

1.0 Introduction

The NHS defines chronic pain as pain occurring for more than 3 months despite therapeutic interventions (NHS inform., 2023). Chronic pain exists on a broad spectrum of many identifiable causes and conditions yet its global effects on an individual have consistency (Birkinshaw *et al.*, 2023). Living with chronic pain has a multi-dimensional impact on patient's livelihoods, affecting many aspects of living such as, social relationships, career opportunities and the performance of household tasks (Hadi *et al.*, 2018).

Patients with chronic pain (PwCP) are at a significantly higher risk of being comorbid with affective conditions, such as depression and anxiety (Gómez Penedo *et al.*, 2019). In a 2016 paper, it was noted that PwCP were up to 6-times more likely to be comorbid with depression and that 50% of the individuals studied also experienced anxiety (Hooten., 2016). Reciprocally, psychiatric conditions increase the probability of experiencing chronic pain. This may be through physical symptoms (Woo., 2010) and through fear-avoidance factors. For example, by directing attention towards the intensity of pain (Vlaeyen *et al.*, 2016).

A further bi-directional relationship occurs through shared neural pathways. Pain is processed by ascending and descending neural tracts that intersect with the processing of anxiety and depression (De Ridder *et al.*, 2021). Sharing these pathways means that one condition increases the likelihood of aggravating the other.

Because of these tightly linked relationships, living comorbid with chronic pain and a mental health condition can significantly affect patients, tying them into a persistent spiral. Chronic pain is recognized as an individual risk factor for suicide by the World Health Organization (WHO). PwCP are at a 2-fold (or greater) risk of experiencing suicidal behaviours. When comorbid with depression, this risk significantly increases due to an exacerbation of active thought processes towards suicide (Racine., 2018 and Goesling *et al.*, 2018).

Complexity of care must also be considered. Many problems exist, such as the clinical implementation of therapies, drug side-effects and barriers in communication between healthcare specialties. These can negatively impact how PwCP receive holistic care for their condition.

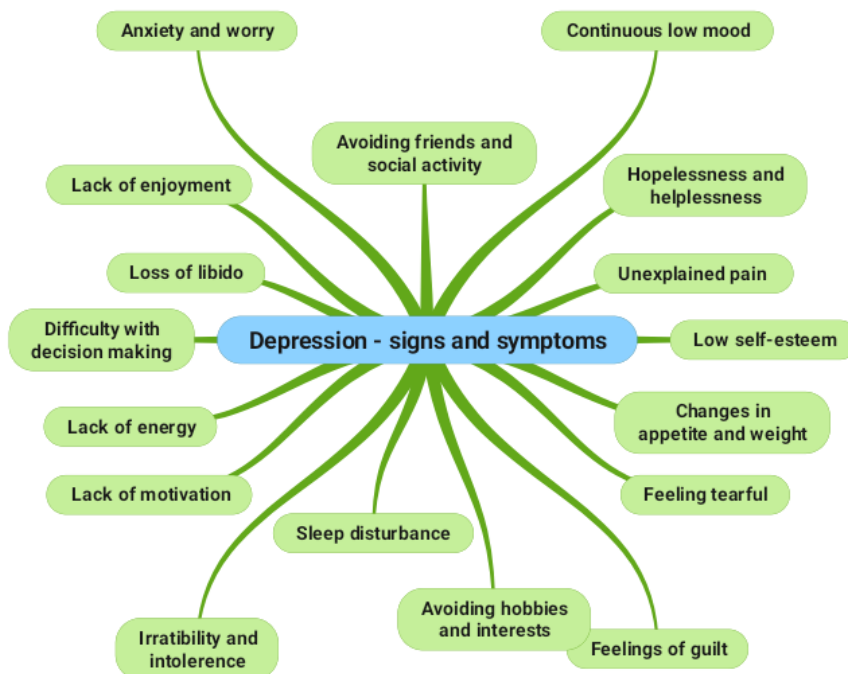
There is certainly a need to pay attention to the mental health status of PwCP. Providing support for one condition may be helpful in managing the other and having good mental health is critical to the overall wellbeing of PwCP.

This essay will aim to explore the importance of managing mental health alongside chronic pain by examining the social, psychological, and physical links between chronic pain and mental health symptoms. It will also explore various psychological and pharmaceutical therapies used to support mental health and comment on their efficacy in reducing the impact of chronic pain.

2.0 Depression and anxiety

2.1 Depression

Depression is the most common psychiatric comorbidity to chronic pain (Gómez Penedo *et al.*, 2019). The description of depression as a “pervasive low mood” (Woo., 2010) is very apt. It exists as a constellation of symptoms with great differences in presentation between patients. There are also great disparities in exact diagnostic criteria however, it is generally accepted that when depression interferes with patient functioning it has become pathological. Experiencing symptoms of depression can be very disabling and increases the risk of suicidality in PwCP, adding to the importance of addressing it when managing chronic pain (Birkinshaw *et al.*, 2023).

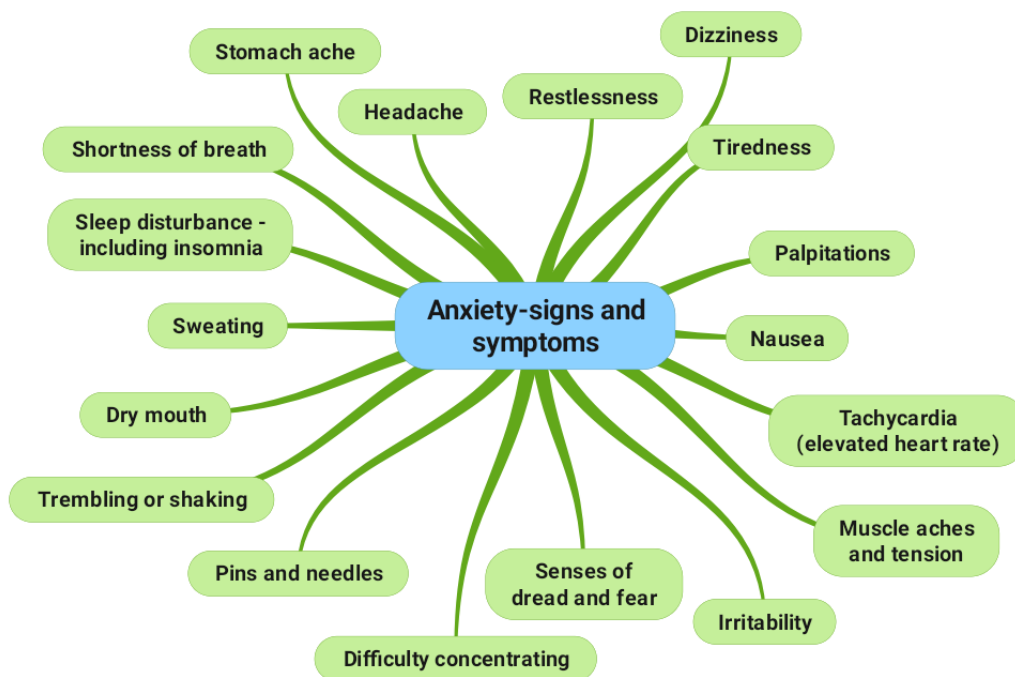


Mind map displaying the signs and symptoms of depression as per NHS guidance (NHS., 2021a).

2.3 Anxiety

Anxiety can be described as a feeling of unease or dread in response to a perceived threat. It is a necessary survival mechanism that everyone experiences in their lives. However, for many it may become pathological. A mixture of physical and sociological symptoms with consistently elevated levels of anxiety can be described as a generalised anxiety disorder (GAD) (Woo., 2010).

GAD is highly prevalent in people with chronic pain, with it being the second most diagnosed psychiatric comorbidity, after depression (Woo., 2010). A 2019 study saw it diagnosed in 50% more PwCP than patients without (Gómez Penedo *et al.*, 2019). Anxiety and depression share notable similarities in symptoms. In fact, chronic pain is often linked to anxiety through shared symptoms with depression, rather than as a direct comorbidity (Gómez Penedo *et al.*, 2019).



Mind map displaying the signs and symptoms of anxiety as per NHS guidance (NHS., 2021b).

3.0 The bi-directional nature of chronic pain and mental health

3.3 Socially

Pain has been redefined as an emotional experience, as well as physical. This means that the patient's environment and mood contribute to their experience of pain (Woo., 2010). Because of this, it is important to consider the social effects of chronic pain, alongside psychological and physical, when looking to support a patient's mental health.

3.3a Employment opportunities

The stress caused by unemployment is a notable social link between poor mental health and chronic pain. In a 2018 study, more than 25% of the individuals surveyed were unemployed due to chronic pain. This led to financial difficulties, disadvantages in career progression and feeling restricted to their homes. (Hadi *et al.*, 2018). Experiencing higher financial difficulties is one of the factors that causes chronic pain to be an individual suicidal risk. Whilst it does not directly increase the pain felt, it adds an extra burden to the individual's livelihood, increasing the risk of comorbid depression (Racine., 2018).

3.3b Isolation

Continuing with the restrictive nature of chronic pain, reduced social opportunities is another significant link. When reading patient's stories, a key point mentioned was isolation. It was felt that people around them could not truly understand what they were going through, as they had not experienced chronic pain themselves. They also noted that there was a lack of understanding of how their illness presented. Being capable of doing an activity one day did not mean that they could do it every day. However, it was difficult for people with no direct experience to understand why, and the PwCP found themselves losing friends as a result (Whitman and Thorp, 2016). Being comorbid with anxiety and/or depression further reduced their social life, as the individuals felt less capable of keeping up with social activities and it was harder to be distracted from the pain (Hadi *et al.*, 2018). The experience of chronic pain was lonely, yet also prevented them from going out and meeting people.

Isolation can have a profound effect on people's mental health, leading to worsened depression (Young Minds., 2019 and Tulane University., 2020). It was also felt that reaching out and socializing became harder the longer they felt isolated, leading to increased anxiety. Because being distracted is an important way to reduce perception of pain (Whitman and Thorp, 2016), isolation can lead to a greater focus on pain intensity. This reciprocally makes it even harder to keep up with a social life. A spiral effect of worsened mental health, chronic pain and isolation can be created (Thompson *et al.*, 2018).

As the intensity of pain felt increases with anxiety and depression (Gómez Penedo *et al.*, 2019) it is unsurprising that being supported with strong and understanding social connections would result in feeling distracted from the pain. It was noted that meeting with support groups was helpful in reducing isolation. Interacting with people who could

personally relate to their experiences, and listening to similar stories made them feel less alone and was useful in the management of their illnesses (Whitman and Thorp, 2016).

3.2 Psychologically

3.2a Fear-avoidance model

The fear-avoidance model is well-accepted and explains how chronic pain becomes disabling. It utilises key emotional aspects of chronic pain, such as fear and self-perception, which are negatively affected by anxiety and depression (Hooten., 2016).

Pain acts as an alarm to immediate threat and nociceptive stimuli, and in acute cases will pass once the threat is avoided/the injury has healed. This means that pain interrupts the person's attention, directing it towards the threat. The aim being to avoid more injury. However, in cases of chronic pain there is no threat to avoid, and this interruptive mechanism becomes harmful (Vlaeyen *et al.*, 2016). Some of the negative effects include widening the individual's perception of situations which may cause pain, leading to avoidance of more situations. This can result in social isolation and a reduced ability to perform tasks, worsening the experience of existing depression and anxiety in PwCP (Hadi *et al.*, 2018). Likewise, catastrophic thinking (a symptom seen in anxiety and depression) escalates the distractive nature of pain. Increased attention towards pain can exacerbate the intensity felt and worsen its impact on the individual's livelihood (Vlaeyen *et al.*, 2016).

3.3 Physically

3.3a: Ascending and descending pathways

It is established that chronic pain causes anxiety and depression, which reciprocally aggravates the pain (Chen *et al.*, 2022). However, the exact processing of chronic pain and the roles of common neural areas is uncertain. A current understanding is built on the idea of balances between the ascending processing pathway and the descending analgesic pathway. These pathways affect, and are affected by, depression, anxiety, fatigue and more (De Ridder *et al.*, 2021).

The ascending pathway is formed from two distinct pathways, medial and lateral. The medial pathway processes the suffering aspect of pain, and the lateral pathway identifies the type of pain (Vanneste and De Ridder., 2023). It is nociceptive and sends signals to the spinothalamic tract to inform of dangerous stimuli. However, in some types of chronic pain, non-harmful signals may be processed as nociceptive, resulting in pain when ordinarily there would be none (allodynia) (Obata., 2017). Due to the individual nature of pain, this hypersensitivity may vary between patients with the same chronic pain

diagnosis. Additionally, not all chronic pain syndromes physically relate to the nociceptive pathway (Eckert *et al.*, 2022).

The descending pathway determines the body's response to pain. It functions by giving context to pain perception and inhibiting pain at the level of the spinal cord. Its reduction in certain chronic pain conditions, such as fibromyalgia, is evidential of its role in suppressing pain. Its deficiency is thought to be a primary cause of chronic pain (De Ridder *et al.*, 2021). A relevant descending pathway involves opioid receptors, primarily, mu, delta, and kappa. This system helps regulate pain, stress, and emotions. Opioids are normally released in proportion to pain. However, in chronic pain, mu receptor function is decreased resulting in less activation and thus, less inhibition of the pain (Haack *et al.*, 2019).

Other important descending pathways can be serotonergic and/or norepinephrinergic (Obata., 2017). These pathways can be closely related to the opioid system and are present in the regulation anxiety and depression (Haack *et al.*, 2019 and Hao *et al.*, 2023). Closely related pathways in the processing of anxiety and pain can be indicative of the bidirectional nature of chronic pain and mental health. However, it should also be noted that the comorbidity may also result from shared neural mechanisms presenting as two separate conditions, rather than two distinct conditions actually being present (Chen *et al.*, 2022).

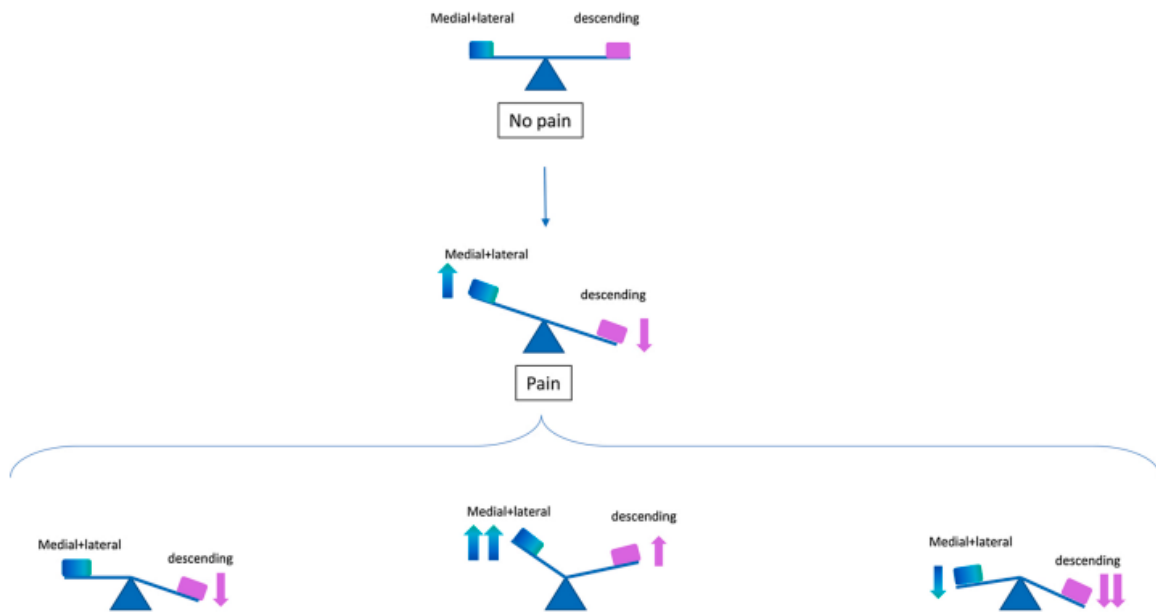


Image caption: Visual diagram from (De Ridder *et al.*, 2021) that demonstrates how pain may result from imbalances between the ascending (medial/lateral) and descending pathways.

3.3b: Shared neurotransmitters

Neurotransmitters are the messaging components of the nervous system. The neurological systems for processing pain and depression share two key monoamine neurotransmitters (serotonin and norepinephrine) amongst others (Harvard Health., 2021). An increase of noradrenaline and, lesser so, serotonin has an analgesic response as well as benefitting mood and mental health (Obata., 2017). Because of this relationship, some antidepressants, such as certain SNRIs (selective norepinephrine reuptake inhibitors), may have analgesic effects. This is different from improving pain via treating depression, rather the crossing pathways of shared neurotransmitters allow pleiotropic effects of the same drugs (Goesling *et al.*, 2018).



Image caption: Norepinephrine (left) and serotonin (right) (American Chemical Society, 2023)

3.3c: Sleep

Anxiety and poor mental health results in impaired sleep (Zhuo., 2016). Insufficient sleep then worsens chronic pain through increasing flare-ups, spontaneous pain episodes, and hyperalgesia (Haack *et al.*, 2019). Reciprocally, excessive sleep deprivation causes more anxiety and worsened mental wellbeing (Klumpers *et al.*, 2015). A network analysis of shared symptoms between depression, anxiety and chronic pain found that pain symptoms were particularly linked to negative mental health outcomes when sleep problems were involved (Gómez Penedo *et al.*, 2019). This is because sleep processing is closely related to pain pathways in much the same way as depression and anxiety, through opioid receptors and shared neurotransmitters. Maintaining good sleep is important to support mental wellbeing. Vice versa, supporting good mental health is vital to keep a full sleep schedule and reduce the intensity of chronic pain.

4.0 Supporting mental health and wellbeing

The bidirectional nature of chronic pain and mental health means that the prevalence of comorbidities is common. A 2016 review found that 2-61% of PwCP were also comorbid with depression and 1-10% with GAD. Reciprocally, patients with depression were 4x more likely to have chronic neck and/or lower back pain and patients with anxiety disorders were 2-3x more likely to develop chronic migraines (Hooten., 2016). Because of these high prevalences, it is essential that adequate mental health support is provided

to PwCP. Examples being through support groups and psychological and pharmaceutical therapies.

4.0a: Clinical management

Effective clinical management can be influential in reducing the impact of comorbid affective disorders. However, chronic pain, anxiety and depression are generally diagnosed and treated separately by different specialties. Patients would benefit from stronger communication between multidisciplinary services to allow for more accurate and individual treatment plans (Goesling *et al.*, 2018).

4.0b: Support groups

As previously mentioned, meeting like people and listening to relatable experiences can reduce social isolation. This is important as feeling isolated can worsen depression and anxiety (Hadi *et al.*, 2018). Support groups led by people who experience chronic pain can provide advice and expertise, as well as friendship and motivation. Quotes from a qualitative study described how friendships formed helped support them through flare-ups and mental health crises. However, possible drawbacks occurred when the groups were too focussed on negative aspects of chronic pain, this was sometimes a reason for dropping out (Farr *et al.*, 2021). Other barriers included being unable to regularly attend due to pain flare-ups and a lack of patient-led support groups in some places. Overall, support groups were considered a positive and safe method of managing mental health and chronic pain.

4.0c: Cognitive Behavioural Therapy (CBT)

CBT focuses on changing behaviour which exacerbates catastrophic thinking, suffering, and disability from chronic pain. It can be applied alongside the fear-avoidance model to target catastrophising and avoidance behaviour which leads to the disabling nature of chronic pain (Hooten., 2016). There is little evidence for its usefulness in directly treating pain, however it can reduce the depression and anxiety which coincide with it (Williams *et al.*, 2012).

In controlled scenarios, CBT was found to be useful. Its positive aspects include altering negative thoughts towards the pain and teaching coping strategies, such as time-based pacing and relaxation. It is also very safe with little risk of making the experience of pain worse for the patient (Goesling *et al.*, 2018).

However, its efficacy is different in practice with as many as 50% of patients not benefiting from psychotherapies (De Ridder *et al.*, 2021). This could be caused by limited access to trained psychologists who can give bespoke treatment for an individual's pain disorder and mental health condition. CBT care is often generalized when translated into clinical practice and trained staff are often stretched between many patients (Goesling *et al.*, 2018). Overall, whilst it is safe and generally useful in the management of comorbid mental

health problems, there are significant problems with delivering CBT treatments on a population level.

4.0d: Antidepressants

Antidepressants are a first-line treatment for clinical depression and there is growing evidence of their efficacy in managing chronic pain (Birkinshaw *et al.*, 2023). This is possibly due to the shared nature of monoamine neurotransmitters, particularly serotonin and norepinephrine (Goesling *et al.*, 2018). It is also possible that the analgesic mechanism is physically separate from their antidepressant mechanism. This is evidenced by the pain-relieving effects appearing quicker than their antidepressive effects (Obata., 2017). Either way, certain types of antidepressants, especially SNRIs and TCAs (tricyclic antidepressants), may be helpful in reducing allodynia, hyperalgesia and supporting affective comorbidities (Birkinshaw *et al.*, 2023).

However, there is also a risk of negative side effects, such as GI bleeds and insomnia (Harvard Health., 2021 and Birkinshaw *et al.*, 2023). There is limited evidence in their efficacy for reducing neuropathic pain and fibromyalgia. Also, the individual nature of chronic pain means that better evidenced antidepressants, such as duloxetine, are still not helpful for every patient (Birkinshaw *et al.*, 2023).

Overall, antidepressants are primarily useful in treating psychiatric disorders, with a possibility of also reducing the impact of chronic pain. However, the complexity and individual nature of chronic pain means that there is no guaranteed effective treatment for everyone with any specific medication.

5.0 Conclusion

In conclusion, intrinsic links exist between chronic pain and mental health. There are many social, psychological, and physical connections between the two and it is important to acknowledge the multidimensional nature of chronic pain when looking to treat comorbid anxiety and depression. Reciprocally, keeping good mental health is a significant part of reducing the intensity and impact of chronic pain. Methods to support mental health include psychological and pharmaceutical therapies. Group therapies give voice to the patient's expertise in the management of their condition and help reduce social isolation. Behavioural therapies, such as CBT, may be useful in altering negative thoughts and behavioural patterns which increase the disabling nature of chronic pain. Additionally, evidence towards the analgesic nature of some antidepressants exists.

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