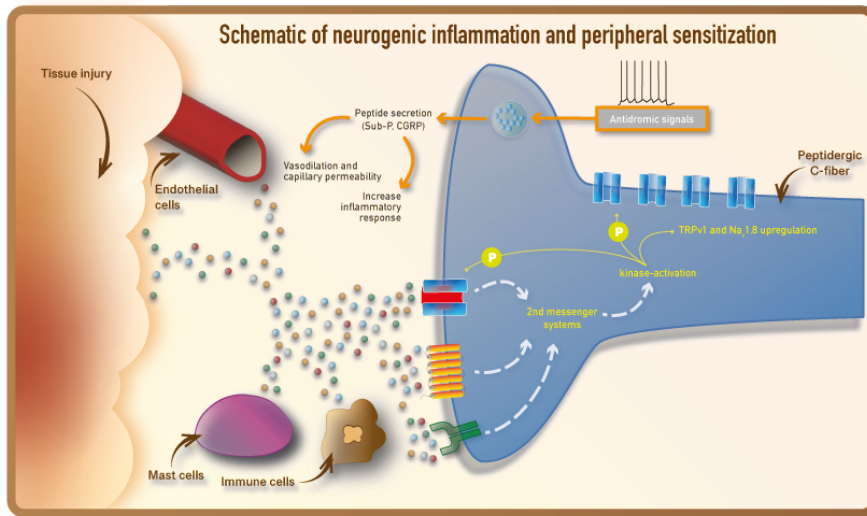
“

For every 1-point **worse baseline pain** (KOOS 0–100), there was approximately 3-points **worse sports-related disability at 6 months**”

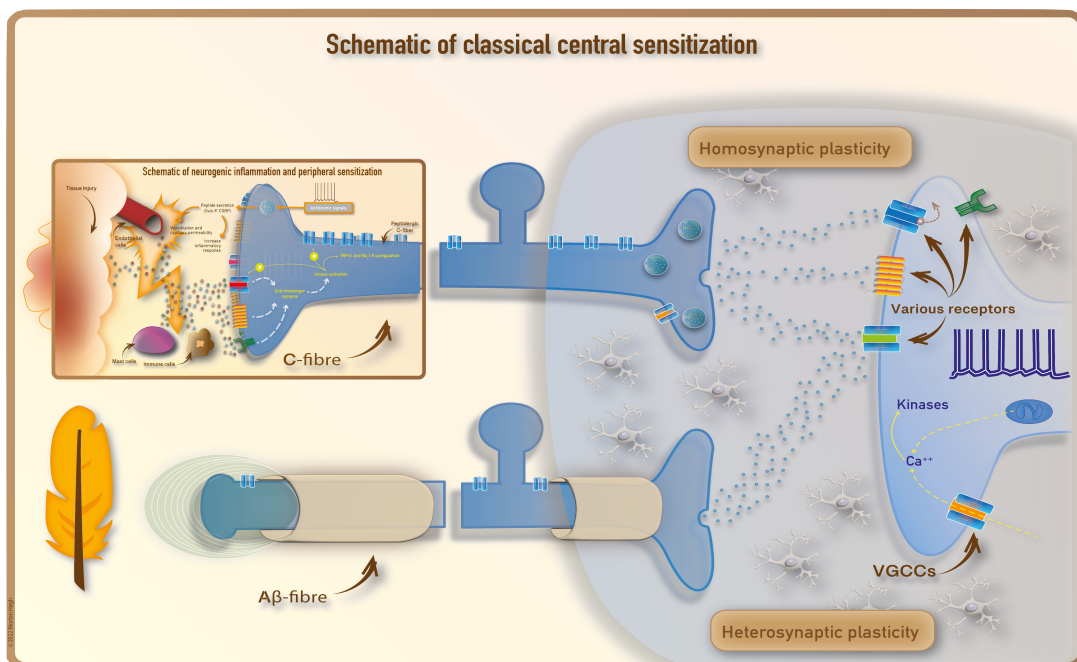
Holden S, et al. *British Journal of Sports Medicine* 2023;57:1388-1394.



Alternative explanations (aka "the nerves did it")



Hoegh M., Pain Science in Practice (Part 3): Peripheral Sensitization ; J Orthop Sports Phys Ther 2022;52(6):303-306.



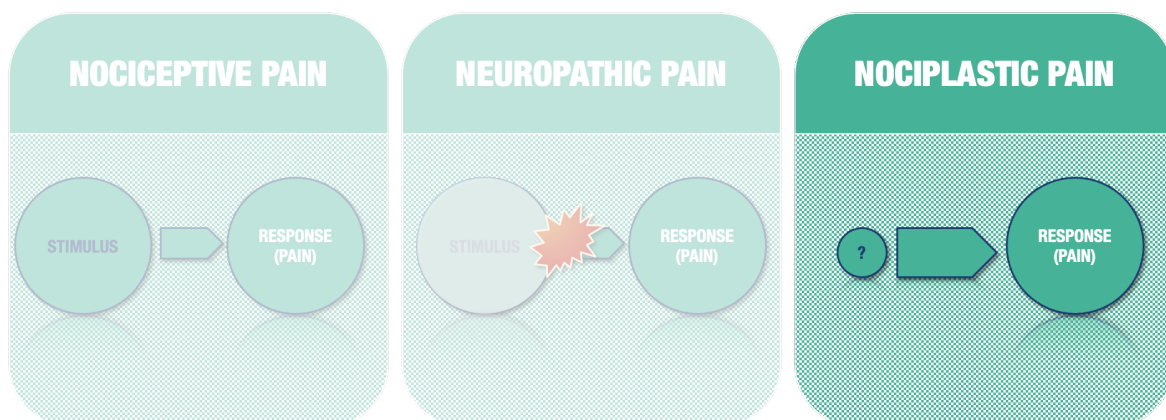
Hoegh M. Pain Science in Practice (Part 5): Central Sensitization. J Orthop Sports Phys Ther 2023;53(2):55-58.

Pain can be a sign of injury

- but not everything that hurts is an injury



Not all **pain** is **inflammatory**



An introduction to neuroscience for clinicians



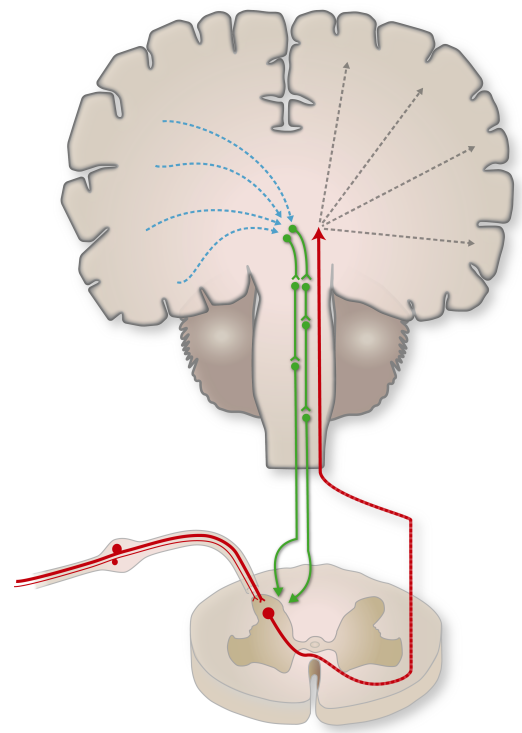
#PainScienceInPractice

Send an email to msh@hst.aau.dk if you want pdf-copies



Lessons learnt from pain research

- **Pain always feels like we're injured**, even when we are not - *Definition of pain, IASP 2011*
- We rely on **context and interoception** to protect ourselves, and pain is likely one of these protective responses (i.e., **we learn** through experience and culture)
- **Nociception** is the most studied aspect of pain, independent of the case ("publication bias")
- **Pain and nociception are not the same**, and therefore managing pain is different from managing nociception
- **Pain is complex**, and in many cases a "trigger" cannot be identified
- **What pain does to us** should guide management, when no mono-causal effect seems plausible



Injuries and pain are not managed the same way, unless nociception is the primary “driver” of the pain experience

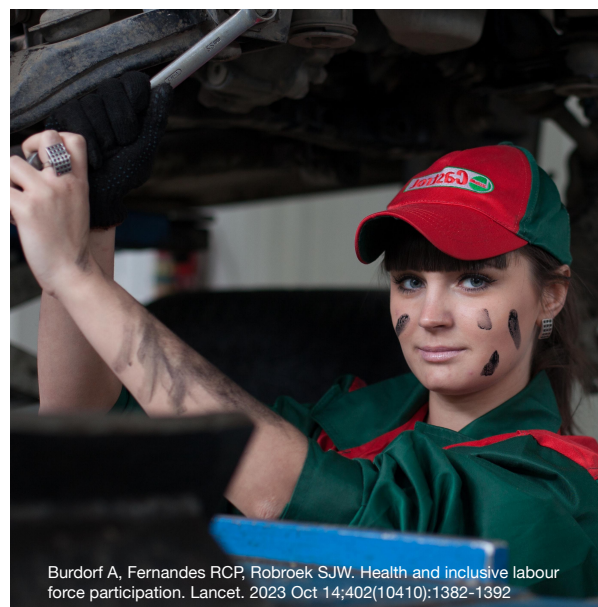


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Oplæg Doha - 8. november 2023

What can we learn from **vocational health research?**

- “In the treatment of people with disabling diseases, work should be considered as an essential part of the treatment protocol.”
- Instead of focusing on the inability to work when a person has health problems, employers, health-care professionals, policy makers, and the general public should be made aware that paid employment is an important social determinant of population health.



Burdorf A, Fernandes RCP, Robroek SJW. Health and inclusive labour force participation. Lancet. 2023 Oct 14;402(10410):1382-1392



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Oplæg Doha - 8. november 2023



If **work** is therapy,
maybe participation
in **sport** could be
the best way back
to sport...?



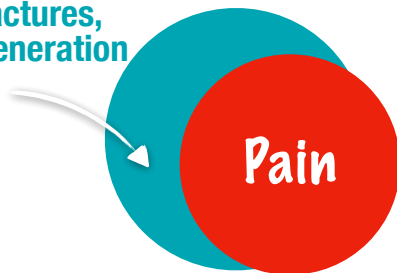
Infographic

Infographic. Pain or injury? Why differentiation matters in exercise and sports medicine

Morten Hoegh ,¹ Tasha Stanton,² Steven George,³ Kristian Damgaard Lyng,^{1,4} Sabina Vistrup,⁴ Michael Skovdal Rathleff^{1,4}

Sports-related injuries

Ruptures, fractures, bruises, degeneration etc.



Sports-related pain

Degeneration, abnormalities etc.



Hoegh M, et al. Pain or injury? Why differentiation matters in exercise and sports medicine. Br J Sports Med. 2022 Mar;56(5):299-300





“The biomedical approach to disease has been successful beyond all expectations, but at a cost.”

From: Engel GL. The need for a new medical model: a challenge for biomedicine. Science. 1977 Apr 8;196(4286):129-36



Athletes (patients) are experts on their own pain

Who am I and who should I be?

"I sometimes feel **ashamed or guilty** about having pain"

Athletic Identity

"If my coach knew... he wouldn't let me play"

Unpredictable

"My plans, expectations and dreams for the future are gone"

Invalidated


"Weakness is **not allowed**" and "They think I'm just **lazy**"

Diagnostic uncertainty

"Everyone is guessing - no-one knows!"




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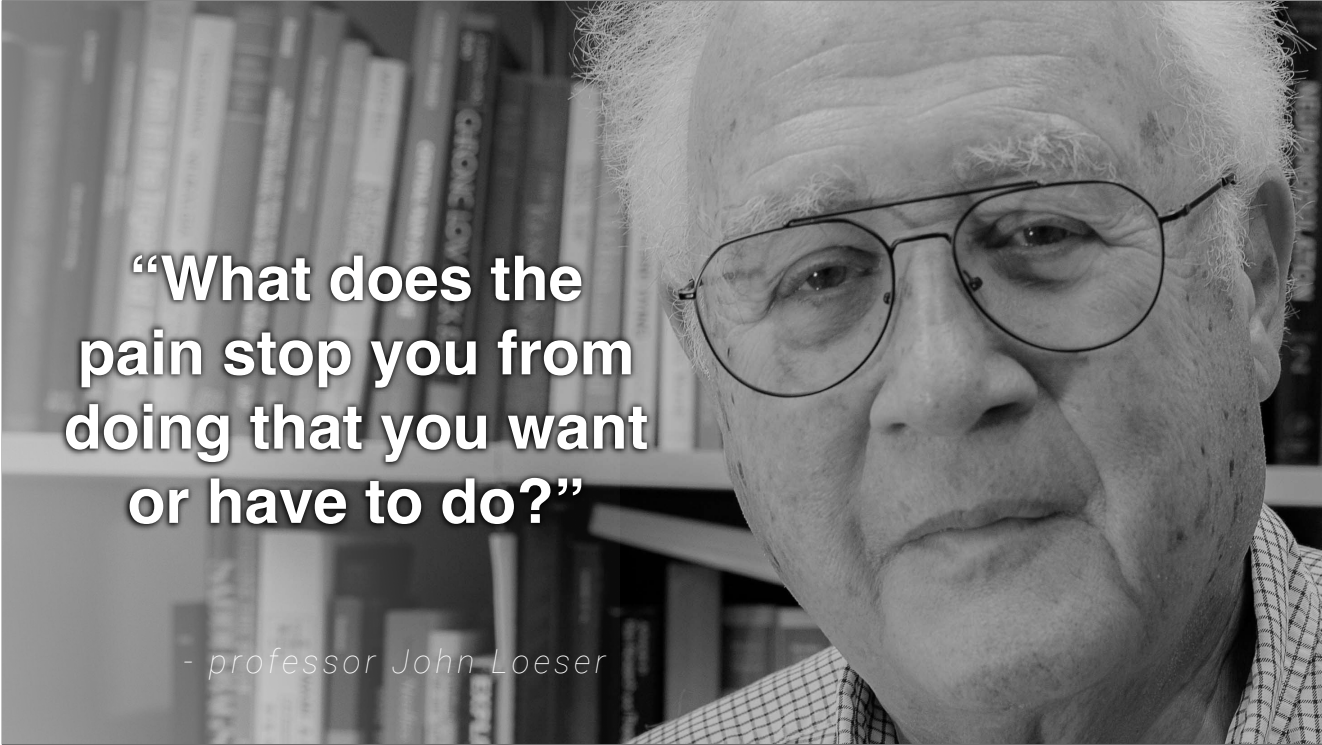
Stop fixing, start listening!

CAUSE ↔ **PAIN** → **CONSEQUENCES FOR YOU**

Why... How...



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A black and white close-up portrait of an elderly man with white hair and glasses, looking directly at the camera. He is wearing a checkered shirt. The background is a blurred bookshelf.

**“What does the
pain stop you from
doing that you want
or have to do?”**

- professor John Loeser

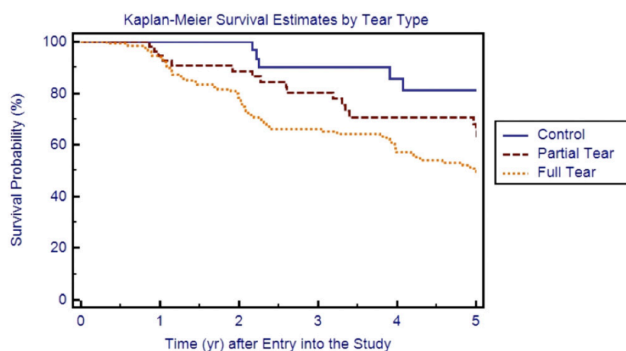
A photograph of a young man in a white soccer jersey and red shorts lying on his back on a grassy field. He is holding his right knee with both hands and has a pained expression on his face. A soccer ball is on the grass next to him.

Pain can be a sign of injury
- but not everything that hurts is an injury

First; Rule out pathology (Specific and serious)



Degeneration and shoulder pain



Number at risk	0	1	2	3	4	5
Group: Control	36	34	31	26	19	12
Group: Partial Tear	54	51	44	36	28	25
Group: Full Tear	129	120	93	68	58	45

Fig. 1
Kaplan-Meier annual survival curves for tear enlargement by final tear type.

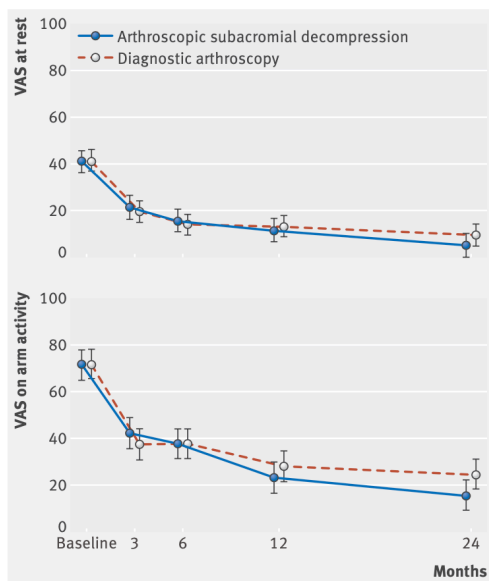
Keener JD, et al. A prospective evaluation of survivorship of asymptomatic degenerative rotator cuff tears. J Bone Joint Surg Am. 2015 Jan 21;97(2):89-98

“ Significant degeneration is present in **24 %** of **younger asymptomatic subjects** (23.4 ± 4.5 yrs)

Guffey JS, et al. Degenerative Changes in Asymptomatic Subjects. J Allied Health. 2018 Summer;47(2):152-155



Treatment effects in shoulder pain

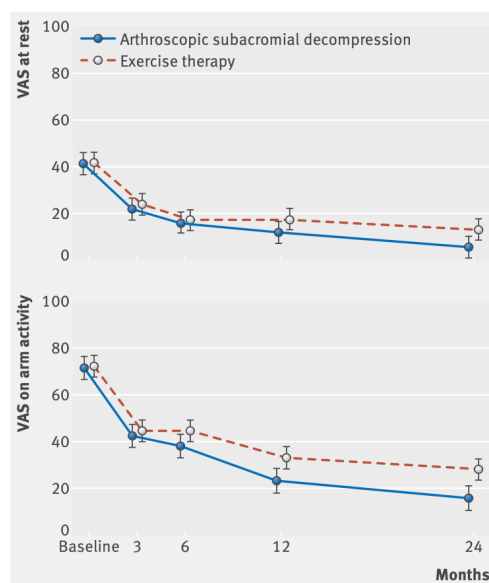


...Both arthroscopic subacromial decompression and diagnostic arthroscopy (placebo surgery) resulted in **significant improvements in pain and functional outcomes with no difference in the incidence of adverse events**

Paavola, M., et al. *BMJ* 2018;362:k2860



Treatment effects in shoulder pain



...statistically significant differences were found in favour of ASD [...] in the two primary outcomes at, but the **mean differences between groups did not exceed the pre-specified minimal clinically important difference.**

Paavola, M., et al. *BMJ* 2018;362:k2860



Treatment effects in shoulder pain

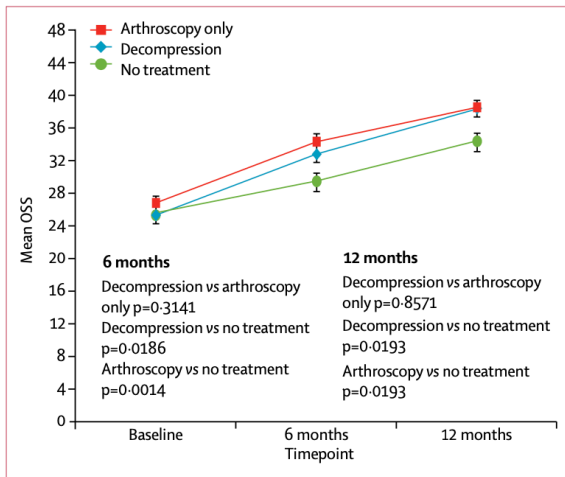


Figure 2: Oxford Shoulder Score in the intention-to-treat analyses
 Data are mean (95% CI) shown at follow-up timepoints. OSS=Oxford Shoulder Score.



...the findings from our study suggest that surgery might not provide clinically significant benefit over no treatment, and that there is no benefit of decompression over arthroscopy only."

Beard, BJ., et al. *Lancet* 2018; 391: 329–38



Maybe 🤔 ...patients don't do their job?

"time-under tension focus"

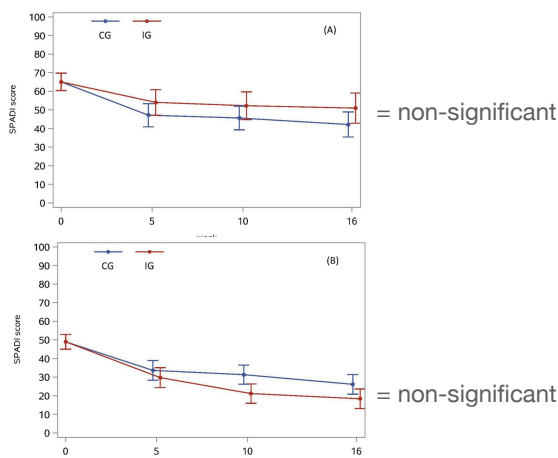


Figure 3: Shoulder Pain and Disability Index (SPADI) Scores with 95% CIs in the control group (CG) and intervention group (IG) before randomization and for each follow-up time point for (A) patients with Pain Catastrophizing Scale (PCS) Score >16 and (B) patients with PCS Score ≤16.



Patients were taught that pain during exercise is not a sign of immediate danger and should be tolerated, as long as it is bearable."

Clausen MB, Rathleff MS, Graven-Nielsen T, et al. *Br J Sports Med* Epub ahead of print (April 2023)

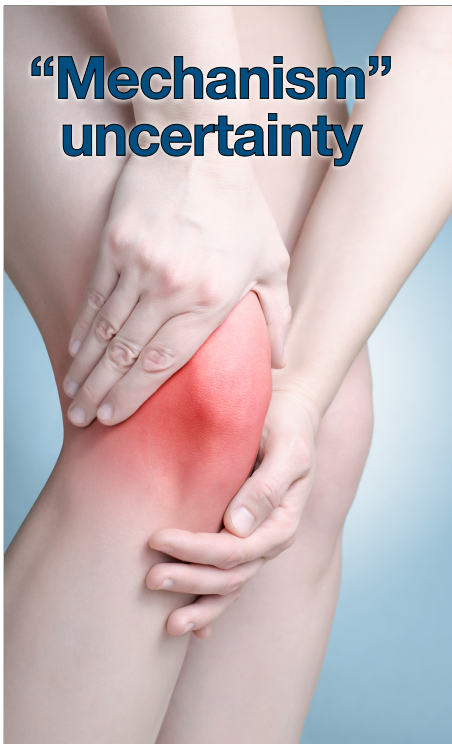


“Management in athletes appears to be guided by a biomedical approach”

Thornton JS, Caneiro JP, Hartvigsen J, Ardern CL, Vinther A, Wilkie K, Trease L, Ackerman KE, Dane K, McDonnell SJ, Mockler D, Gissane C, Wilson F. Treating low back pain in athletes: a systematic review with meta-analysis. Br J Sports Med. 2021 Jun;55(12):656-662



**“Mechanism”
uncertainty**



Runhaar J, et al. Mechanisms of action of therapeutic exercise for knee and hip OA remain a black box phenomenon: an individual patient data mediation study with the OA Trial Bank. RMD Open 2023;9:e003220

Increase in strength can only explain 2% of the effect from a knee-OA exercise regime!

“As **98% of the effectiveness** of therapeutic exercise compared with non-exercise controls **remains unexplained**, more needs to be done to understand the underlying mechanisms of actions.”



"...sports-related **disability** at 6 months appears to be **independent of** lower extremity muscle **strength, or depression/anxiety and knee confidence** in adolescents with non-traumatic anterior knee pain..."



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Holden S, Lee H, van Middelkoop M, et al Exploring the pain and disability continuum in adolescents with non-traumatic anterior knee pain: a mediation analysis using individual participant data of prospective studies British Journal of Sports Medicine 2023;57:1388-1394.

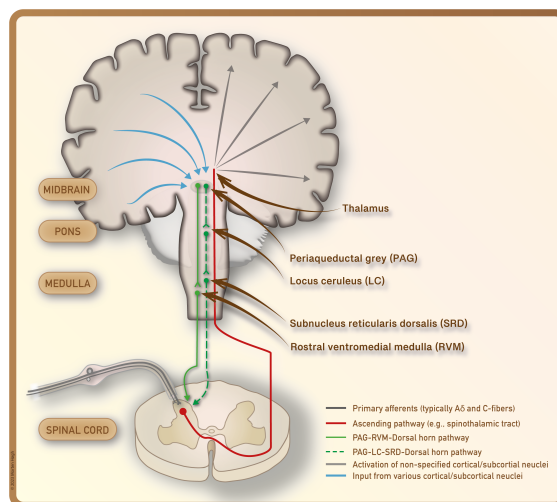
Exercise is
part of the
solution...



But **how does**
it work?

Possible effects of exercise on pain

- **Exercise can be pain relieving in the short term**
 - "Descending Pain Modulatory System"
 - Exercise-induced hypoalgesia could be a way to test this
- **Regular = longer effect?**
 - Example 1: 8-week exercise for shoulder pain =
 - Reduction in pain
 - Improved sleep quality, and
 - Increased CPM
 - Lyng KD, et al. *Eur J Pain* 2022;26(9):1882-1895
 - Example 2:
 - Regular exercise may change pro-inflammatory macrophages (M1) into anti-inflammatory phenotypes (M2)
 - See Lesnek, JB et al. *Neurobiology of Pain* 13 (2023) 100126
- **Athletes vs non-athletes?**
 - Genetic? Adaptive?



Hoegh, M. and Bannister, K. (In review) JOSPT #PainScienceInPractice

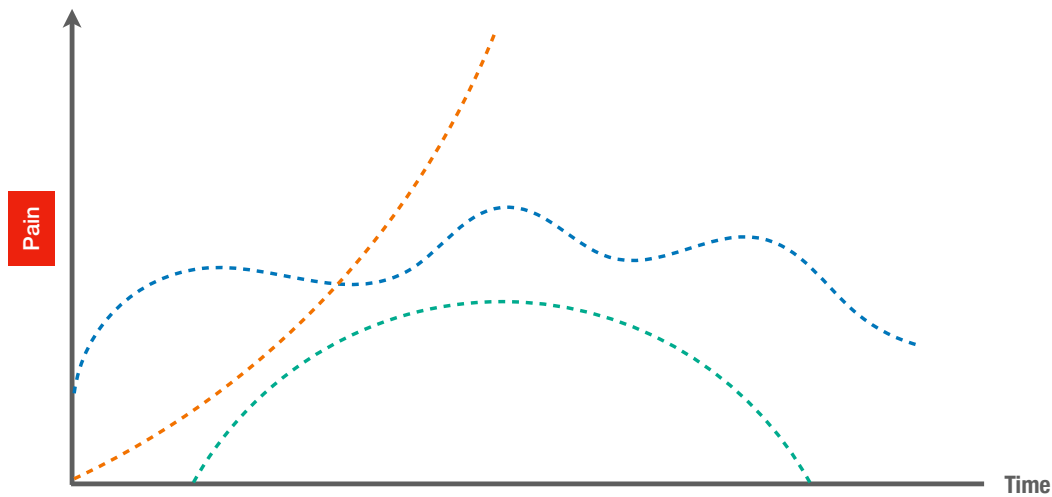


Maybe **managing pain** in itself
has substantial value!

But it's unlikely to be sufficient
(or possible) for all athletes...



Would you manage the athlete the same way?



Can you change the pain?!

8 follow-ups over four years (n=1.905), not only athletes!

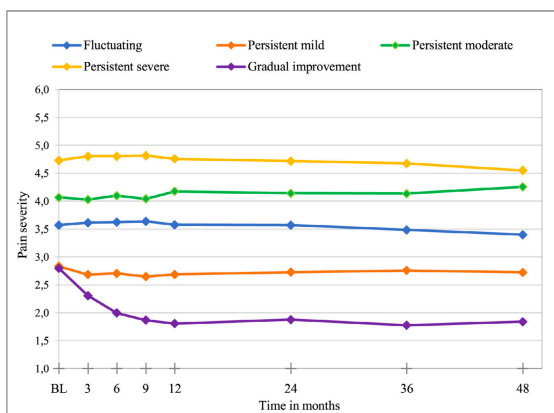


Figure 2. Average pain intensity values for all the 5 trajectory groups identified over all 8 follow-up time points.

- "fluctuating" (n = 586 [31%]),
- "persistent mild" (n = 449 [24%]),
- "persistent moderate" (n = 414 [22%]),
- "persistent severe" (n = 251 [13%]),
- "gradual improvement" (n = 205 [11%]).

Glette M, Stiles TC, Borchgrevink PC, Landmark T. The Natural Course of Chronic Pain in a General Population: Stability and Change in an Eight-Wave Longitudinal Study Over Four Years (the HUNT Pain Study). J Pain. 2020 May-Jun;21(5-6):689-699



”

...**stressing that treatment is needed** for recovery more often **elicits psychological distress**, attention to pain and having a serious condition, **and the need for treatment/investigation** including injections, surgery and seeing a doctor/ specialist.

Zadro JR, et al. BMJ Open 2023;13:e069779.

”

...**emphasising spontaneous recovery reassures some people** that they have a minor issue that can be managed [...] **However**, care needs to be taken when providing this advice to **ensure patients do not feel** their problem is being **dismissed**.

Thank you for your attention!




FAKS     

Find links to interviews etc on linkt.ee
https://linktr.ee/mhdk_drmortenhoegh

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