

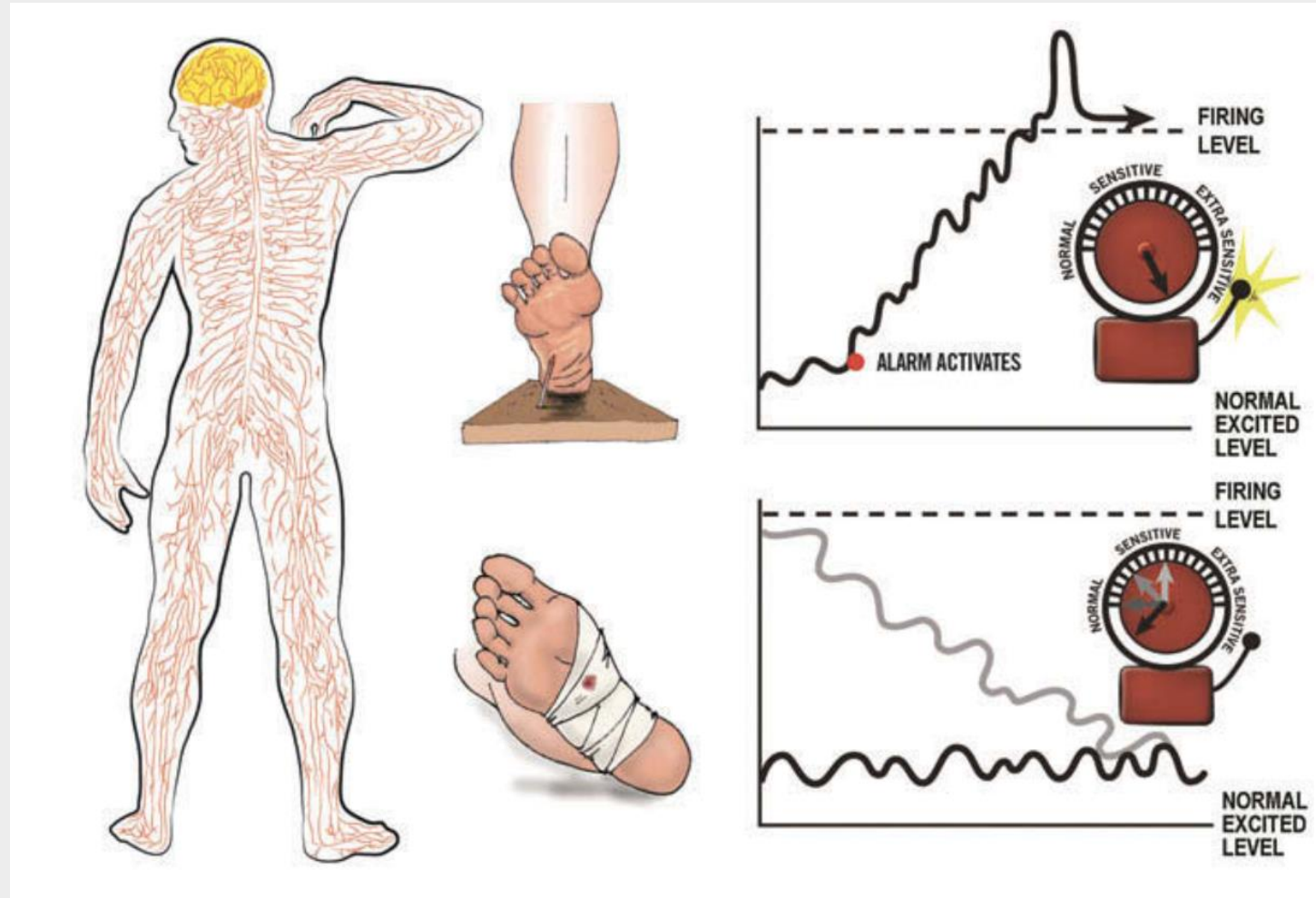


# Corticolimbic Pain Thresholds

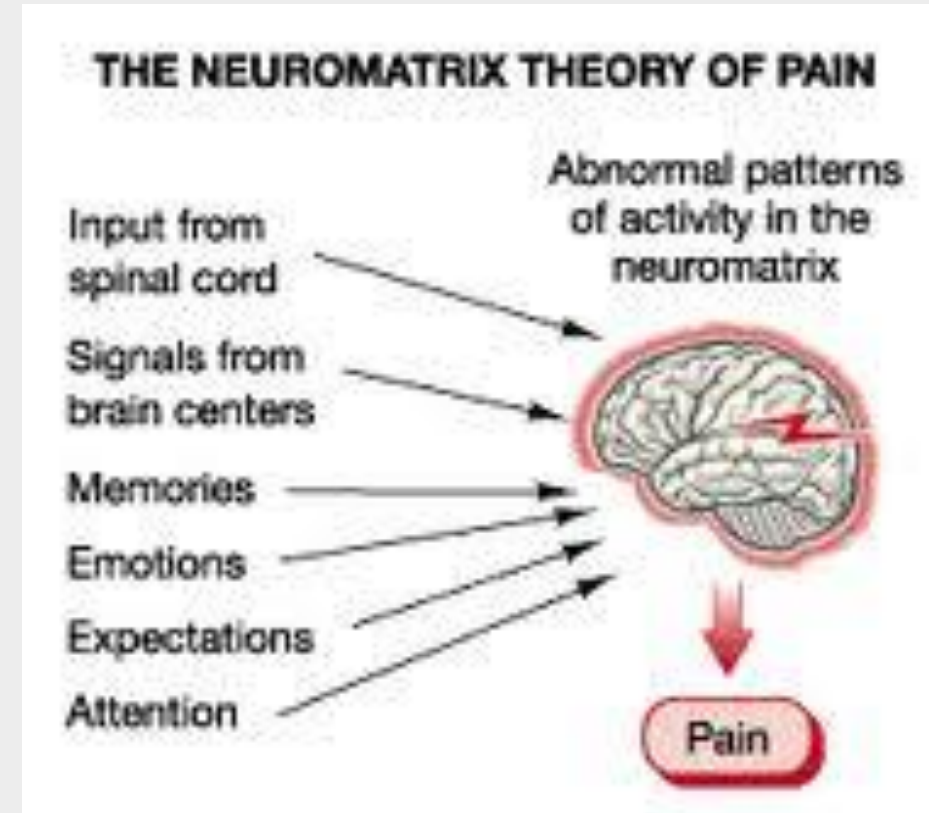
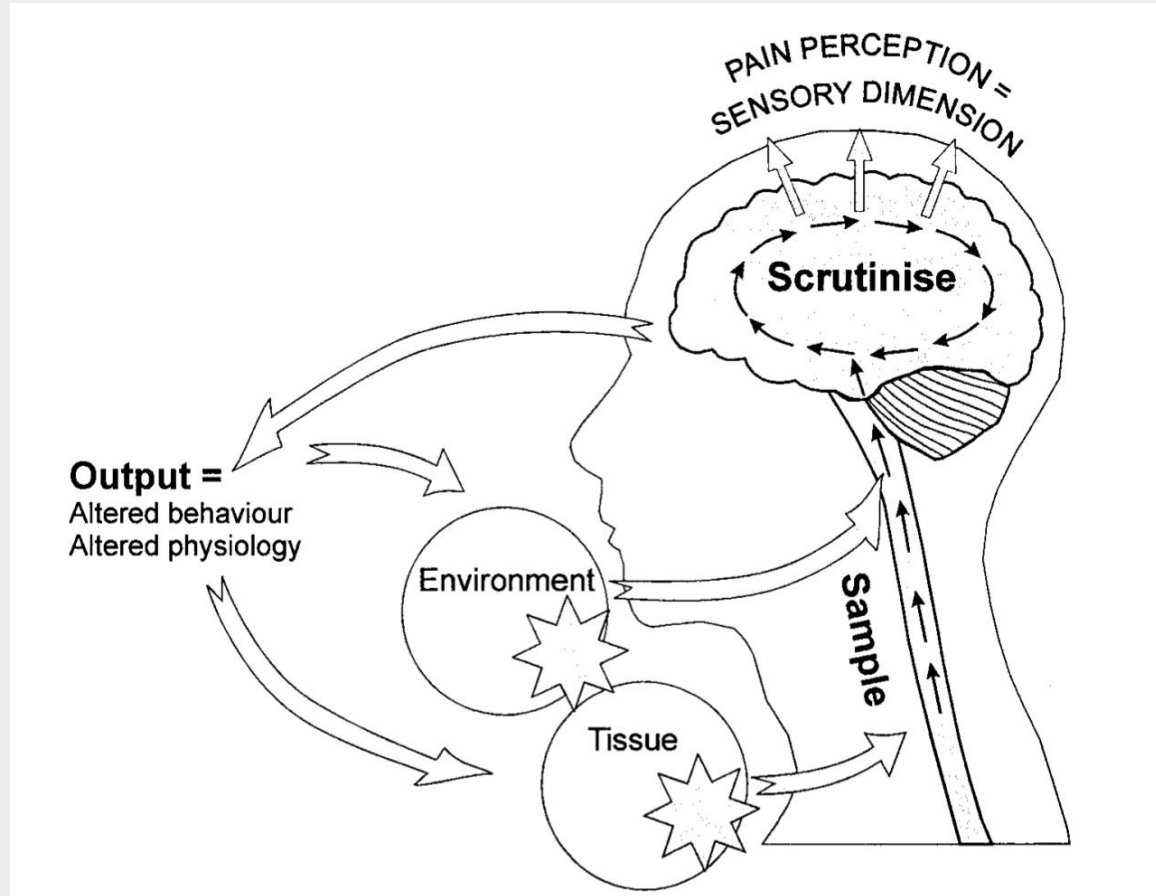
## A model for explaining pain.

Danny Orchard, BSc (Hons), BOst, MSc, PGCertACE

# The nervous system as an alarm system

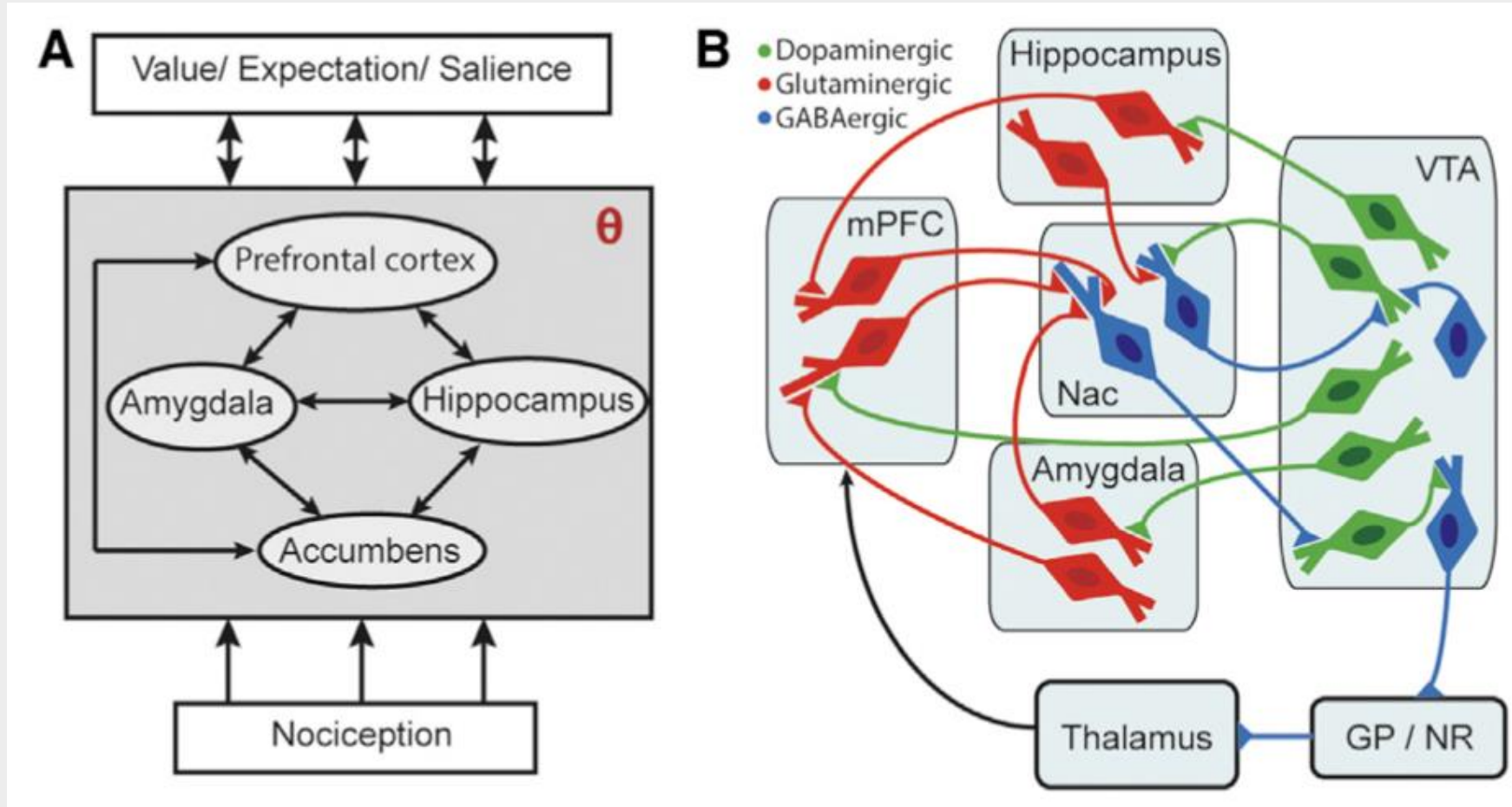


# Pain as an output of the nervous system



Gifford, 1998. Pain, the tissues and the nervous system: a conceptual model. *Physiotherapy* 84(1):27-36.

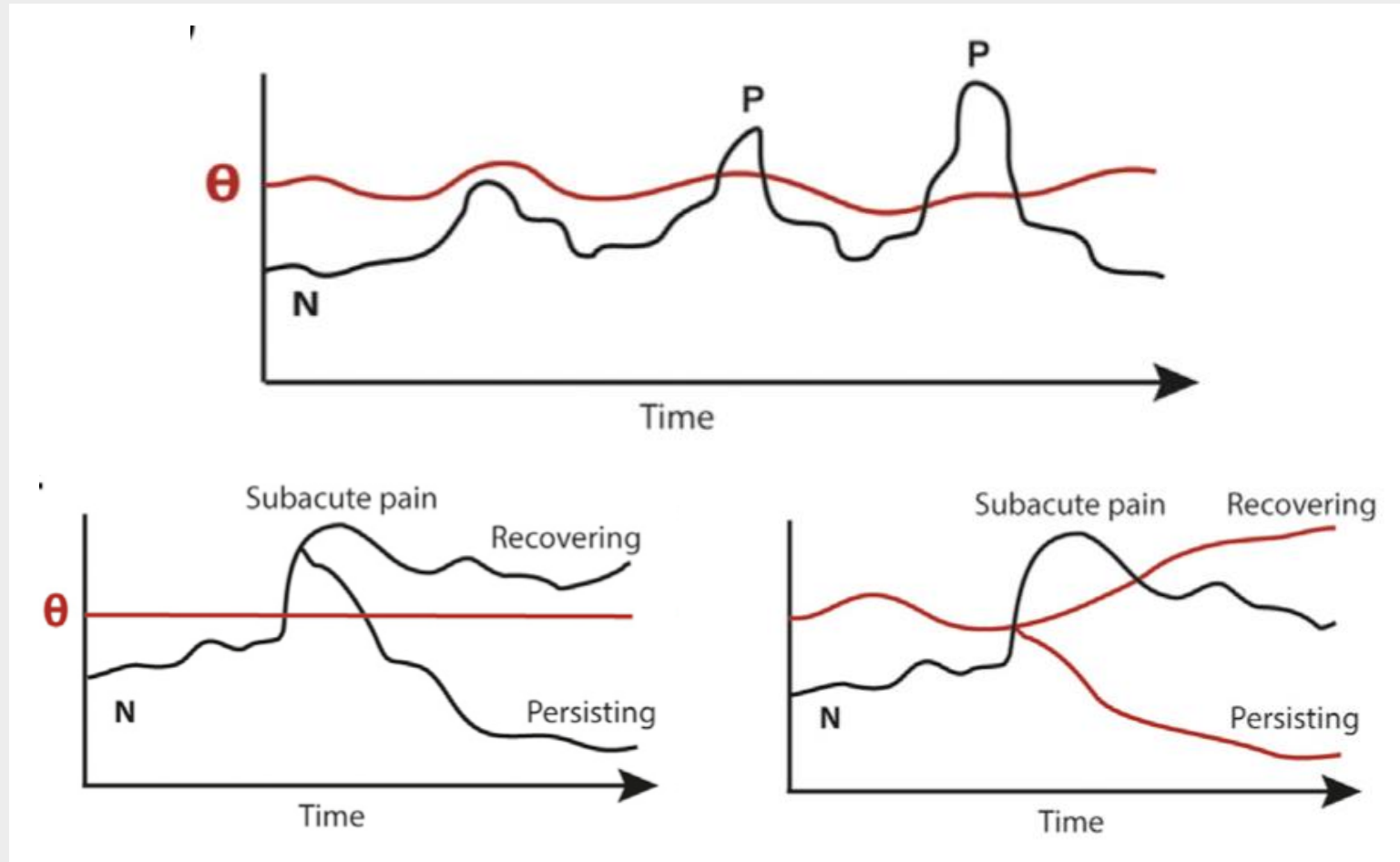
# Cortico-limbic threshold $\theta$



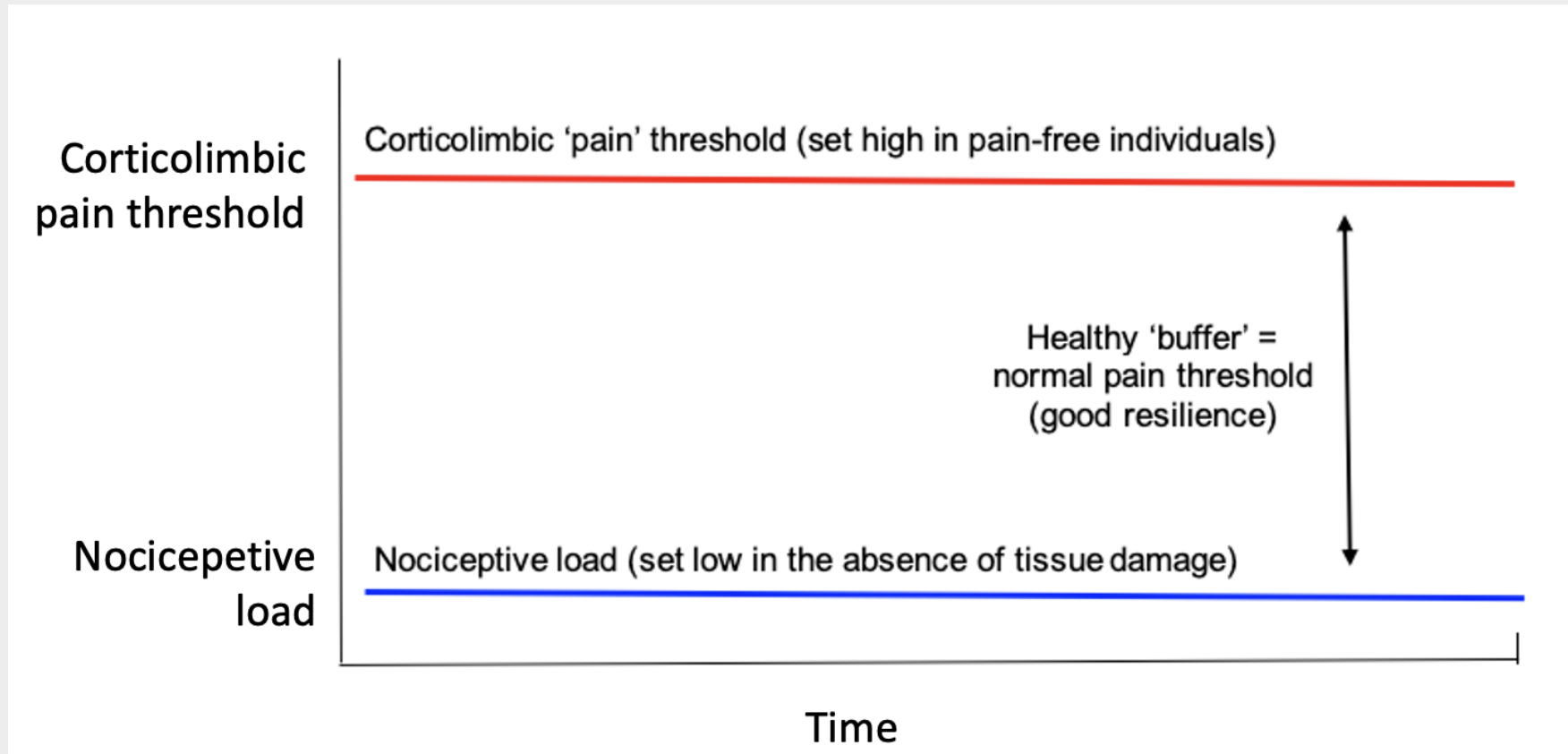
# Cortico-limbic threshold $\theta$

- Cortico-limbic threshold is a term used to refer to the point at which unconscious information from the sensory system is perceived by the cortex, via the limbic system, and becomes a conscious sensation.
- Prior to this, it is just information with no correlation to a painful experience until it is given meaning based on the level of threat.
- $\theta$  is the output of the limbic brain.
- Internal states of the limbic brain, relative to neocortical memories determining current state of the organism (value, expectation, and salience), as well as the afferent nociceptive drive control  $\theta$ .

# Cortico-limbic 'pain' threshold



# Model for corticolimbic nociceptive threshold



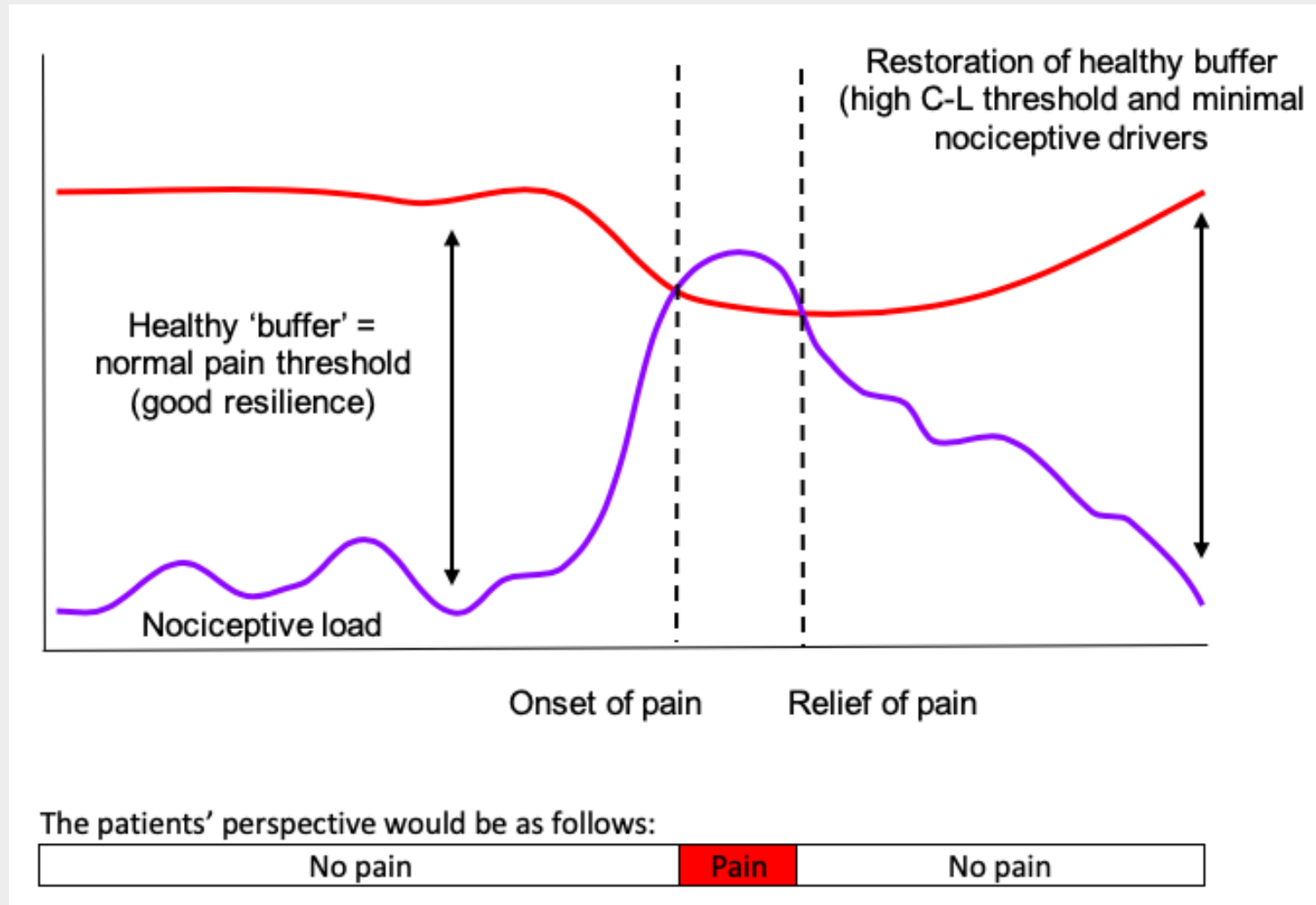
# Nociception is one driver for $\theta$

- To fully understand a patient's pain experience we first need to deduce what is happening at a tissue level and thus the extent of nociception or biomechanical stress/strain.
- Trauma, inflammation or excessive mechanical stress will create a 'nociceptive load' that ascends to the spinal cord and on to the limbic system and cortex.
- Our clinical tests (ie orthopaedic, neurological etc) will give us some insight to the state of the tissues, along with the feel of the tissues and the way the patient reacts under our manual assessment.

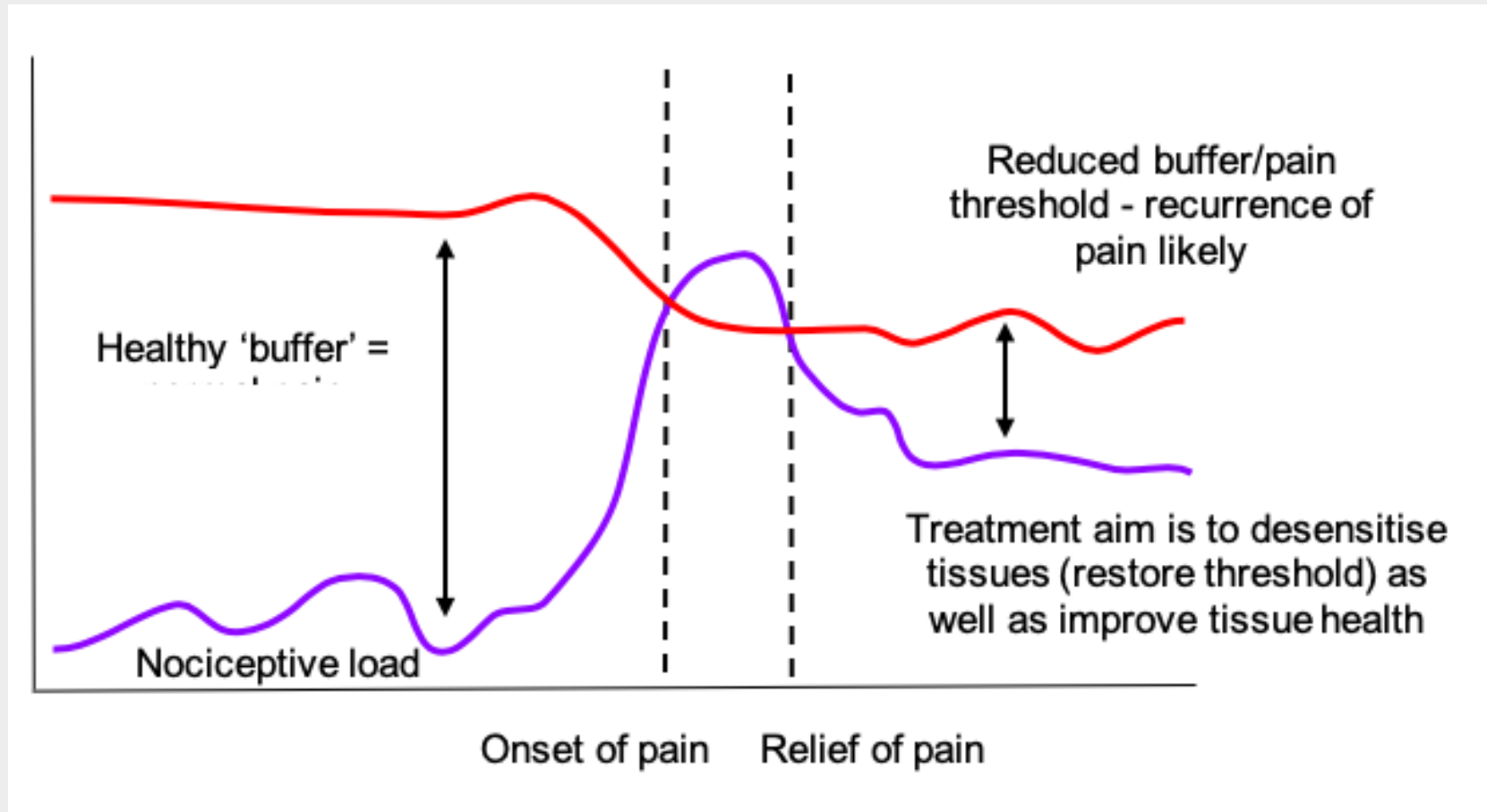
# Thoughts, beliefs and meaning also affect $\theta$

- At the same time, whether these nociceptive signals 'break through' to the patient's conscious awareness will depend on the threshold at which the corticolimbic centres are 'set'.
- Increased levels of threat (i.e. the presence of yellow flags or prior injury) results in the limbic system lowering its threshold resulting in a facilitation of ascending signals and a loss of descending inhibition, thereby amplifying the nociceptive signal.
- Rather than being static, a person's pain threshold varies depending on numerous variables, such as their current psychological state, the degree of awareness or focus on the affected body part, the meaning or context of the injury, and their expectations of whether it will resolve or not.

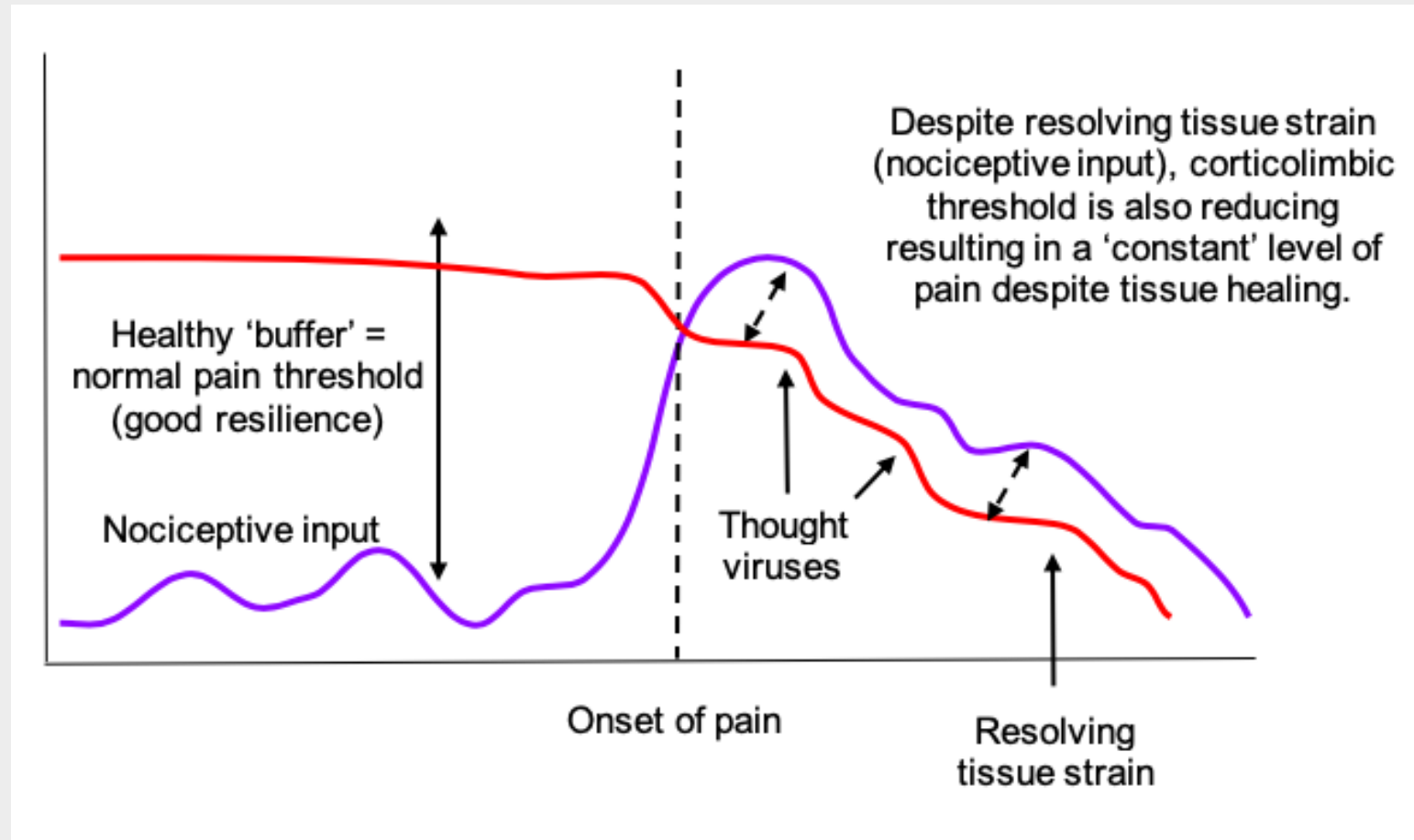
# Diagram to explain pain sensitivity following injury



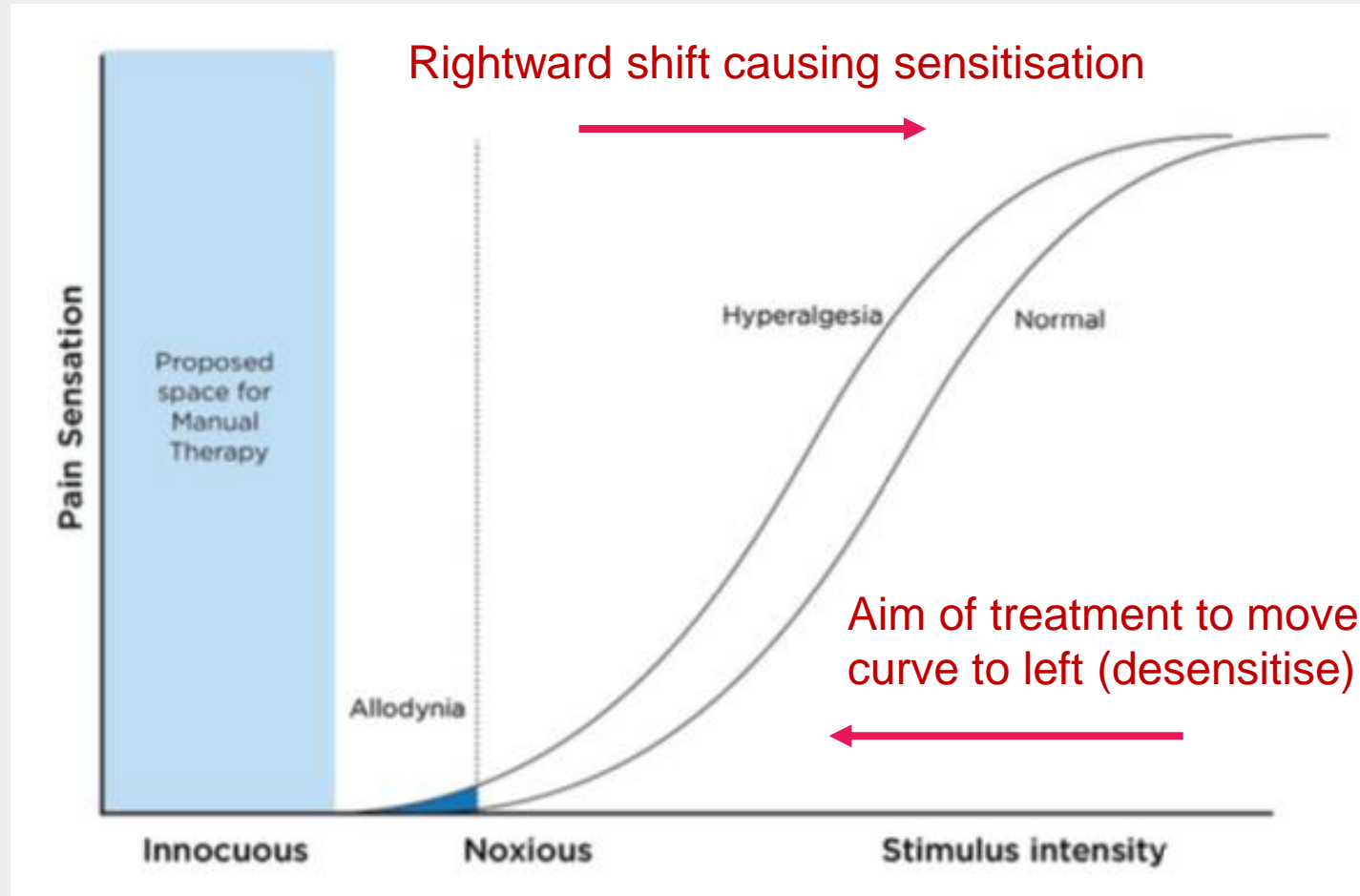
# Diagram to explain recurring pain



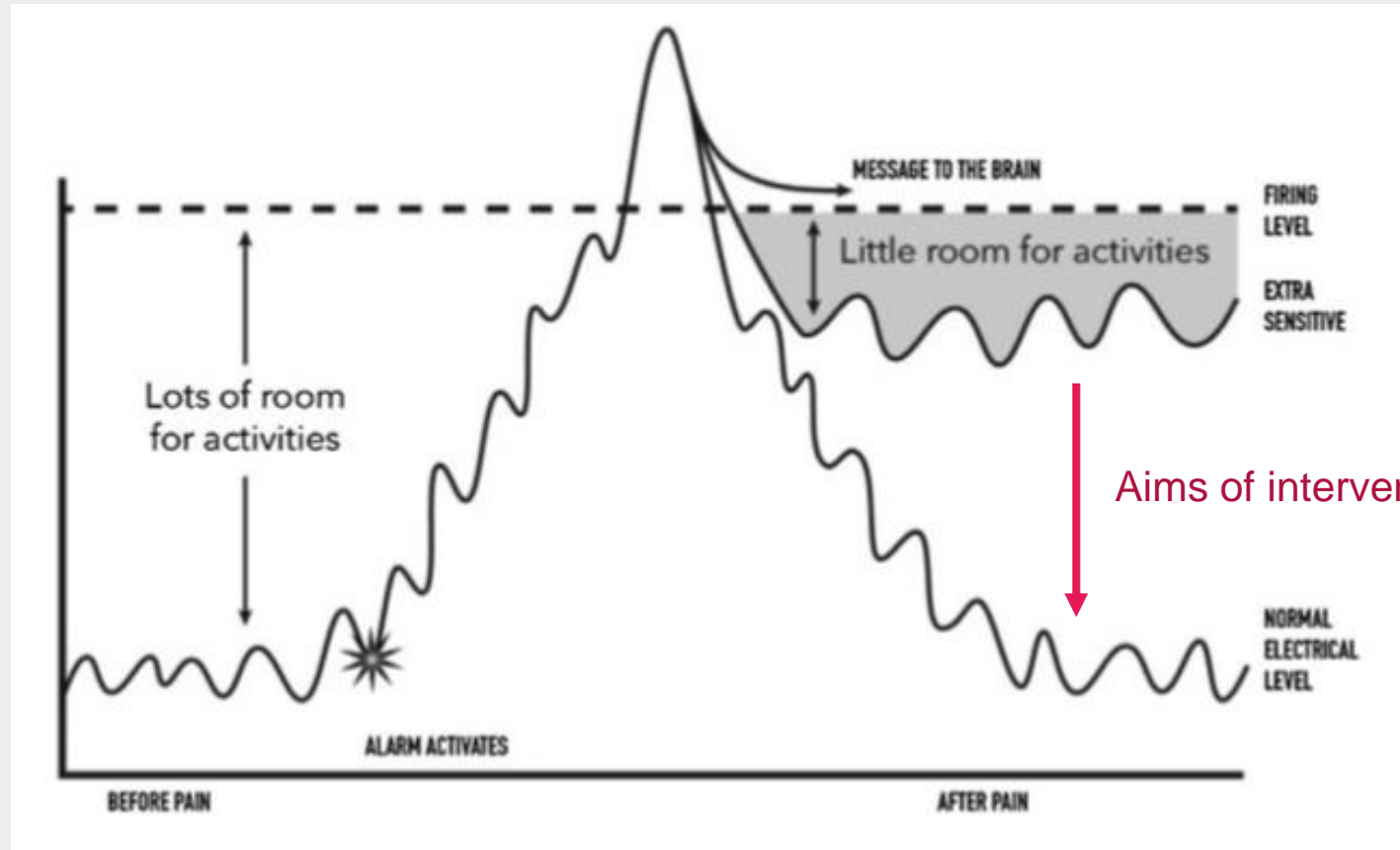
# Diagram to explain chronification of pain



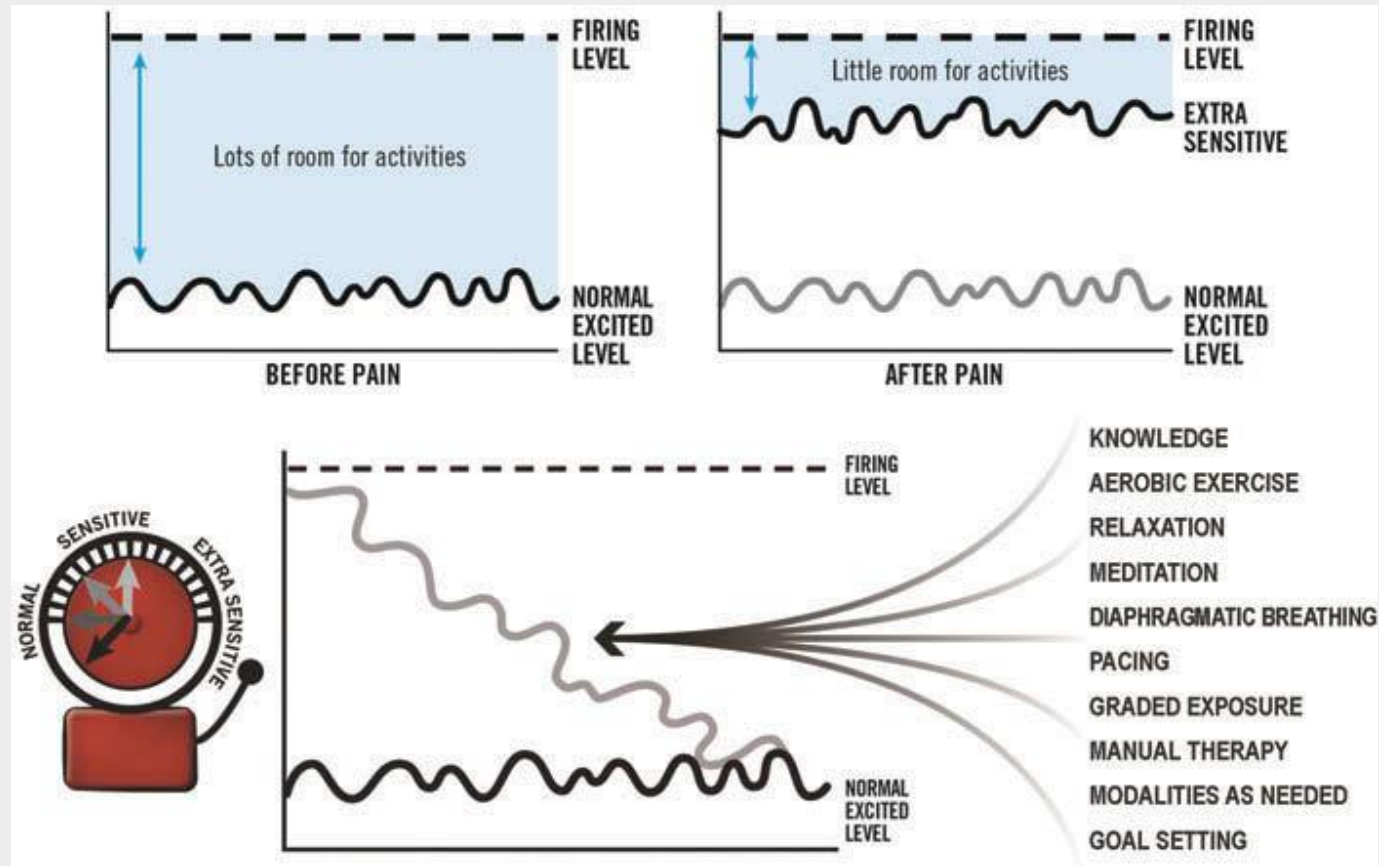
# Using manual therapy to desensitize tissues



# Using pain thresholds as a management tool



# Factors that can reduce tissue sensitivity



# Case study - Jared

- 48-year-old director at a local insurance company, who enjoys an active life; playing golf at weekends and going to the gym (3 x week) and socialising with friends.
- Past medical history includes a history of childhood asthma from 5 years to 15 years, annual hayfever in early summer and a tendency for colds to become chest infections easily.
- Work has been very stressful for the last six months as his company has recently been bought by a competitor and Jared is worried about redundancy.
- Working long hours and unable to go to the gym. He has a cold that has lasted six weeks, and he feels he is unable to take a deep breath.

# Case study (continued)

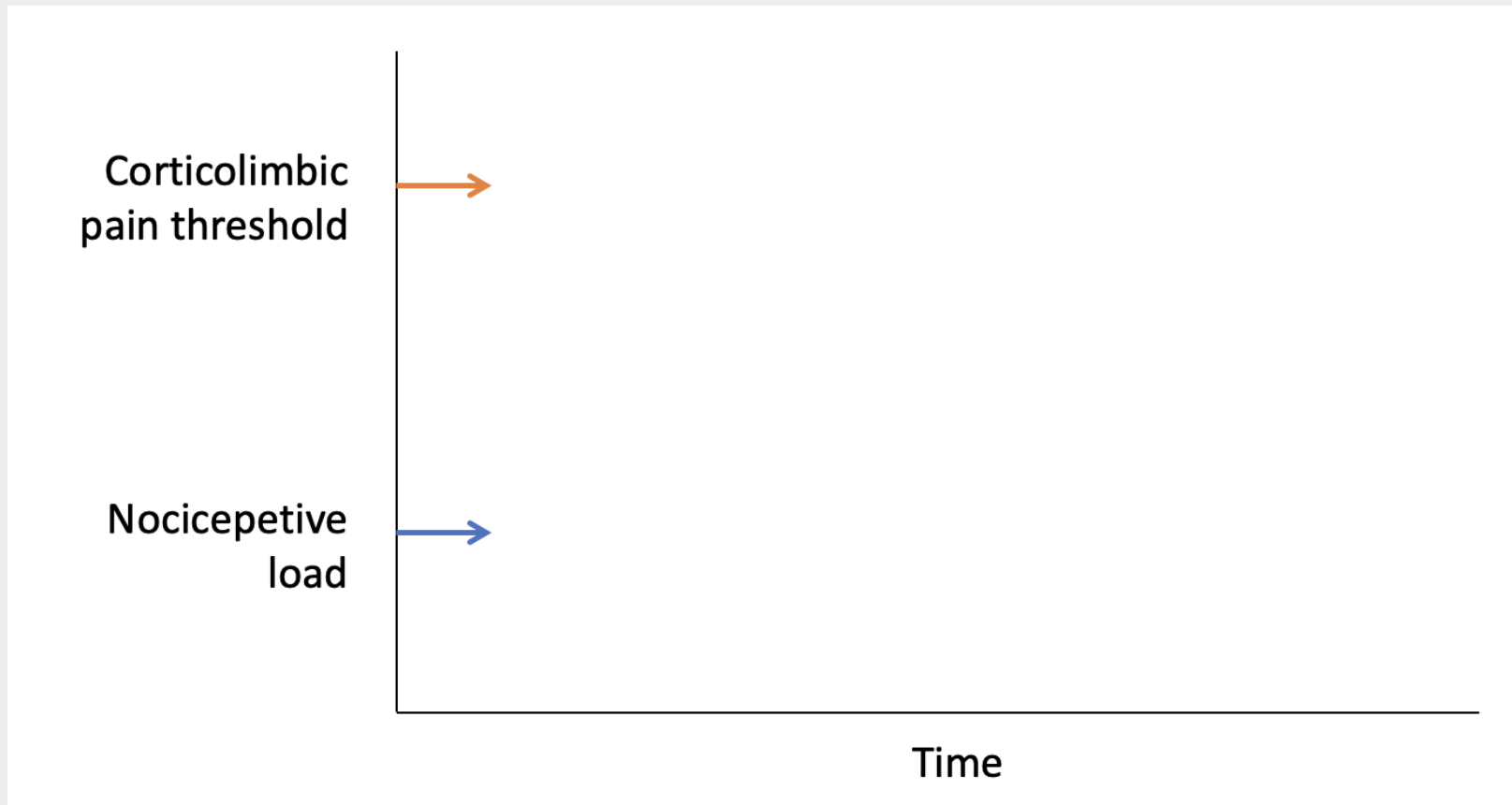
- Two weeks ago, he played golf in a work competition that lasted all weekend. On the second day in the afternoon he noticed sudden right sided thoracic spine pain after taking a big swing.
- He managed to finish the round of golf and felt better in the bar that evening. However, the following day he was aware of moderate right posterior thoracic spine pain and difficulty breathing deeply.
- Over the next week the pain settled into a pattern of right sided mild thoracic pain aggravated by flexion and rotation. It also seemed to spread to his anterior thorax around the ribs and coughing also aggravated the pain.

# Questions from case study:

- How much tissue damage do we think Jared has experienced? (i.e. what is the nociceptive load driving  $\theta$ )
- What factors does he mention that might alter (amplify or attenuate) the nociceptive signal from his tissues?
- How much does his temporal onset reflect trauma to his tissues? How can we assess this?
- How does the above help assess/diagnose/treat/manage Jared?

# Using CLT model as a pain science education tool

Using Jared or a patient of your own, continue the two lines above to best represent their pain threshold and nociceptive load before, immediately after their pain onset and as they present today.



# THE END – Thank you for listening!

Please email [Daniel.Orchard@uco.ac.uk](mailto:Daniel.Orchard@uco.ac.uk) with any comments or queries.