Using Corticolimbic Pain Thresholds as a Model for Pain Management

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Abstract

In 2015, Baliki & Apkarian wrote a seminal paper in the journal *Neuron* where they first coined the term ‘corticolimbic threshold’ as a way of expressing the moment at which subconscious activity of nociceptive pathways passes into conscious awareness to become ‘pain’.

Since then, we have been using a variation of this model at the UCO to give undergraduates students, and postgraduates alike, a better understanding of how nociception and biomechanical load are important aspects in the presentation of pain but that they are only one dimension of this experience. The other critical dimensions to consider, the cognitive and emotional dimension (often unhelpfully reduced simply to ‘psychosocial factors’) are often disregarded due to the sense that these are ‘psychological and we’re not psychologists’, or as manual therapists we should be fixing the ‘issues in the tissues’ etc.

By using the corticolimbic threshold model students are able to appreciate the fact that nociception on its own is neither sufficient or necessary to produce pain. And, furthermore, that the thoughts, beliefs and focus of the patient play a crucial role in the reduction or strengthening of the corticolimbic threshold and, therefore, determining whether the patient feels pain or not, often irrespective of the degree of tissue damage present.

Using this model of corticolimbic thresholds allows the patient to fully understand the role the nervous system and brain, and their thoughts and beliefs, play without reducing it to a cartesian mind-body split suggesting ‘it’s all in their head’.

In 2015, Baliki & Apkarian wrote a seminal paper in the journal *Neuron* where they first coined the term ‘corticolimbic threshold’ as a way of expressing the moment at which subconscious activity of nociceptive pathways passes into conscious awareness to become ‘pain’. Contrary to previous models where pain thresholds were depicted as fixed entities wholly reliant on nociceptive behaviour to instigate a painful experience, this new model introduced a way of appreciating that thresholds were not fixed but were highly variable and dependant on various factors such as attention, beliefs and mood (as well as previous sensitisation) (Fig.1).

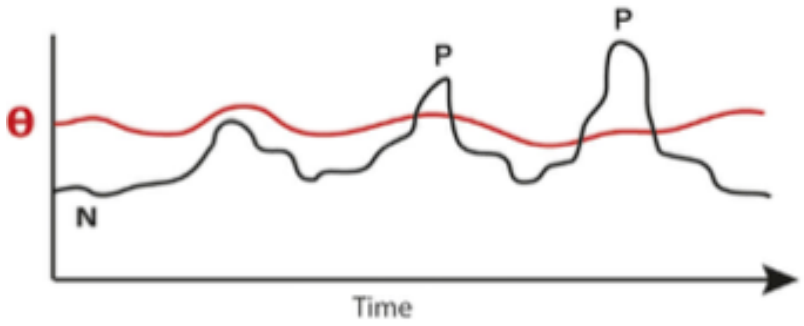

Figure 1. Model of pain perception where N represents nociceptive activity and θ equates to the corticolimbic threshold. When the amount of nociceptive activity exceeds the corticolimbic threshold, pain (P) is felt as a perception, prior to which it is merely neuronal noise and not a percept. From: Baliki & Apkarian, 2015. Nociception, Pain, Negative Moods, and Behavior Selection. *Neuron;* 87, pp474-91.

Since 2015, we have been using a variation of this model at the UCO to give undergraduates students, and postgraduates alike, a better understanding of how nociception and biomechanical load are important aspects in the presentation of pain but that they are only one dimension of this experience. The other critical dimensions to consider, the cognitive and emotional dimension (often unhelpfully reduced simply to ‘psychosocial factors’) are often disregarded due to the sense that these are ‘psychological and we’re not psychologists’, or as manual therapists we should be fixing the ‘issues in the tissues’ etc. By using the corticolimbic threshold model I have found students to be readily able, and willing, to appreciate the fact that nociception on its own is neither sufficient or necessary to produce pain. And, furthermore, that the thoughts, beliefs and focus of the patient *and those around them* play a crucial role in the reduction or strengthening of the corticolimbic threshold and therefore, importantly, determining whether the patient feels pain or not, often irrespective of the degree of tissue damage present.

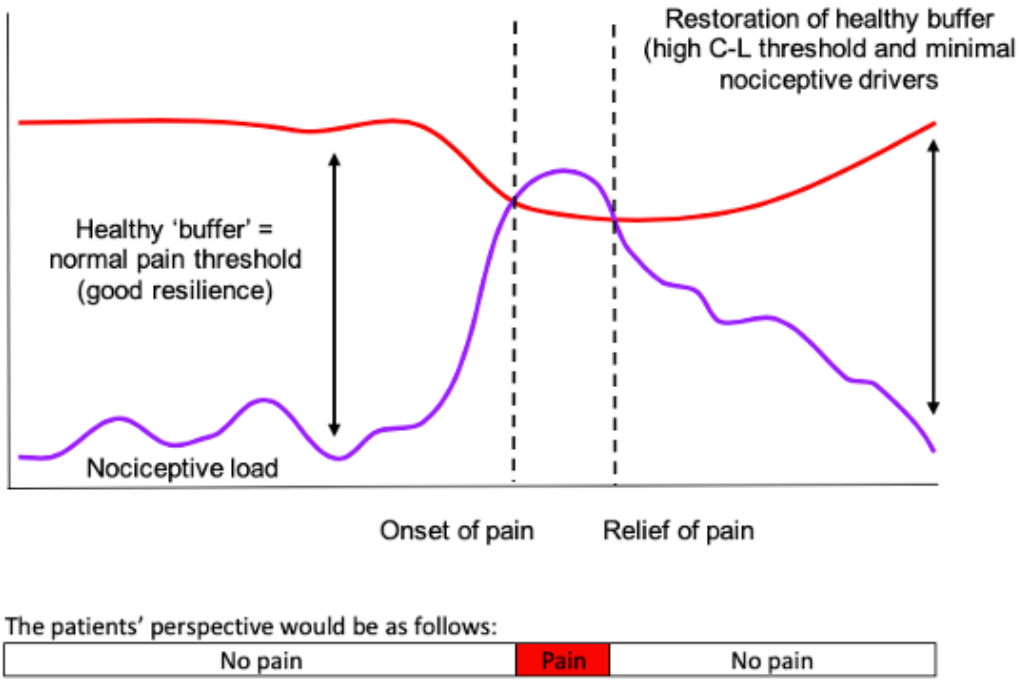

Figure 2. Conceptual model first utilised as a teaching aid in 2015 at the University College of Osteopathy by Daniel Orchard, lecturer in pain science. The bottom (purple) line depicts the nociceptive load (NL) and the top (red) line, the corticolimbic threshold (CLT).

When the degree of nociception is insufficient to cross the corticolimbic threshold no pain is felt despite a mild to moderate noxious event occurring. Once the nociceptive load crosses the corticolimbic threshold pain occurs and the person becomes aware of the body part at which the pain is felt. Once nociception reduces to a sub-threshold level the person is no longer 'in pain'. For normal 'healing' to occur both the nociceptive load and CLT should reduce to pre-injury levels where there is no significant neurological memory of the event. Whilst this is likely impossible to achieve, the higher the corticolimbic threshold remains the more likely the person is to experience pain during a subsequent tissue insult in the same area when only minor nociceptive load may occur (Fig. 3).

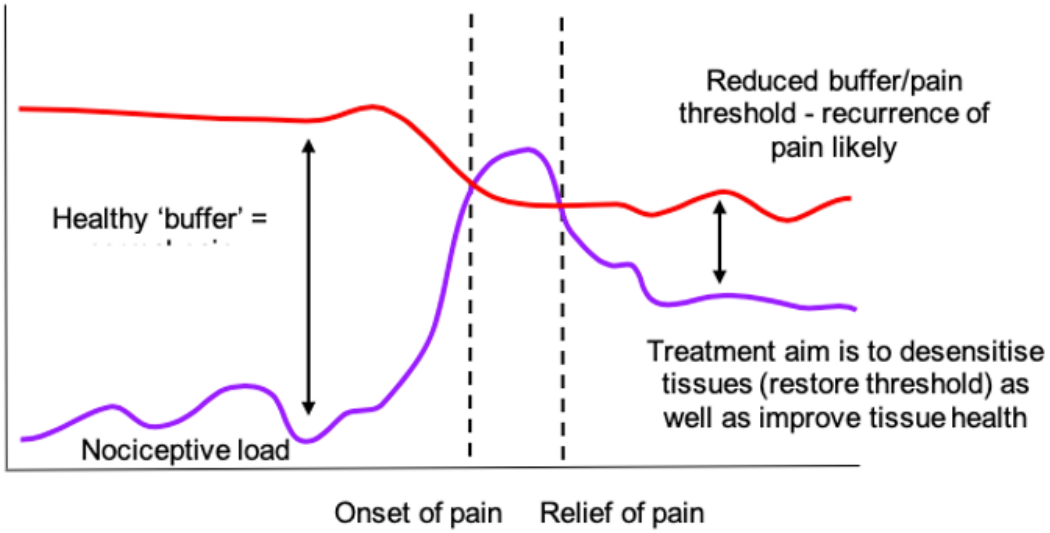

Figure 3. Example of when both the nociceptive load and the corticolimbic threshold fail to return to pre-injury levels and the tissue therefore remains in a state of sensitisation and will more readily become painful even in the event of minimal further nociception.

This model has also proven to be well accepted by patients when used to explain how their tissues may have suffered minor damage (or not!). Quite often as is the case, patients hear healthcare practitioners talking about pain sensitisation and psychosocial factors as 'all in their head' and become reluctant to engage further in the education process. Using this model of corticolimbic thresholds allows the patient to fully understand the role the nervous system and brain, and their thoughts and beliefs, play without reducing it to a cartesian mind-body split and thus causing offence. I would exert that this model of corticolimbic thresholds should be a staple tool in the clinical management of pain patients by all healthcare practitioners.