Physiotherapist factors associated with the intention to deliver psychologically informed physiotherapy in persistent low back pain: A vignette study

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Abstract

Introduction

Non-specific low back pain is a leading cause of disability worldwide and can have devastating impacts on work, whānau and community roles, social relationships and quality of life. Physiotherapists are the main providers of low back pain care in Aotearoa New Zealand, so supporting them to provide evidence based, and effective management is crucial to improve pain outcomes. Psychologically informed physiotherapy (PIP) incorporates the use of psychological techniques within physiotherapy. PIP can improve pain outcomes compared to usual physiotherapy, but global research suggests that many physiotherapists do not provide PIP in real life clinical practice. It is not known how many New Zealand physiotherapists provide PIP to people with low back pain. Qualitative research suggests the barriers to delivering PIP are related to physiotherapists' confidence, knowledge, skills, lack of time, biomedical orientation, organisational support, training and supervision. The relative importance of these barriers has not been evaluated quantitatively.

Aims

This study aimed to determine the proportion of physiotherapists in Aotearoa New Zealand that intend to deliver PIP to patients with persistent low back pain, and identify which factors are associated with the intention to deliver PIP.

Methods

New Zealand physiotherapists (n = 224) completed an online vignette case study where they outlined their intended assessment and treatment plan for two persons with persistent low back pain. They then completed the Knowledge and Attitudes of Pain Questionnaire (KNAP), components of the Determinants of Implementation Behaviour Questionnaire (DIBQ) and demographic questions. Logistic regression was used to determine which questionnaire and demographic variables were associated with the intention to deliver PIP.

Results

One third of participants intended to deliver PIP in the management of low back pain. A logistic regression analysis showed that the KNAP score was consistently and most strongly associated with the intention to deliver PIP. Beliefs about the consequences of PIP was also associated with the intention to deliver PIP in one vignette.

Conclusion

This study suggests that physiotherapists' knowledge and attitudes towards pain and their belief that PIP is effective in low back pain management are associated with PIP delivery in Aotearoa New Zealand. These findings indicate that improving pain knowledge and beliefs around PIP may improve the quality of low back pain management. Future research needs to confirm these results in clinical settings, understand how pain neuroscience knowledge is acquired, and identify how best to translate this into Aotearoa New Zealand physiotherapy practice.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor used artificial intelligence tools or generative artificial intelligence tools (unless it is clearly stated, and referenced, along with the purpose of use), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed: Claire Earl

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Chapter 1

Introduction

1.1 Statement of the Problem

Low back pain is defined in the Global Burden of Disease (GBD) study as “pain located posteriorly between the 12th rib to the lower gluteal folds with or without one or both lower limb involvement” (Chen et al., 2022). Non-specific low back pain is a leading cause of disability worldwide (Hartvigsen et al., 2018). When death and disability are considered, low back pain is regularly rated in the top ten in the GBD and its prevalence is increasing (Tamrakar et al., 2021). This is despite extensive research, new knowledge and medical technology in the treatment of low back pain (Buchbinder et al., 2020; Yang et al., 2023). Low back pain can have wide-reaching effects to individuals, including impaired physical function, reduced psychological wellbeing, and decreased participation in work and activities (Hoy et al., 2014). This can lead to high costs for individuals, communities, workplaces, the economy, and society (Edwards et al., 2016).

Most cases of low back pain are non-specific and benign, with less than 5% of cases of low back pain requiring specialist assessment. Acute episodes of non-specific low back pain will generally improve in six weeks (Maher et al., 2017). However, approximately 40% develop into persistent pain (Almeida et al., 2018), defined as “a persistent or recurrent pain experience of more than three months” (Treede et al., 2019). Persistent non-specific low back pain is associated with poorer pain and disability outcomes (Maher et al., 2017) and is not necessarily maintained by the initial cause of the pain (Cormack et al., 2023). Instead, persistent pain is characterised by a complex combination of biological, neurophysiological, environmental, cultural, emotional, spiritual, and behavioural factors (Wijma et al., 2016).

It is, therefore, understandable that clinical guidelines for managing persistent low back pain encompass the biopsychosocial model. In acknowledgement of this, many physiotherapists have been trained in psychological techniques to help manage

the psychological components of pain. When the use of psychological approaches are undertaken by physiotherapists, this is referred to as psychologically informed physiotherapy (PIP) (Denneny et al., 2020).

In studies where physiotherapists are trained to deliver PIP, the physiotherapists find it acceptable and patients tend to have improved disability, quality of life and pain outcomes compared to those receiving traditional physiotherapy methods (Ballengee et al., 2021). However, despite training in psychological strategies and support for the biopsychosocial model in clinical guidelines, the behaviour of physiotherapists in clinical practice has not had a significant change (Holopainen et al., 2020; Loftus, 2011; Weiser & Hiebrt, 2018). Even when trained in PIP, physiotherapists can still spend more time and place more importance on biomedical treatments (Stevenson et al., 2006). This only serves to reinforce patient biomedical beliefs about pain, which can impact on ongoing disability (Darlow et al., 2012; Loftus, 2011). Qualitative studies have suggested several reasons why physiotherapists are reluctant to implement PIP strategies, including lack of support, fear of it being unacceptable to patients, presence of biomedical beliefs, and lack of knowledge, skills and confidence (Driver et al., 2017; Gardner et al., 2017; Holopainen et al., 2020). Quantitative data would help us to understand which factors are most important to PIP delivery. To our knowledge, there is limited quantitative literature that tests these theories more widely in the physiotherapist population.

1.2 Purpose of the Study

This study has two research questions:

1. What proportion of physiotherapists in Aotearoa New Zealand intend to deliver PIP to individuals with persistent low back pain?
2. Which factors are associated with the intention to deliver PIP to those with persistent low back pain?

1.3 Significance of the Problem

This study will help to determine which factors are most important in the delivery of PIP so that the barriers to PIP delivery can be better understood and addressed in clinical practice. This is highly relevant in Aotearoa New Zealand, where physiotherapists are primary health care practitioners and are a main provider for musculoskeletal conditions (Reid & Larmer, 2007). This means that Aotearoa New Zealand physiotherapists need to appropriately assess, triage and direct treatment strategies for patients with non-specific low back pain. For this reason, it is necessary to understand the extent to which physiotherapists are practicing PIP and how physiotherapists can be supported to deliver PIP. This information can be used to direct future research, policy and implementation strategies so that more physiotherapists are supported to deliver care under a biopsychosocial model. Most importantly, this means that individuals with persistent low back pain will receive higher quality of care, which could ultimately improve the health and economic costs associated with persistent low back pain in Aotearoa New Zealand.

Chapter 2

Literature Review

2.1 Introduction to Persistent Low Back Pain

In non-specific low back pain the cause of pain is not able to be pinpointed to a particular tissue or structure of the spine (Maher et al., 2017). Most cases of non-specific low back pain require low levels of intervention for full recovery (Almeida et al., 2018). Referral for imaging and specialist input should only occur in the presence of red flags (Finucane et al., 2020). However, low back pain is frequently and inappropriately over managed with biomedical assessments and interventions (Malfliet et al., 2019).

Low back pain can become persistent due to a complex combination of neurobiological, psychological and social factors, which may exist pre-injury or develop due to the experience of back pain (Edwards et al., 2016). The persistent and worsening nature of persistent pain can be highly concerning and debilitating to the sufferer, causing impacts on their psyche, social and work activities (Schofield et al., 2012; Toye & Barker, 2012), only to further impact on their overall wellbeing. This creates healthcare and economic costs to the individual and society.

In Aotearoa New Zealand, low back pain is ranked second in the top ten causes of death and disability (Vos et al., 2020). New Zealand spends $321.2 million per year on treatment for low back pain and $2.6 billion on non-health care related costs (National Health Committee, 2015). From 2009 to 2020, there was a 23% increase in low back pain claims and a 52% increase in costs under the New Zealand Accident Compensation Corporation (ACC) which is a no-fault accidental injury compensation scheme that is available to all New Zealanders (Hill et al., 2023). The disability adjusted life years (DALYs) for low back pain in New Zealand has risen from 3.73% to 4.52% from 1990 to 2019 (The Institute for Health Metrics and Evaluation, 2019), indicating that the cost to New Zealand is rising (Hill et al., 2023).

New Zealand physiotherapists are at the forefront of managing low back pain (Reid & Larmer, 2007). Due to rising costs and disability related to low back pain, it is important that New Zealand physiotherapists are assessing and managing low back pain appropriately. Traditionally, physiotherapists have worked under a biomedical model which has been shown to be ineffective for back pain (O. O. Babatunde et al., 2017). Instead, there is extensive support for the biopsychosocial model and psychological strategies for the management of persistent low back pain (Almeida et al., 2018; Malfliet et al., 2019; Wiles & Maher, 2022). Physiotherapists can successfully manage low back pain using psychologically informed strategies (Ballengee et al., 2021). This may be a shift in practice for many physiotherapists, requiring a process of change. Understanding the factors related to this change will help to facilitate PIP delivery. This chapter will explore the evidence for the biopsychosocial model over the biomedical model in relation to persistent low back pain, justifying the use of management approaches that are centred on the biopsychosocial model for physiotherapists. It will describe the large body of evidence for psychological therapies in the treatment of persistent low back pain and show that physiotherapists can effectively provide psychologically informed strategies. The uptake, framework and challenges of PIP will also be explored. Lastly, rationale for the importance of understanding PIP delivery in Aotearoa New Zealand will be provided.

2.2 Traditional Biomedical Model in the Management of Low Back Pain

In musculoskeletal medicine, biomedical management of injuries is centred around diagnosis and treatment of tissue pathology (Johnson et al., 2022). This includes determining the location of tissue damage through clinical tests and radiology to provide an explanation of the pain, prognosis of tissue healing, and applying treatment to the damaged and surrounding tissues. The biomedical model presents a linear model where pain is the result of a physical pathology (see Figure 2.1) (Asmundson & Wright, 2004). This model assumes that pain arises due to stimulation of the nociceptors and that pain is proportionate to the degree of tissue damage

Figure 2.1

The biomedical model of pain

Note. This model demonstrates the biomedical model of pain. From "Biopsychosocial approaches to pain," by G. J. G. Asmundson and K D. Wright, in T. Hadjistavropoulos and K. D. Craig (Eds.), *Pain: Psychological Perspectives,* (p. 36), 2004, Psychology Press. Copyright 2004 by Lawrence Erlbaum Associates, Inc. Reprinted with permission from Taylor & Francis Group LLC – Books, permission conveyed through Copyright Clearance Center, Inc.

(Waddell, 1987). This management style can be appropriate in managing acute musculoskeletal pathology (Trouvin & Perrot, 2019), but evidence shows it is ineffective for the treatment of non-specific low back pain (Beyera et al., 2019). It may even delay recovery: there is good quality evidence to show that people with low back pain who have Magnetic Resonance Imaging (MRI) scans have increased length of disability (Shraim et al., 2021) and at least moderate evidence that imaging has no benefit for pain, function, satisfaction and quality of life for people with pain (Chou et al., 2009; Karel et al., 2015).Traditional physiotherapy fits within the biomedical model. Many traditional physiotherapy treatment methods are considered passive because they require little effort from the recipient. Traditional physiotherapy methods that aim to improve musculoskeletal tissue pathology can include therapeutic ultrasound, Kinesio tape, exercise, massage, and spinal manipulations and mobilisations (Malfliet et al., 2019). Yet in non-specific low back pain, there is not convincing evidence that acute pathology exists. For example, there are inconsistent associations between MRI findings of tissue pathology and pain and disability outcomes (Jarvik et al., 2005; Steffens et al., 2014).

There is also limited evidence that treatments such as aids, braces, TENS and acupuncture are effective (O. O. Babatunde et al., 2017). Manual therapy only provides temporary pain relief by modulating the nervous system through reducing alpha motor neuron activity (Dishman & Bulbulian, 2000) and activation of descending inhibitory pathways (Frey Law et al., 2008; Sterling et al., 2001). Utilising these passive treatments may reinforce biomedical understandings of pain and the individual's belief that the physiotherapist's treatment has an important role in changing the state of the tissue (Malfliet et al., 2019). Recipients therefore may continue to seek passive treatments under the biomedical model, believing that this is the appropriate management for low back pain, while creating further delay in receiving the appropriate care (Chou et al., 2011) and reducing their overall physical function and experiencing greater disability (Flynn et al., 2011).

When pain persists, individuals often seek further investigations and persist with ineffective interventions focussed on pathology, which may result in further confusion, frustration and costs to the healthcare system (Lewis & O'Sullivan, 2018). Some individuals may blame their lack of recovery on medical management leading to distrust in the system and reduced attendance to health settings (Johnson et al., 2022). The individual may begin to perceive the pain as mysterious and any activity that flares pain is perceived as threatening and is best avoided, leading to reduced confidence in their ability to cope with activity and a cycle of fear, avoidance and disuse (Vlaeyen & Linton, 2012). The individual may not return to work (Yang et al., 2023) and have negative changes in physical conditioning, relationships, finances and psychological status (Robinson et al., 2013). This demonstrates the changes that occur bio-psychosocially. Psychological changes may include lower self-efficacy, higher catastrophising (Tardif et al., 2021), increased fear, greater frustration and depression (Petrie et al., 2014).

Evidence shows that biomedical factors have little or no influence on the development of persistent pain. Physical aspects of the injury are not consistently associated with persistent pain (Alkassabi et al., 2022; Kent & Keating, 2008). There is

consistent, although limited, evidence that physical variables such as strength, endurance and mobility and physical job factors are not predictive of outcome after attendance at a multidisciplinary team (MDT) or back school facility (van der Hulst et al., 2005). Physical activity has also been shown not to be a prognostic factor in pain and disability in low back pain, although the quality of these studies is low (Oliveira et al., 2019). There is also no evidence that one form of exercise is more effective in improving pain and disability (Grooten et al., 2022), showing that targeting certain muscle groups to support the spine is no more relevant than general exercise. These studies imply that focussing on the physical aspects in persistent low back pain is insufficient and ineffective.

The biomedical model is also not supported in clinical guidelines, which state that, unless there is suspicion of serious pathology, the biomedical model is inappropriate for the management of persistent pain (Lin et al., 2020). Imaging, massage, traction, opioids, and surgery are not recommended in clinical guidelines for persistent musculoskeletal pain (Foster et al., 2018; Malfliet et al., 2019; Wiles & Maher, 2022) and there is weak evidence for passive strategies such as acupuncture, therapeutic injections, orthoses and electrotherapies (Wiles & Maher, 2022). Instead, most clinical guidelines for persistent low back pain recommend addressing psychosocial issues and education as preferred methods over biomedical management (Almeida et al., 2018; Foster et al., 2018; Wiles & Maher, 2022).

In summary, a large body of evidence that shows that a biomedical model of care is ineffective and can lead to poorer outcomes in low back pain. The next section will explore the biopsychosocial model of pain, including the different components and its limitations of the biopsychosocial model as a whole.

2.3 The Biopsychosocial Model of Pain

The biopsychosocial model is a holistic framework encompassing the biological, psychological and social aspects of health. The biopsychosocial model in healthcare is not new. It was defined by Dr George Engel in 1977, who urged healthcare

practitioners to consider the individual and social factors that influenced the individual's experience of health (Epstein & Borrell-Carrio, 2005). Since this conception, the biopsychosocial model has evolved and researchers have explored the influence of biopsychosocial factors on low back pain, providing evidence of the importance of the biopsychosocial model in pain.

The biopsychosocial model has been adopted in health organisations and diagnostic systems for a variety of health conditions. In 2001, the World Health Organization introduced the International Classification of Functioning, Disability and Health (ICF) model to allow health professionals to express the complexity of the health of an individual. The ICF model considers the dynamic interplay of personal factors, environmental factors, participation and body structure and function (Allan et al., 2006). The International Classifications of Disease model classifies the health condition and diagnosis (Escorpizo et al., 2013). These two models complement each other to create a biopsychosocial description of an individual's health (Escorpizo et al., 2013).

The terms "chronic primary pain" and "chronic secondary pain" were added to the 11th edition of the International Classification of Diseases model (World Health Organization, 2022). Under this classification, the importance of psychological and social factors in persistent pain was recognised by including "significant emotional distress" within the definition to emphasise that pain is biopsychosocial rather than purely physical (Treede et al., 2019). Non-specific low back pain fits under chronic primary pain. This is evidence that there is a shift away from a biomedical understanding and towards a biopsychosocial understanding of pain.

For physiotherapists to treat low back pain effectively, it is important to understand how the biopsychosocial model applies in pain. This includes the neurobiological processes of pain, psychological factors that are involved in the transition and maintenance of pain and the influence of the social, cultural and spiritual context that the individual lives within. All these factors will play a part in the experience of pain, the beliefs, attitudes, behaviours and the impact it has on the person's identity and participation within their whānau/family and community. Understanding these

factors allows the physiotherapist to develop therapeutic alliance and provide patient centred care, which facilitates effective pain management treatment (Kinney et al., 2020).

The following section will explain how biopsychosocial factors are relevant in the development and maintenance of persistent low back pain.

2.3.1 Biological. While there is evidence that the biomedical model for persistent low back pain is insufficient and ineffective, the biological aspect of persistent pain is still relevant in the biopsychosocial model. There is ample evidence for neurobiological changes that occur in the nociceptive system that can lead to the ongoing maintenance of pain. These changes can cause increased nociceptive processing from the bottom-up along with altered top-down modulation (den Bandt et al., 2019) and involves multiple processes that likely interact with each other (Perl, 2011). This includes amplification of peripheral nociceptive information at the periphery and dorsal horn (den Bandt et al., 2019), increased processing in the brain nuclei (den Bandt et al., 2019), and structural changes of the brain (Gatchel et al., 2007). These changes reflect the neural plasticity that occurs as a result of prolonged activation of the nociceptive system (Lewis & Rice, 2014) and are considered to contribute to the maintenance of pain (Gatchel et al., 2007; Lewis & Rice, 2014). These central changes help to explain why there is little evidence to suggest that focusing on the treatment of peripheral tissue will aid in the prevention or management of persistent pain.

In acute tissue pathology, temporary activation and sensitisation of the nociceptive system is normal and is known as peripheral sensitisation. A normal response to tissue injury includes the release of substances that sensitise the nociceptors, increase excitability of the peripheral nociceptors and awakening of dormant nociceptors. Substances released following peripheral noxious stimuli, including glutamate, neuropeptides substance P and calcitonin gene-related peptide (CGRP), brain derived neurotrophic factor (BDNF) and bradykinin, can contribute to sensitisation of the nociceptors (Latremoliere & Woolf, 2009), as well as the release of nerve growth factor, which also contributes to sensitisation (Hoheisel et al., 2007).

Release of substance P and CGRP from the nociceptors themselves can further sensitise nociceptors, while dormant nociceptors can activate, both of which increase afferent input to the spinal cord which then ascends to the brainstem via medial and lateral pathways (Lewis & Rice, 2014). In the brain, nociceptive processing and interpretation occurs through a complex neural network system which includes the somatosensory cortex, thalamus, limbic system, and frontal cortex and is known as the neuromatrix (Melzack, 2001). Activation of the neuromatrix brings about the experience of pain (Lewis & Rice, 2014).

In persistent pain, these processes may be maladaptive and contribute to the maintenance of pain. Prolonged noxious stimuli in the periphery may lead to hyperexcitability of the dorsal horn projection neurons in the spinal cord, termed central sensitisation (Hush et al., 2013). Ongoing nociceptive input to the spinal cord can lead to a raft of neurochemical changes in the dorsal horn, including additional release of substance P, increased receptor availability, changes in ion function and numbers, enlargement of dorsal horn neuron receptive fields, and reduced function of inhibitory pathways (Lewis & Rice, 2014). In response to tissue injury, these short-term neurochemical changes are normal and functional. In persistent pain conditions, including low back pain, there is evidence that additional anatomical changes can occur at the spinal cord dorsal horn that contribute to persistent central sensitisation, which is maladaptive and promotes ongoing pain (Roussel et al., 2013). These include changes from nociceptive-specific neurons to wide-dynamic neurons which then respond to both innocuous stimuli and an increased response to normal noxious stimuli (Latremoliere & Woolf, 2009), loss of inhibitory interneurons, decreased opioid receptor availability, and a phenotypic switch of mechanoreceptors to release nociceptive neurotransmitters and synapse with nociceptive dorsal horn neurons (Lewis & Rice, 2014).

There is evidence that altered morphology and function in the brain is associated with persistent pain. Functional MRI scans, transcranial magnetic stimulation and voxel-based morphometry have demonstrated that structural and

functional cortex changes occur with persistent pain (Gatchel et al., 2007). This includes neuro-chemical changes in the dorsolateral prefrontal cortex, thalamus, orbitofrontal cortex and anterior cingulate cortex; changes in gray matter in the dorsolateral pre-frontal cortex, right anterior thalamus, somatosensory cortex, brainstem and post-parietal cortex; and changes in blood flow (Medrano-Escalada et al., 2022; Wand & O'Connell, 2008). Activation of the nociceptive system also leads to activation of the autonomic nervous system and the Hypothalamic-Pituitary-Adrenal (HPA) axis. If prolonged, the presence of cortisol levels can contribute to hippocampus neural degeneration, immune system suppression and alterations of the brain structure which can impact on mental and physical function of the individual (Gatchel et al., 2007). The representation of the lower back in the somatosensory cortex has been shown to be enlarged and shifted medially, plus has greater cortical response to lumbar spine tactile stimulation compared to healthy controls (Flor et al., 1997). These changes in the peripheral and central nociceptive systems can contribute to altered proprioception, sensory discrimination, and widespread pain (Hush et al., 2013), referred pain, impaired motor control, sensory changes, spontaneous pain, allodynia and hyperalgesia (Lewis & Rice, 2014).

Changes to the function of inhibitory and facilitatory pain pathways may also contribute to the maintenance of persistent pain. Ongoing ascending input alters inhibitory and facilitatory pathways in the modulatory regions of the brainstem (Perl, 2011). Persistent nociceptive input may change the facilitation of descending nociceptive pathways through the alteration of ON/OFF cells in the brainstem, including the activation of neutral cells, switch of inhibitory input to facilitatory input and lower threshold for OFF cells and- an increased number of ON cells (Kregel et al., 2015; Lewis & Rice, 2014). In persistent pain, this is associated with reduced descending inhibition and increased excitation of descending facilitatory pathways (Lewis & Rice, 2014).

This evidence shows that the presence of persistent pain is not generally related to peripheral noxious stimuli but represents the maladaptive response and

hypersensitivity of the central nervous system which can alter the perception of noxious and innocuous stimuli (Latremoliere & Woolf, 2009). The sensitisation of the spinal cord, cortex changes, neurochemical changes and dampening of inhibitory descending pathways interact and enhance the amplification of pain. This demonstrates why providing treatment to the peripheral tissues in persistent low back pain is largely ineffective, because these treatments do not have significant or long-lasting impact on the central nervous system.

These neurobiological factors are intertwined within the biopsychosocial model. The neuromatrix includes centres of the brain which are also are involved in arousal, mood, attention, cognitions, behaviour and memory (Lewis & Rice, 2014). These centres communicate with key brainstem regions that are involved in nociceptive modulation and therefore pain modulation can be affected by attention, expectations, stress and vigilance (Brosschot, 2002). The function of these modulatory centres may have been altered prior to the onset of pain (Vachon-Presseau et al., 2016) or adapted once pain began (Hashmi et al., 2013). As central sensitisation can cause widespread or amplified pain and sensory changes, these symptoms may be alarming for the persistent pain sufferer. This may only enhance negative beliefs about their pain, resulting in further maladaptive behaviours and psychological distress, only to reinforce the central sensitisation process (Wand & O'Connell, 2008). This shows that these biological changes do not occur in isolation and can be influenced by psychosocial, cognitive and behavioural factors related to the individual. Psychosocial factors and their interactions with some of these key neurobiological processes are described below.

2.3.2 Psychological. Many psychological factors have been associated with the development and perpetuation of persistent pain and disability. These factors include depression, catastrophising, pain related fear and avoidance, psychological flexibility, recovery expectations and self-efficacy (Otero-Ketterer et al., 2022). Psychological factors, whether pre-existing or developed with pain, can have a

detrimental or protective influence on individuals with persistent pain. This can have significant impact on behaviour, how one attends to pain and can influence neurobiological processes (Edwards et al., 2016). These factors may also impact on social relationships as well as participation in activity, work and roles within the family/whānau or wider community. Therefore, psychological factors are integrated with the biological and social components of the biopsychosocial model. The following section will demonstrate that psychological factors have an integral role in pain outcomes. This will be evidenced by studies that have shown an association between psychological factors and pain outcomes, with an emphasis on evidence from low back pain systematic reviews, where possible.

2.3.2.1 Depression. The evidence for the co-existing nature of persistent pain and depression was documented several decades ago (Romano & Turner, 1985; Von Korff & Simon, 1996) and has since been extensively researched. Symptoms associated with both pain and depression include feelings of hopelessness, worthlessness, low energy, worry, disturbed sleep and feeling that everything is an effort (Von Korff & Simon, 1996). It has since been identified that pain and depression are closely linked neurobiologically, sharing similar brain regions, pathways, and neurotransmitters, and both respond to inflammation-induced changes in the central nervous system (Sheng et al., 2017). The relationship is likely bi-directional: depression may increase the risk of persistent pain and/or develop alongside or after persistent pain has been established (Alkassabi et al., 2022; Tenti et al., 2022) due to changes in activity levels, participation and/or multiple stressors related to the pain experience (Campbell et al., 2003; Tenti et al., 2022).

Systematic reviews show that depression is associated with the development and outcome of persistent low back pain (Hruschak & Cochran, 2018; Pincus et al., 2002). Both reviews found that depression was a consistent key factor in the transition from acute to persistent pain, with one of these reviews finding strong evidence of this. However, this was not supported by a third systematic review (Ramond et al., 2011),

although this review was mostly focused on the primary health care setting, which may have limited its results.

Systematic reviews also indicate that depression that is present at the onset of pain is related to worse outcomes, such as pain intensity, disability, return to work and health related quality of life (Pinheiro et al., 2016; Wong et al., 2022). Studies included in these systematic reviews were generally of moderate quality and it was often larger studies that found an association (Pinheiro et al., 2016), providing convincing evidence that depression is associated with poorer outcomes in persistent pain.

In summary the association between depression and pain is well documented. These systematic reviews provide convincing evidence that depression is linked with the development of persistent pain and is related to worse pain outcomes.

2.3.2.2 Catastrophising. Catastrophising of pain has been described as the "exaggerated negative orientation to actual or anticipated pain" (Sullivan, 2012). It has traditionally been broken down into three separate components: rumination, magnification and helplessness (Sullivan et al., 1995). In recent literature, it is suggested that it is far more complex and can also involve emotional regulation, catastrophic worry, behavioural activation and behavioural inhibition (Petrini & Arendt-Nielsen, 2020). Cognitive rumination may help the individual to avoid engaging with a negative emotional state or be an attempt to problem solve the inescapable pain. This can lead to cycles of worry due to lack of solution and influence neuro-biological processes, only to enhance the perception of pain (Haythornthwaite et al., 2024).

Pain catastrophising has been shown to be associated with the perpetuation of persistent low back pain in several systematic reviews. While an earlier systematic review on psychological predictors of low back pain outcomes only found weak evidence for the association of pain catastrophising and chronicity (Pincus et al., 2002), two more recent reviews have demonstrated that baseline catastrophising is associated with pain and disability at acute, sub-acute and long-term follow-up measurements (Hruschak & Cochran, 2018; Wertli, Eugster, et al., 2014). One of these

latter reviews only included moderate-high quality studies (Wertli, Burgstaller, et al., 2014) meaning there is strong evidence that catastrophising is related to pain outcomes. A decrease in catastrophising is also associated with improved treatment outcomes (Wertli, Burgstaller, et al., 2014). (Ryum & Stiles, 2023)

These reviews demonstrate strong evidence that pain catastrophising contributes to persistent pain. Further research may involve reconceptualising pain catastrophising using different terminology, since the phrase does not explain the phenomenon accurately (Petrini & Arendt-Nielsen, 2020) and may stigmatise people with pain (Webster et al., 2023). However, regardless of the terminology, the evidence clearly shows that catastrophising is an important factor in the biopsychosocial model of persistent low back pain.

2.3.2.3 Fear Avoidance. Fear avoidance in pain is the avoidance of activity due to fear of pain and/or injury that the individual perceives will occur during physical activity (Crombez et al., 2012). This process may start with cognitive factors such as a negative appraisal of stimuli or catastrophising, and then a negative emotional response and/or anxiety (Vlaeyen & Linton, 2000). The resulting pain-related fear leads to hypervigilance and avoidance patterns, increased muscular reactivity and then physical disuse (Vlaeyen & Linton, 2000, 2012). This cyclical nature has been portrayed in the Fear Avoidance Model (Vlaeyen & Linton, 2000), which has been used extensively in research to explore its relationship with persistent pain.

Systematic reviews have studied the link between fear avoidance and the development of persistent pain. There is high quality evidence that fear avoidance is associated with pain and disability up to 6 months after pain onset (Wertli, Rasmussen-Barr, Weiser, et al., 2014) and at least moderate evidence that fear avoidance is predictive of return to work outcomes in the first 6 months of low back pain(Iles et al., 2009; Wertli, Rasmussen-Barr, Weiser, et al., 2014). There is also moderate-high quality evidence that fear avoidance beliefs are an important moderator of treatment

change in people that have had pain for up to 6 months (Wertli, Rasmussen-Barr, Held, et al., 2014).

Beyond 6 months, there is mixed evidence about association of fear avoidance and persistent pain. Two reviews report no evidence that fear avoidance is predictive of pain and disability beyond 6 months (Wertli, Rasmussen-Barr, Weiser, et al., 2014) or related to persistent pain symptoms or disability (Pincus et al., 2002). In contrast, a more recent review found that fear avoidance is a significant predictor of disability even in studies with a 12-month follow-up, yet the included studies were of low quality (Alhowimel et al., 2021). In other systematic reviews, a small to moderate association between fear avoidance and pain was demonstrated in persistent pain; however, one review reported that it was significantly moderated by other factors (Markfelder & Pauli, 2020) and another was not specific to persistent low back pain (Kroska, 2016). The differences in effect sizes and consistency between studies may occur because participants may vary in whether fear avoidance exists and to which degree this impacts on them. Future studies may need to stratify participants according to scores on fear avoidance outcome measures to confirm these findings.

In summary, there is high quality evidence suggesting that fear avoidance predicts the presence of pain and disability and there is moderate-high quality evidence that it impacts on treatment change up to 6 months after onset of pain. The evidence is less clear for the perpetuation of outcomes beyond this time frame. This body of research demonstrates the importance of considering fear avoidance in individuals that present with low back pain.

2.3.2.4 Recovery Expectations. Recovery expectations of persons with low back pain may also relate to persistent pain outcomes. Individuals with positive recovery expectations are more likely to return to normal function, whereas negative recovery expectations are associated with poor outcomes (Otero-Ketterer et al., 2022). In individuals with musculoskeletal pain, recovery may mean either complete resolution of symptoms with full return to pre-injury function or return to function with residual

symptoms (Carroll et al., 2016). It is likely that recovery expectations involve a multitude of personal psychological and environmental factors but the relationships between these factors are not known (Iles et al., 2008).

In persistent low back pain populations, recovery expectations have mostly been studied in the context of returning to work (Hayden et al., 2019). There is consistent evidence from systematic reviews that recovery expectations predict return to work outcomes (Hallegraeff et al., 2012; Hayden et al., 2019; Iles et al., 2009; Steenstra et al., 2017). The strength of prediction is generally reported as strong (Hallegraeff et al., 2012; Hayden et al., 2019; Iles et al., 2009) and if measured in the acute phase the prediction tends to be stronger (Iles et al., 2009). Negative expectations of recovery are two times more likely to result in work absence compared to positive expectations and this remains when only high-quality studies are included (Hallegraeff et al., 2012). This indicates confidence in the evidence that negative expectations are associated with work absence. However, there are limitations with this literature. Recovery expectations to return to work are generally measured with a single item question and are inconsistent across studies (Iles et al., 2008), and studies vary in which phase of back pain the recovery expectation measures were performed.

There is less evidence available for the association of recovery expectations and general pain outcomes. One systematic review concluded there was low-quality evidence for the association of positive recovery expectations and better clinically important recovery, pain intensity, and functional outcomes (Hayden et al., 2019). Study findings were consistent and demonstrated moderate to large effect sizes (Hayden et al., 2019). Higher quality studies would be required to confirm these associations.

In conclusion, there appears to be strong evidence that recovery expectations are associated with work and limited evidence for its association with pain outcomes. While there are limitations with this research, the body of research suggests that an individual’s expectations of recovery play an important role in the experience of pain

and therefore is an important consideration in the biopsychosocial model of persistent low back pain.

2.3.2.5 Self Efficacy. Self-efficacy is the confidence to carry out functional tasks, goals and participate in activities (Bandura, 1977). The role of self-efficacy in persistent pain is widely studied and summarised in several systematic reviews; however, there are fewer reviews specifically on low back pain.

There is evidence that higher self-efficacy is associated with improved disability and pain (Alhowimel et al., 2021; Martinez-Calderon et al., 2018) and has negative correlations with impairment, distress and function (Jackson et al., 2014; Martinez-Calderon et al., 2018) in general persistent pain populations. Overall, the strength of this association was medium to strong (Alhowimel et al., 2021; Jackson et al., 2014). In contrast, another review found weak evidence for self-efficacy being a prognostic factor for disability, health related quality of life and pain; however, they only included participants enrolled in pain management programmes (Hayward & Stynes, 2021). Overall, the quality of studies within these reviews was low (Alhowimel et al., 2021; Hayward & Stynes, 2021; Martinez-Calderon et al., 2018) or not reported (Jackson et al., 2014).

Studies continue to emerge on the effect of self-efficacy in low back pain populations. A recent large longitudinal study showed self-efficacy played a protective role in the development of pain and disability, even in long term follow-up (Puschmann et al., 2020). Other research has shown that when receiving treatment, a change in self-efficacy may be an important mediating factor for function or disability (Riley et al., 2020; Ryum & Stiles, 2023; van Hooff et al., 2021) and may be more important than fear avoidance (Riley et al., 2020; van Hooff et al., 2021) or catastrophising (van Hooff et al., 2021). Overall, the literature points towards higher self-efficacy being associated with improved persistent pain outcomes, showing that this is an important factor to the overall experience of persistent pain.

2.3.2.6 Psychological Flexibility. Psychological flexibility is described as the

ability to be ‘fully present’ despite discomfort and to appropriately maintain or change behaviour to achieve the task at hand (Thompson & McCracken, 2011). This can be practiced through pain acceptance and persistence of activity (McCracken et al., 2007). On the other hand, inflexibility can be displayed by avoidance of situations that may cause pain and/or distress (Gentili et al., 2019). In persistent pain conditions, avoidance of pain may become a default pattern of behaviour ultimately leading to reduced participation in normal activities and therefore disability (Gentili et al., 2019).

Several single studies have shown that psychological flexibility and pain acceptance are positively associated with improved pain outcomes (Gentili et al., 2019; McCracken, 2007). Cross-sectional studies demonstrate that psychological flexibility negatively predicts depression, disability, anxiety (McCracken & Eccleston, 2006), pain interference, (Davey et al., 2020; Gentili et al., 2019) and social and work adjustment (Davey et al., 2020) in persistent pain. In single studies, pain acceptance has also been shown to be associated with improved cognitive, emotional, social, and physical functioning compared to attention, control-oriented coping strategies and other traditional pain management methods (McCracken, 2007; McCracken et al., 2007). Pain acceptance has been shown to mediate the effect between pain symptoms and functioning (Gentili et al., 2019) and reduce the effects of catastrophising on a range of psychological outcomes (Vowles et al., 2008).

This research suggest that psychological flexibility can facilitate improved function despite symptoms in persistent pain conditions and may even be predictive of several pain outcomes. These studies have large sample sizes, similar measures, and involve participants entering treatment for persistent pain, indicating consistency amongst the studies and confidence in the results. However, most of these studies are cross-sectional. Longitudinal studies would help to understand more fully how psychological flexibility is associated with persistent pain participants over a longer period, and a systematic review would help to summarise the results of these studies. There is also a large body of evidence for acceptance in treatment trials, providing further support for psychological flexibility. These findings are described in section

2.4.3. This body of research suggests that psychological flexibility is important to the individual's behaviour in pain and therefore impacts on pain outcomes.

2.3.2.7 Summary of Psychological Factors. There is a large body of evidence for the role of psychological factors in the development of persistent pain and the association of pain and disability outcomes. Overall, systematic reviews demonstrate consistently that depression, catastrophising, fear avoidance and self-efficacy are associated with pain and disability outcomes. There is consistent evidence that recovery expectations predict return to work outcomes and several studies demonstrate that psychological flexibility can improve function despite symptoms. In self-efficacy and recovery expectations, the strength of association between psychological factors and pain outcomes were medium to strong. For fear avoidance, the association was small to medium and less convincing beyond six months. The difference in effect sizes or associations in the research may be because there will be variations between individuals in the presence of psychological factors and the degree to which these factors impact on each individual.

There are some minor limitations within these reviews. There are few high-quality studies examining the association of self-efficacy and recovery expectations with low back pain outcomes. There is also variation in outcome measures that are used, and in the case of recovery expectations, the outcome measures were often unstandardised. This could contribute to inconsistency between systematic reviews. Potentially using more than one outcome measure to assess psychological construct to help with synthesis of studies (Kroska, 2016).

Despite some limitations, there is a large body of evidence for the role in psychological factors in the development of persistent pain, perpetuation of persistent pain and association of pain and disability outcomes. This demonstrates that psychological factors are highly relevant in pain and provides further evidence for the appropriateness of the biopsychosocial model in pain. Therefore, it is integral that physiotherapists understand the role that psychological factors play in pain. Treatments

that target psychological factors and their efficacy will be discussed in section 2.4. The final component of the biopsychosocial model, social, is described below.

2.3.3 Social. The social environment that an individual lives within can influence pain beliefs, attitudes, behaviours, access to and quality of healthcare. These factors include social determinants of health (SDH), government policies and interpersonal relationship within the home, community and workplace. These influences may be positive or negative. Social factors are not well explored in the literature compared to psychological factors (Pincus et al., 2013). Social factors can impact on the outcomes of psychologically informed management in low back pain (Beneciuk et al., 2017), therefore should be considered in the framework of applying PIP. The following section will discuss the evidence supporting the association between social factors and pain outcomes. Where appropriate, this will be discussed in the context of Aotearoa New Zealand to provide insight into what social factors may contribute to the biopsychosocial model of persistent low back pain in this country.

2.3.3.1 Social Determinants of Health. The World Health Organisation define social determinants of health as “the conditions in which people are born, grow, live, work, and age, and the wider set of forces and systems shaping the conditions of daily life” (WHO Commission on Social Determinants of Health & Organization, 2008). This includes socio-economic status, political climate, living environment, education, and community contexts (World Health Organization, 2024). The SDH affect empowerment and control over one’s life (Marmot, 2015), access to health care, resources, discrimination within health settings (Anderson et al., 2009; Craig et al., 2020), exposure to health conditions and impacts on lifestyle choices and behaviour (Rethorn et al., 2019).

In low back pain, there are few systematic reviews for the association of SDH and low back pain outcomes, and SDH are rarely considered as confounding factors in research (Rethorn et al., 2019) or in clinical guidelines (Rathbone et al., 2020). In a systematic review, lower socioeconomic status, low income and unemployment were

consistently associated with poorer low back pain outcomes with moderate to large effect sizes (Karran et al., 2020). Empirical studies and narrative reviews suggest that people who are female (Wáng et al., 2016), older age (Mathieu et al., 2024) and of an under-represented ethnicity report more clinical pain (Bui et al., 2010; Palmer et al., 2007). People of minority ethnicities are more likely to experience pain even when socioeconomic status, comorbidities, education and employment are controlled for (Campbell & Edwards, 2012). They may also experience racial discrimination within health settings. Systematic reviews show that people of minority ethnicities may have longer wait times to be assessed and treated (Krupić et al., 2018) and be less likely to be prescribed opioid analgesics or receive spinal surgery (Chen et al., 2023). Racial discrimination may lead to greater disability and poorer function (Scott et al., 2019) and distrust in the health system, meaning they are less likely to seek healthcare (Bosire et al., 2022; Igwesi-Chidobe et al., 2017). SDH may even impact on outcomes where psychologically informed treatment is provided. In a study using psychologically informed management for low back pain, low socioeconomic status and education were associated with poorer treatment outcomes (Beneciuk et al., 2017).

In Aotearoa New Zealand, Te Tiriti o Waitangi was established in 1840 to ensure equal rights and responsibilities between the New Zealand Europeans and Māori, who are the indigenous culture of New Zealand. This founding document requires the New Zealand government to promote equity for Māori in all areas of health (Kidd et al., 2022). Despite the adoption of Te Tiriti o Waitangi principles in the health sector, Māori still experience poorer outcomes in persistent pain (McGavock et al., 2012). They are 1.4 times more likely to experience persistent pain than non-Māori (Ministry of Health, 2021), experience significantly higher pain intensity, number of pain sites, pain disability and psychological distress (Burri et al., 2018) and have significantly poorer outcomes in pain management services compared to Europeans (Lewis & Upsdell, 2018). There are also less Pasifika and Asian people accessing pain management services PMS than expected despite having a higher need for pain management care (Lewis & Upsdell, 2018). When entering PMS, Māori also have a

significantly higher need for treatment in all outcome measurements compared to Europeans (Lewis & Upsdell, 2018). Furthermore, several mental health outcomes are poorer for these minority ethnicities either on exiting PMS or at follow-up measurements (Lewis et al., 2021).

Reasons for these inequities may include prior experiences in western medical practices of feeling unwelcomed or discriminated against, language challenges and lack of staff with the same ethnicity (Jones et al., 2025; Ludeke et al., 2012; Palmer et al., 2019). There may be a mismatch of beliefs on pain or cultural influences that prevent the person from entering PMS; or logistical issues such as parking and transport costs may also prevent attendance (Lewis & Upsdell, 2018). While accessing services minority ethnicities may experience a lack of cultural sensitivity and inclusion. Māori have reported a lack of tikanga informed practices in PMS (Jones et al., 2025), as well as exclusion of traditional treatments such as rongoā/mirimiri may be excluded and resources that are not culturally tailored (Devan et al., 2021; Hoeta et al., 2020). The inclusion of traditional methods can be helpful to improving outcomes for minority ethnicities (Lewis et al., 2023). This evidence demonstrates that despite governmental policy, disparities in pain outcomes exist in Aotearoa New Zealand and culturally sensitive initiatives are required to improve equity of care.

Health care system and government policies may also impact on recovery of low back pain, although this is understudied (Pincus et al., 2013). One area that is important for individuals with pain in Aotearoa New Zealand is the compensation policy, which can impact on role and participation in work activities. In Aotearoa New Zealand, individuals who develop back pain from an accident and are unable to return to employment can be entitled to weekly income compensation under the ACC system until they make a return to work (Hill et al., 2023). This policy has previously been critiqued for providing less favourable outcomes (Carron et al., 1985; McNaughton et al., 2000). However, there is generally mixed evidence as to whether compensation policies affect pain outcomes (Bartys et al., 2017; Lewis & Bean, 2021; Ramond et al., 2011) but consistent evidence that certain aspects of compensation schemes (such as

unlimited access to compensation, higher compensation and processes that are slow or incite recipients to defend or legitimise their case) are associated with greater workplace absenteeism (Bartys et al., 2017). This research suggests that government health policies such as weekly compensation could impact on return to work-based activity in some cases, but this cannot be generalised to all persons with weekly compensation entitlements. Yet the individual may still experience stigma associated with receiving compensation which has negative psychological, social and return to work consequences (Kirsh et al., 2012).

In summary, research has demonstrated that SDH, inequities and health systems are associated with pain outcomes. These factors can also have an impact on the experience of pain and psychological status of the individuals with pain. This demonstrates that these factors should be an important consideration in the biopsychosocial model and when providing psychologically informed care.

2.3.3.2 Social Support (Personal, Workplace and Health Settings).

Systematic reviews have examined the effect of social support on pain outcomes. In the workplace, co-worker support and general support is associated with improved return to work outcomes in non-specific low back pain (Campbell et al., 2013) and there is medium quality evidence that positive employer-employee relationships improve return to work outcomes in musculoskeletal injuries (White et al., 2019). There is mixed evidence on whether personal social support is associated with pain and disability outcomes. One systematic review found a small but significant association between various forms of social support and pain outcomes (Bisconti et al., 2024) and other reviews found weak or no association (Campbelll et al., 2011; Ramond et al., 2011). The mixed evidence may be due to heterogeneity in how social support is defined and measured in each study (Bisconti et al., 2024). In contrast, it may reflect that social support has positive or negative outcomes depending on how it is received by the recipient. For example, when persons with persistent pain perceive that support provided by solicitous partners as positive, this is associated with greater physical

dysfunction and pain behaviours (Crone, 2022). Pain tolerance can also differ based on the nature of the interaction between the support person and the individual with pain, the relationship dynamics, and individual factors (Krahé et al., 2013). In this systematic review, whether the partner was present, the nature of their relationship, the attachment style of the individual receiving painful stimuli and perceived support impacted on pain tolerance and pain intensity. This shows that the impact of social support on pain is complex and may explain why research shows varying outcomes.

Social support is associated with psychological status in persistent pain. There is moderate evidence that individuals with persistent pain who had poorer psychological outcome measure scores had lower satisfaction with social support (Campbelll et al., 2011). In addition, observational studies in persistent pain have shown associations between social support and psychological outcomes (Coady et al., 2024; Crone, 2022; McKillop et al., 2017). A systematic review found that positive social support decreases the pain experience by alleviating stress (Che et al., 2018). This review suggested that higher social support may have a protective effect on psychological factors in individuals with persistent pain, highlighting how social factors may be an important consideration when assessing the psychological status of an individual with persistent pain.

In managing low back pain, provision of social support by health care professionals may be associated with improved outcomes. Provision of support can be achieved through reflective enquiry, patient centred care, mutual decision making and facilitating empowerment (Cormack et al., 2023). These factors lead to improved therapeutic alliance, which can positively impact on treatment outcomes (F. Babatunde et al., 2017). Applying this approach has shown to reduce the need for biomedical management by general practitioners (GPs) treating persistent low back pain (George, 2008). Similarly, when physiotherapists are skilled in providing patient centred care it allows their clients to discuss their concerns in depth, providing opportunity to address psychological aspects of pain (Cowell et al., 2021) and can lead to improved persistent

pain outcomes when compared to traditional physiotherapy methods (Kinney et al., 2020).

The evidence described above has demonstrated that social factors play an important role in the experience of pain, either impacting negatively or positively on the person's outcome. This provides further evidence for the biopsychosocial model, over the biomedical model, in relation to persistent low back pain. Social factors can also impact on psychological factors in persistent pain. Additionally, the provision of support from health practitioners is important in developing therapeutic alliance which helps the psychological aspects of pain to be addressed. The following section will briefly describe cultural factors that also influence the experience of pain but are not explicitly included in the biopsychosocial model.

2.3.4 Cultural. Culture refers to practices and beliefs held by an individual or group which may be based on their ethnicity but could also be influenced by the society in which they were born in or live in. Each culture varies in their traditional beliefs, values and model of healthcare, which may reflect in their pain attitudes, acceptance, behaviours and expression of emotions in relation to pain (Craig et al., 2020; Krupić et al., 2018; Lane & Smith, 2018). There may be large variation within cultures and the adoption of beliefs and behaviours may vary between individuals (Bui et al., 2010; Craig et al., 2020; Krupić et al., 2018; Lane & Smith, 2018; Lewis et al., 2023; Palmer et al., 2007). The following section demonstrates the importance of considering cultural aspects in pain and how this relates to the Aotearoa New Zealand context.

Pain may be experienced positively or negatively depending on the cultural beliefs or attitudes of the individuals, which will impact on the behaviour of the individual. Pain may be seen to reflect years of hard work or aging, earning respect, attention or personal and spiritual growth (Krupić et al., 2018; Lane & Smith, 2018; Lewis et al., 2023; Lovering, 2014). This philosophical attitude may lead to improved locus of control, better social support and coping strategies (Igwesi-Chidobe et al., 2017), reduced pain medications (Lane & Smith, 2018) and improved health outcomes

(Pandav & Kumar, 2018). Alternatively, beliefs that pain is a punishment, karma or due to supernatural forces may lead to one viewing pain as negative and experiencing emotional distress (Igwesi-Chidobe et al., 2017; Lewis et al., 2023; Lovering, 2014). These beliefs will help to inform adoption of treatment strategies which may include prayer or meditation, use of traditional medicines, traditional therapies and western-based medical management (Bosire et al., 2022; Lane & Smith, 2018; Lovering, 2014; Orhan et al., 2018).

Cultural values may also impact on the pain behaviours of an individual. In many cultures, drawing attention to oneself during a pain experience may go against cultural norms and stoicism may be a more preferred response (Anderson et al., 2009; Lane & Smith, 2018). Displaying pain may elicit shame and could threaten role perception (Igwesi-Chidobe et al., 2017) or go against values of being courageous, showing self-restraint and prioritising family roles (Lewis et al., 2023). Yet, a meta-analysis showed that these cultural attitudes are associated with fear avoidance and increased pain, and results in avoiding activities, community participation and seeking health care (Kroska, 2016). Stoicism can also increase psychological distress due to lack of expression (Lewis et al., 2023). This demonstrates how cultural influences can impact on the psychological status and behaviours of a person in pain.

In Aotearoa New Zealand, Māori view health to include te taha wairua (spiritual dimension), te taha hinengaro (mental health), te taha whānau (family) and te taha tinana (bodily dimension) (Durie, 1985). In rongoā Māori (traditional healing practices), physical pain may be a manifestation of emotional or mental pain or be the cause of suffering due to the implications of the physical issue on hinengaro/psychological wellbeing, wairua/spiritual wellbeing or whanaungatanga/relationships with others (Morunga et al., 2023). Pain may impact on one’s ability to perform their role in the community, impacting on the sense of self, only to add to the pain experience (McGruer et al., 2019). For example, the inability to help on the marae may induce feelings of shame, burden or a sense of pity from whānau and friends (Dixon et al., 2021). This can have an impact on mana (self-esteem) for some Māori and lead to acts

of stoicism to protect their identity (Dixon et al., 2021). Pain may also be caused by having important aspects of culture being ignored or disrespected within society (Morunga et al., 2023) and derive from a range of historical events, socio-political issues, or family trauma which could be passed down from one generation to another (Antunovich et al., 2024).

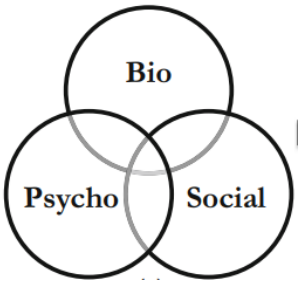
This evidence shows how cultural and spiritual beliefs contribute to the biopsychosocial model. Cultural beliefs and attitudes may impact on behaviour, coping strategies and expression of pain, which can either improve or worsen the individual's pain experience. These aspects are not considered in the biomedical model which may lead to insufficient management of pain. Understanding cultural attitudes to pain enhances the therapeutic alliance, which has shown to be effective in persistent pain management (Kinney et al., 2020). Therefore, culture is an important aspect of the biopsychosocial model for those with persistent pain and when providing psychologically informed management.

2.3.5 Summary of the Biopsychosocial Model. The above review has presented evidence that biomedical model is limited, ineffective and insufficient in the management of low back pain; and provided an argument for the use of the biopsychosocial model in persistent low back pain. There is ample research to support that the biopsychosocial model is relevant in the transition to and maintenance of persistent pain. Most of this research focuses on biological and psychological factors but there is also evidence showing that social and cultural factors are relevant to the experience of pain and can negatively or positively impact on pain outcomes. While the components have been discussed separately, the biopsychosocial model is intertwined. Several models have attempted to explain the biopsychosocial model, but sufficiently describing the relationship of these components is challenging. A common biopsychosocial model is shown in Figure 2 which demonstrates how the biological, psychological and social factors interact (Stilwell & Harman, 2019). This reflects that persistent pain is highly complex and requires clinicians treating the individual to understand and manage this complexity. It therefore makes sense that for optimal

outcomes, clinicians such as physiotherapists, working in persistent pain need to be equipped to understand and manage the interaction of the individual's psychological state, social, environmental and lived experiences on their condition (Cormack et al., 2023). Most of the research in the biopsychosocial management of pain is centred around psychological techniques, which have demonstrated to be effective in the management of persistent low back pain. The following section will describe the evidence for managing the psychological components of persistent low back pain.

Figure 2.2

The biopsychosocial model of persistent pain and disability



Note. This model demonstrates how the biological, psychological and social factors interact. From "An Enactive Approach to Pain: Beyond the Biopsychosocial Model," by P Stilwell & K Harman, 2019, *Phenomenology and the Cognitive Sciences*, *18*(4), p. 20. Copyright 2019 by Springer Nature B.V. Reproduced with permission from Springer Nature.

2.4 Psychologically Informed Treatment Methods in Persistent Low Back Pain

There is a large body of literature for the psychological components of the biopsychosocial model (Tousignant-Laflamme et al., 2017). While psychological management does not fully address the biopsychosocial nature of pain, it demonstrates the shift away from managing low back pain from the biomedical perspective. Research and clinical guidelines have supported that psychological interventions are more effective than biomedical approaches (Almeida et al., 2018; Foster et al., 2018; Wiles & Maher, 2022) and these can be delivered considering the wider social and cultural environment of the individual.

Common psychological interventions in persistent low back pain include education, cognitive behavioural therapy (CBT), graded exposure, motivational

interviewing (MI), mindfulness, and acceptance and commitment therapy (ACT) (Driver et al., 2017; Fardi et al., 2023; Holopainen et al., 2020). These interventions aim to improve pain outcomes in a variety of ways, such as reducing the sense of threat, changing thoughts and behaviours about pain and soothing the physiological response to pain (Keefe et al., 2018). The following section will discuss the evidence for applying these psychologically informed treatments in the management of persistent low back pain.

2.4.1 Pain Neuroscience Education. Pain neuroscience education (PNE) aims to reduce perceived threat by reconceptualising the individuals understanding of pain (Keefe et al., 2018; Zimney et al., 2023). This education considers the individual's current beliefs and aims to challenge any misconceptions using a range of educational techniques, to improve their behavioural response to pain (Moseley & Butler, 2015).

There is consistent evidence from systematic reviews that PNE compared to no intervention leads to significant improvement in pain and disability in the short term (Ho et al., 2022; Ma et al., 2024; Tegner et al., 2018; Watson et al., 2019; Wood & Hendrick, 2019) and medium term (Ma et al., 2024; Watson et al., 2019). There were too few studies examining the long-term outcomes of PNE so no conclusions for the long-term effects were drawn (Ho et al., 2022; Tegner et al., 2018; Wood & Hendrick, 2019). The effect of PNE is greater when it is added to physiotherapy (Wood & Hendrick, 2019). There is mixed evidence for the effect of PNE on kinesiophobia or fear avoidance (Ho et al., 2022; Tegner et al., 2018; Watson et al., 2019) and limited evidence for PNE improving catastrophising (Watson et al., 2019) and quality of life (Ho et al., 2022). In most of these reviews physiotherapists were delivering the intervention.

One review concluded that PNE sessions greater than 60 minutes for 4-8 sessions over a 7-12 week period may be most beneficial (Ma et al., 2024). This length of time may allow for a greater interaction learning process and reflection from the PNE recipient which is more effective in changing behaviours or beliefs (Caneiro et al., 2021). Another consideration is that the effectiveness of PNE may be impacted by

therapists' beliefs because any implicit or explicit messaging can strongly influence patients' attitudes towards their pain (Darlow et al., 2012), which can impact on pain outcomes (Sherriff et al., 2022).

These reviews support that providing PNE can improve persistent low back pain outcomes, can be delivered by a physiotherapist and should be a part of persistent low back pain management.

2.4.2 Cognitive Behavioural Therapy. In persistent pain, CBT is a treatment that aims to reduce emotional distress and encourage adaptive behaviours in response to pain (Wenzel, 2017). This includes the acknowledgement and modification of unhelpful cognitions and addressing behaviours that limit function, so that patients can achieve their goals and improve their quality of life (Wenzel, 2017). It has been shown that CBT works by reducing pain related fear and catastrophising, as well as promoting self-efficacy when provided in persistent musculoskeletal pain (Murillo et al., 2022).

There is ample research showing efficacy of CBT for persistent pain. Several systematic reviews show improvement in outcomes such as pain, disability, self-efficacy, fear avoidance and quality of life when compared to control groups (Cheng & Cheng, 2019; Hajihasani et al., 2019; Petrucci et al., 2021; Saadat et al., 2021; Williams et al., 2020; Yang et al., 2022). However, the evidence is generally of low-moderate quality and effect sizes are small (Cheng & Cheng, 2019; Petrucci et al., 2021; Williams et al., 2020; Yang et al., 2022). When comparing a combination of CBT and active interventions to exercise or physiotherapy alone, the results are variable. For example, in one review the addition of CBT to exercise only improved disability compared to exercise alone and with small effect sizes (Cheng & Cheng, 2019). In another review, with good to high quality studies, CBT and physiotherapy led to improved pain, disability, quality of life and functional capacity when compared to physiotherapy alone (Hajihasani et al., 2019).

Overall, the literature demonstrates a large body of evidence for the effectiveness of CBT. The results are consistent amongst reviews when compared to

no intervention and less consistent when compared to active interventions but still may provide some additional benefit. This suggests that CBT is a useful approach to utilise in managing persistent low back pain.

2.4.3 Acceptance and Commitment Therapy. ACT is a form of cognitive behavioural therapy that aims to promote improved function through nonjudgemental acceptance and aligning behaviour the individual's values (Moens et al., 2022). In persistent pain, individuals can achieve goals that are important to them by acknowledging the presence of pain and living life in accordance with their values despite the pain (Moens et al., 2022). ACT can improve psychological flexibility which, as discussed earlier, is linked to persistent pain outcomes.

There are many systematic reviews in the literature on the efficacy of ACT in persistent pain but none on persistent low back pain specifically. In persistent pain, systematic reviews have shown medium-large effect sizes for ACT improving pain interference, function, pain acceptance, and psychological inflexibility and small-medium effect sizes for ACT improving pain intensity, anxiety, depression and quality of life (Hughes et al., 2017; Ma et al., 2023; Trindade et al., 2021; Ye et al., 2024). There is some minor inconsistency amongst the systematic reviews, with one review showing no change for quality of life and pain (Hughes et al., 2017) and another only showing a small effect size for psychological inflexibility (Trindade et al., 2021). This may be because these reviews had fewer trials included. The quality of evidence, when reported, tended to be low to moderate, with only one review reporting high quality of evidence (Ye et al., 2024). The efficacy of ACT for the outcomes listed above has been supported by a recent overview of systematic reviews but methodological concerns of the studies were cited (Martinez-Calderon et al., 2024). It is important to note that many of these reviews include studies that examined a variety of pain conditions such as fibromyalgia, endometriosis, neuropathic, rheumatic and joint pain, therefore it can only be assumed that ACT would produce similar results for low back pain.

This assumption is supported by RCTs that have shown that ACT can improve pain-related depression and anxiety (Irandoost, 2015), pain interference (Soleimani et al., 2022), pain catastrophising, pain acceptance and psychological flexibility (Sanabria-Mazo et al., 2023) in comparison to control groups for persistent low back pain. These individual studies suggest that ACT generates similar benefits to persons with persistent low back pain as other persistent pain conditions and can be worthwhile in the treatment of persistent low back pain. The body of evidence for ACT is smaller compared to CBT, likely because ACT is a more recently developed therapy.

2.4.4 Meditation and Mindfulness. Mindfulness meditation in persistent pain is a technique where one can learn to reappraise a sensory event through practising non-judgemental awareness and sustained attention (Zeidan et al., 2012). It is often integrated with ACT (McCracken & Vowles, 2014).

Meditation and mindfulness have shown to have a positive influence on persistent low back pain outcomes. Systematic reviews demonstrated that meditation and mindfulness have a positive effect on pain intensity, physical quality of life, psychological status, pain acceptance and physical function (Paschali et al., 2024; Petrucci et al., 2021; Saadat et al., 2021). Mindfulness has also shown to be comparable to CBT in some pain outcomes. Two reviews that have compared CBT and mindfulness-based therapies showed no difference between CBT and mindfulness in reducing pain intensity (Petrucci et al., 2021; Saadat et al., 2021). In one review, mindfulness had greater benefit in improving quality of life (Petrucci et al., 2021). Mindfulness has less convincing effect on disability compared to CBT (Petrucci et al., 2021; Saadat et al., 2021). This may reflect that the goal of mindfulness is to target acceptance of pain whereas CBT targets disability, suggesting that these interventions can be used for different outcomes. The findings were consistent across both reviews and most of the studies were of moderate to low risk of bias (Petrucci et al., 2021) indicating confidence in the results.

In summary, these systematic reviews demonstrate evidence that mindfulness is effective in improving pain outcomes, therefore should be considered as a treatment in the management of low back pain, and a good alternative to CBT when aiming to improve pain and quality of life.

2.4.5 Motivational Interviewing. Motivational Interviewing (MI) is a client-centred approach that uses techniques to explore a client's ambivalence towards making a behavioural change and elicit their expression of desire, ability and reasons to change (Miller & Rose, 2009). It aims to strengthen the readiness for change and the planning of change**,** which is always patient directed (DiClemente & Velasquez, 2002). It was originally used as a method of improving adherence to addiction treatment but has since been successfully used to assist in the uptake of multiple health interventions (Rubak et al., 2005). In pain management**,** adherence to self-management approaches has been shown to be positively and negatively associated with pain outcomes (Jack et al., 2010; Nicholas et al., 2012) suggesting that it could be worthwhile including MI in pain management interventions. Recently the integration of MI and PNE has been suggested to help improve the effectiveness of PNE and may help the acceptability of both treatments although this hypothesis needs to be tested (Nijs et al., 2020).

Two systematic reviews and meta-analyses have shown that MI has a small to moderate effect on treatment adherence and improved pain intensity (Alperstein & Sharpe, 2016; Hardt et al., 2025). There were no gains in physical function in one review (Alperstein & Sharpe, 2016). MI was superior to education and control groups in improving pain intensity, and superior to the control group in improving state anxiety and global improvement outcomes (Hardt et al., 2025). Both reviews commented on the low number of studies and one review cited that the studies were underpowered (Alperstein & Sharpe, 2016). The other review reported a high risk of bias and high heterogeneity between studies (Hardt et al., 2025). This indicates that MI studies require consistency in their outcome measures and protocols and increased sample size to improve the quality of the studies, so there is greater confidence in the results.

In summary, limited evidence shows that MI can improve treatment adherence and pain intensity, but there is limited or no evidence for other outcome measures. This may be because MI aims to improve adherence to treatment rather being a treatment itself, which may impact on the results (Alperstein & Sharpe, 2016). While there are shortcomings to these reviews, MI has been shown to be useful in several mental and physical health conditions, which helps to support the findings of the above reviews. Therefore, MI should be considered to improve adherence to pain management interventions in persistent low back pain. Future studies are required to confirm its value in persistent low back pain.

2.4.6 Graded Exposure. Graded exposure is a form of CBT that provides an individual a method of facing and overcoming feared activities (Macedo et al., 2010). In pain, individuals are supported to create a hierarchy of tasks that are often avoided due to pain, address maladaptive beliefs that are associated with this task and then face the feared task until the anxiety is reduced (Macedo et al., 2010). This type of therapy is beneficial for those experiencing pain related fear and so may not be used in all individuals with pain.

There are few studies available that examine the efficacy of graded exposure in pain conditions. There is moderate level evidence from a systematic review that graded exposure is more effective in reducing catastrophising than graded activity in the short term and some indication that graded exposure is more effective in reducing pain and disability than graded activity (López-de-Uralde-Villanueva et al., 2016). In a rapid review, three good quality studies showed that graded exposure was superior to best practice physiotherapy in reducing catastrophising, kinesiophobia and disability (Laura & Jones, 2020).

The evidence suggests that graded exposure can positively impact on cognitive factors and improve disability in pain and may be more effective than graded activity. Yet the research is limited so further studies are needed to confirm these findings. Future studies could consider comparing graded exposure to other psychological

methods in certain patient groups (i.e.. those with higher fear avoidance) to help direct treatment selection in clinical practice.

2.5 Physiotherapists Utilisation of Psychological Methods In Persistent Low Back Pain

The review above shows there is a large body of evidence supporting psychological therapy in the treatment of low back pain. This is often recommended to be provided within a multidisciplinary team. Multidisciplinary team rehabilitation (MDR) involves two or more health professionals providing integrative care to an individual and encompasses at least two aspects of the biopsychosocial model of pain, e.g. physical, social, work or psychological factors (Kamper et al., 2014). Clinical guidelines recommend MDR for persistent low back pain due to evidence that it is superior to single discipline methods. Evidence suggests that MDR is more effective than physical treatment alone (Ho et al., 2022; Kamper et al., 2014) and there is moderate quality evidence that it can improve pain and disability with those with medium to high risk of persistent pain compared to usual treatment and physical treatment alone (Almeida et al., 2018; Malfliet et al., 2019).

Yet it can also be resource intensive, time consuming (Malfliet et al., 2019) and not always available (George, 2008). The cost-effectiveness of MDR for persistent pain is not well understood globally (Chowdhury et al., 2022) or in Aotearoa New Zealand. It is also not known if MDR is more effective than a single discipline providing biopsychosocial management (Malfliet et al., 2019). The effect sizes in research are modest, therefore it has been questioned whether MDR should be weighed up against the time and resources that are required to implement it (Kamper et al., 2014). It may be, at times, more cost-effective, efficient or necessary for a single health provider to deliver biopsychosocial care.

In Aotearoa New Zealand, physiotherapists provide primary care, meaning that physiotherapists can assess, diagnose and treat low back pain without a referral from a doctor. Physiotherapists can also refer for x-rays, ultrasound scans and to orthopaedic

surgeons. In the management of low back pain, physiotherapy services are more frequently used in ACC claims than GP visits, radiology services, chiropractic care and acupuncture services (Hill et al., 2023). This means that, in some cases, physiotherapists may be the first and only practitioner to be providing management for people with low back pain. While physiotherapists are not traditionally trained in psychological techniques, research has shown that physiotherapists can incorporate psychological approaches into their usual practice. The following evidence shows that physiotherapists can achieve good outcomes in persistent pain by performing these techniques and, where studied, these techniques are found to be acceptable by both physiotherapists and patients.

2.5.1 Cognitive Behavioural Therapy. The provision of physiotherapy-directed CBT is shown to be effective for people with persistent pain. Systematic reviews have shown that delivery of CBT by physiotherapists is superior in reducing pain (Hall et al., 2018; Zhang et al., 2019) and disability (Hall et al., 2018; Veillon et al., 2024; Zhang et al., 2019) compared to usual care, exercise or education. In a review that included high quality RCTs, physiotherapists were provided between 16 and 72 hours of training in CBT, indicating that extensive training is not needed for physiotherapy delivered CBT to be successful (Hall et al., 2018). It is not known whether more extensive training or regular supervision following CBT training makes a difference in the effect sizes of physiotherapy-delivered CBT. However overall, this evidence shows that physiotherapists can deliver CBT effectively and could be considered worthwhile in management of persistent low back pain.

2.5.2 Acceptance and Commitment Therapy. Individual studies examining physiotherapists' delivery of ACT show improved pain outcomes as well as treatment acceptability from both physiotherapists and patients. Physiotherapy informed by ACT is superior to usual care in improving disability, function and physical health measures in persistent low back pain in the short term (Godfrey et al., 2020). In a qualitative study involving patients who had received three weeks of intense ACT informed

physiotherapy, participants described improvements in quality of life, including social connections and participation in activities (Aymerich et al., 2022). Physiotherapists are able to deliver ACT with high fidelity (Godfrey et al., 2020), high content adherence and satisfactory therapeutic alliance (Galea Holmes et al., 2022). ACT is also acceptable to both patients and clinicians (Galea Holmes et al., 2021; Godfrey et al., 2020; Tatta, 2022) with physiotherapists reporting improved knowledge skills and confidence when addressing the psychosocial and behavioural aspects of low back pain (Tatta, 2022 (Galea Holmes et al., 2021). However, one study concluded that the physiotherapists' overall competence in ACT required further development (Galea Holmes et al., 2022). Overall, the evidence suggests that physiotherapists can achieve good outcomes using ACT, with a good response from patients and may be useful to improve physiotherapists' confidence in addressing psychological and behavioural aspects of low back pain.

2.5.3 Graded Exposure Therapy. The evidence for physiotherapists delivering graded exposure therapy for persistent low back pain is very limited. A mix of RCTs and multiple baseline design studies have involved physiotherapists delivering graded exposure within an interdisciplinary team (Boersma et al., 2004; Leeuw et al., 2008; Leonhardt et al., 2017; Linton et al., 2008; Vlaeyen et al., 2002). In these studies physiotherapists shared the graded exposure delivery with psychologists (Boersma et al., 2004; Leeuw et al., 2008; Linton et al., 2008) or a movement scientist (Vlaeyen et al., 2002). The quality of these studies was generally low. Only one study had physiotherapists as the sole provider of graded exposure therapy. This study showed that the participants had significantly improved physical activity, pain intensity, catastrophising and avoidance beliefs (Leonhardt et al., 2017). While this is promising evidence it was a pilot non-controlled study, meaning it is not sufficient evidence for physiotherapists providing graded exposure therapy. Further high quality RCTs exploring the efficacy of physiotherapists delivering graded exposure therapy would be needed to confirm these findings. This would help determine whether graded exposure

therapy is a key skill for physiotherapists working with persistent low back pain

2.5.4 Motivational Interviewing. Similarly, there is positive but limited evidence on the effectiveness of physiotherapists delivering MI. A systematic review found only three studies, including one RCT, examining the efficacy of MI implemented alongside physiotherapy (Diamantoglou, 2014). In the RCT, physiotherapists delivered MI to persons with low back pain, yet it was underpowered, had a high dropout rate, limited follow-up, and the physiotherapists received inadequate training. Despite this, the results indicated that the recipients of MI had significantly improved strength, exercise compliance, and general health compared to the control group. Since this review, a quasi-experimental study comparing MI combined with physiotherapy to a control group found that the intervention group improved pain, function and exercise compliance (Jamil et al., 2021). There was only a 2 week follow-up, meaning the long-term effect of this intervention cannot be concluded. In a mixed methods study physiotherapists trained in MI felt that it was acceptable, beneficial with complex cases and they were still using it in practice 6 months after the training (Haig, 2019). However, they felt ongoing training was required to develop their skills (Haig, 2019).

In summary, very limited research suggests physiotherapists can deliver MI with efficacy and find it acceptable and beneficial. Confirming these findings with high quality RCTs may help to determine if physiotherapists are able to deliver MI effectively and with good outcomes. This would help to determine if physiotherapists should be trained in MI for the management of persistent low back pain.

2.5.5 Summary. The evidence above shows that physiotherapists can deliver psychological techniques and improve persistent pain outcomes of pain and disability. There is good evidence that physiotherapists can improve pain and disability when applying CBT and limited but promising evidence that physiotherapists can achieve good outcomes with MI, ACT and graded exposure therapy. Where the findings are mixed, it may be due to varying use of outcome measures and different modes of delivery or training given to the physiotherapists. Future research may need to consider

the level of training and support that is required for physiotherapists to achieve good outcomes and acceptability from both patients and physiotherapists.

2.6 Psychologically Informed Physiotherapy

The incorporation of psychological techniques in physiotherapy is labelled as PIP (Denneny et al., 2020; Main & George, 2011). PIP is often described to fit within a cognitive-behavioural framework in combination with traditional physiotherapy techniques (Denneny et al., 2020; Main & George, 2011). The goal of PIP is to reduce secondary disability and improve outcomes by understanding and addressing the complex factors of the person's pain (Keefe et al., 2018).

There are several components to PIP. This includes screening for psychological risk factors (Main & George, 2011), identifying and addressing patient expectations, beliefs and feelings towards their pain (Keefe et al., 2018), developing therapeutic alliance and patient centred care (Ballengee et al., 2021) and providing interventions that address beliefs and behaviours. This is delivered in the context of understanding the client's social, economic, cultural and familial influences (Main & George, 2011). In PIP psychological factors (pain attitudes, beliefs, emotions, behaviours) may be the key focus of the treatment session or these may be delivered alongside traditional physiotherapy methods (Denneny et al., 2020).

PIP does not necessarily remove the need for other health care practitioners. PIP manages the normal psychological processes that occur as part of the pain experience and human functioning but does not incorporate the management of more serious mental health concerns such as post-traumatic stress disorder or severe depression (Keefe et al., 2018; Main & George, 2011). In these cases, it is appropriate to refer to a mental health practitioner (Keefe et al., 2018). Referrals to appropriate physicians would also occur when red flags are suspected (Main & George, 2011). PIP may also not be appropriate for persons unable to fully engage in PIP due to cognitive impairment or unwillingness to participate despite therapist efforts to overcome these

obstacles (Keefe et al., 2018). In these circumstances, the physiotherapist may need to consider altering or delaying their approach to maximise pain outcomes.

Several frameworks for PIP have been described in the literature. PIP can be divided into five subgroups: educational, cognitive behavioural, behavioural change, psychophysiological and contextual cognitive behavioural therapy (Keefe et al., 2018). Each of these groups targets different aspects of an individual's response to pain. For example, pain neuroscience education may be delivered to enhance the individual's understanding of pain, thereby reducing the sense of threat and encouraging adaptive behaviours (Keefe et al., 2018). In contrast, relaxation and mindfulness may be delivered to reduce the psychophysiological response to pain (Keefe et al., 2018). Key components of PIP in other literature have been described as the five Rs: Realisation, relief, regulation, reactivation and reinforcement. In this framework, low back pain is managed through patient centred communication (realisation), pain modulation techniques (relief), pain coping skills (regulation), activity (reactivation) and therapist monitoring (reinforcement) (Ballengee et al., 2021).

Cognitive functional therapy (CFT) is an example of an approach that embraces PIP. It was developed to help physiotherapists manage non-specific low back pain through a combination of psychological techniques, neuroscience and physiotherapy (O'Sullivan et al., 2018). This allows flexibility, improved confidence and an effective way of managing the challenges of low back pain (Cowell et al., 2019). In CFT, clinicians determine modifiable and non-modifiable biopsychosocial factors that have contributed to the person's presentation and use this information to tailor their treatment, with an emphasis on therapeutic alliance (O'Sullivan et al., 2018).

The application of PIP has been well researched in recent years. When compared to standard physiotherapy, systematic reviews show cognitive behavioural based physiotherapy appears to show improved pain, disability or function (Coronado et al., 2020; Hall et al., 2018); but this is less convincing when compared to standard multimodal rehabilitation (Coronado et al., 2020). Several trials have studied the impact of CFT on persistent low back pain outcomes. Five RCTs were included in a recent

systematic review and meta-analysis (Devonshire et al., 2023). Pain intensity improved in two studies in the short term and four trials reported improved disability. The systematic review determined the certainty was very low and outlined the limited statistical reporting (Devonshire et al., 2023). A qualitative study summarised that CFT improved physiotherapists' confidence and satisfaction, attitudes towards pain, appreciation of therapeutic alliance and the importance of including CFT in their daily practice (Synnott et al., 2016). Overall, this evidence shows that CFT may improve pain, disability and physiotherapists' appreciation of CFT in their clinical practice; however, the certainty is currently low.

There have been challenges in studying PIP in clinical trials. Efficacy in research may be low due to not being able to quantify PIP interventions (Keefe et al., 2018), not stratifying and targeting specific individuals (Archer et al., 2018; Coronado et al., 2020), low implementation of PIP by physiotherapists, low utilisation of written resources and time constraints (Coronado et al., 2020). It was suggested that greater efficacy was shown in studies with rigorous training, implementation protocols and collaborations with other professionals (Coronado et al., 2020). These issues may reflect that physiotherapists have barriers to providing PIP, therefore making it difficult to research in clinical trials. The following section will discuss the adoption and challenges of delivering PIP in real clinical practice.

2.7 Barriers to Physiotherapists Providing Psychologically Informed Management in Persistent Low Back Pain

While the previous review shows that physiotherapists can be trained and deliver PIP with good outcomes, that does not mean that physiotherapists are performing PIP in daily clinical practice. There is mixed evidence on physiotherapists' beliefs and attitudes towards providing PIP, and even when attitudes are positive, provision of PIP in real life clinical practice may still not occur. Studies show that physiotherapists believe in the importance of the therapeutic alliance, reducing threat, addressing beliefs and self-efficacy (Denneny et al., 2020) and have positive attitudes

and beliefs towards the use of psychological interventions (Driver et al., 2017). Other literature shows that physiotherapists only partly recognised biopsychosocial factors in low back pain, can stigmatise patients with persistent low back pain, perceive that some factors are outside of the physiotherapists' scope of practice and are uncomfortable managing psychological aspects (Holopainen et al., 2020; Synnott et al., 2015). In one mixed methods study, physiotherapists reported they had a high level of satisfaction with their delivery of treatment in low back pain and felt no need to change their practice even if psychosocial factors were present (do Prado et al., 2022). These studies show an incongruence within the physiotherapy profession regarding attitudes towards the psychological aspects of pain.

Even if physiotherapists have engaged in psychologically informed training, this does not mean that this is translated into clinical practice. Physiotherapists may still continue to focus on exercise, manual therapy and posture advice (Stevenson et al, 2006). It is common for physiotherapists who have been trained in psychologically informed therapies to question whether it fits within their scope of practice (Nielsen et al., 2014), report issues with confidence and competency (Simpson et al., 2024), struggle with the transition to an approach of not 'doing' and fall back into traditional methods of physiotherapy (Holopainen et al., 2020). Many physiotherapists request ongoing training (Driver et al., 2017), which was evident in some of the reviewed studies above (Galea Holmes et al., 2021; Haig, 2019; Simpson et al., 2024). Qualitative studies specifically examining barriers to PIP cite lack of confidence, skills and knowledge, time constraints, perception of scope of practice, discomfort dealing with psychosocial aspects of pain, being sceptical about omitting biomedical assessment, lack of support and belief that it is unacceptable to patients (Ballengee et al., 2021; Driver et al., 2017; Fritz et al., 2018; Gardner et al., 2017; Holopainen et al., 2020). This demonstrates some resistance and several barriers to PIP delivery.

For many physiotherapists, working under the biopsychosocial model means a complete paradigm shift. Physiotherapy students may have chosen physiotherapy based on biomedical perspectives, which are reinforced in the early stages of

physiotherapy training which may focus on biomedical models of health (Foster & Delitto, 2011). In undergraduate training, pain is not regularly taught on its own, therefore it is inferred that pain occurs as a result of disease or injury (Foster & Delitto, 2011). This training creates an inherent biomedical orientation which has found to be associated with conservative clinical judgements in physiotherapists (Gibbs et al., 2021; Simmonds et al., 2012) and an intolerance to uncertainty (Simmonds et al., 2012). This indicates that some physiotherapists may remain biomedically oriented due to fear of missing acute pathology or causing further harm, making a shift towards the biopsychosocial model challenging for these physiotherapists.

Due to institutions teaching biomedical models, a change towards a biopsychosocial model must occur post-qualification. This change could be challenged by several factors: physiotherapists having to self-direct and self-fund their own learning in biopsychosocial strategies (Ballengee et al., 2021) and courses in biopsychosocial techniques may be very limited (Foster & Delitto, 2011; Holopainen et al., 2022). PIP may not be standardised amongst providers (Main & George, 2011) and PIP competencies are not well developed (Denneny et al., 2020). This also confounded by public perceptions that low back pain requires a diagnosis, radiological investigations and have pre-conceived ideas of how low back pain is managed (Foster & Delitto, 2011). It is therefore not surprising that physiotherapists who are self-directing the change towards a biopsychosocial model may fall back into biomedical methods.

Research shows that integrating PIP is complex (Coronado et al., 2020; Simpson et al., 2024). This requires a process of change which includes recognition of the problem, exploration of alternate viewpoints, integration of new viewpoints, commitment to change, critical reflection, support, collaboration with other professionals and ongoing learning (Denneny et al., 2020; Foster & Delitto, 2011). For example, in learning to deliver CFT, researchers observed a complex behavioural change process that occurred within physiotherapists which was impacted by pre-training factors, physiotherapy culture and context (Simpson et al., 2024).

To help support physiotherapists to shift towards delivering psychological techniques, it is important to understand the process required for change to occur and what factors support this change. The Theoretical Domains Framework (TDF) is a well-researched method that is used to understand what factors influence behavioural change in health professionals (Atkins et al., 2017). This framework will be discussed in the next section.

2.8 The Theoretical Domains Framework

The TDF is a validated framework devised from theories of behaviour to assist with understanding the process of behavioural change in health professionals (McGowan et al., 2020). The TDF is made of up 14 domains that have been constructed from 33 models of behaviour (Dyson & Cowdell, 2021) and has been used in qualitative research to explore and understand the reasons for the lack of translation from evidence to practice (Atkins et al., 2017). This information can then be used to develop an intervention that will improve implementation of the target behaviour (French et al., 2012). The TDF has been found to be useful across a wide variety of settings and disciplines in health care research, including dietetics, occupational therapy, medicine, pharmacology, health psychology and physiotherapy (Phillips et al., 2015).

In low back pain, the TDF model has been used for health professional use of imaging and clinical guidelines (Bussières et al., 2012; Hall et al., 2019; Pike et al., 2022; To et al., 2022). In physiotherapists management of low back pain, the TDF has been utilised to understand barriers and enablers to an autonomy supportive communication style (Matthews et al., 2015) and to explore physiotherapists' perceived barriers and facilitators to the implementation of a behaviour change-informed exercise intervention (Moniz et al., 2024). In the former study, the TDF was used in a focus group prior to the intervention, which allowed researchers to identify barriers to the intervention and address any modifiable factors. At the end of the study, physiotherapists felt the intervention was feasible and acceptable, indicating that the

use of the TDF was helpful towards addressing the identified barriers. Similarly, the latter study used the TDF model in focus groups and explored barriers and enablers to implementation of the exercise intervention, to help inform future training protocols. The barriers to physiotherapists providing biopsychosocial care in persistent pain have also been shown to align with several items on the TDF model (van dijk, 2023). These studies support that the TDF model has been previously useful in studies specifically related to physiotherapy and low back pain and therefore could be used in understanding the implementation of PIP.

The Determinants of Implementation Behaviour Questionnaire (DIBQ) was developed from the TDF to allow the determinants of behaviour change to be measurable in quantitative research (Huijg et al., 2014). The DIBQ contains 93 items from 18 domains. Internal consistency of the DIBQ using Cronbach's alpha has been shown to be from .68 to .93 and the domains have showed good discriminant validity (Huijg et al., 2014). This questionnaire has been used with physiotherapists and in low back pain research, including exploring physical therapists beliefs around physical activity promotion (Rethorn et al., 2021), to understand the barriers and facilitators to implementation of an evidence based biopsychosocial intervention for low back pain patients (Schröder et al., 2020) and in a group based education programme (Ris, Boyle, et al., 2021; Ris, Schröder, et al., 2021). In these studies, the DIBQ has provided a quantitative insight into what factors are required for long-term sustainability of an intervention (Schröder et al., 2020) and the difference between implementers and the non-implementers of an intervention (Ris, Schröder, et al., 2021). In these studies, the DIBQ was shortened for feasibility purposes, and remained feasible, valid and linked to all domains of the behavioural change wheel (Ris, Schröder, et al., 2021). Therefore, the DIBQ is adaptable and useful in quantitative research in physiotherapists in low back pain.

2.9 Summary of Literature Review

There has been a call for further research to improve physiotherapists' competence in delivering PIP (Denneny et al., 2020) and to understand physiotherapy adherence to psychologically informed care (Ballengee et al., 2021). PIP is needed due to the economic and health burden that persistent low back pain places on society. Research shows that many physiotherapists continue to provide biomedical methods of treatment despite the evidence showing that the biomedical model is insufficient for explaining or managing the experience of low back pain. The body of research overwhelmingly demonstrates that that the biopsychosocial model is a far better fit for managing the complexity of persistent pain. The psychological factors that are involved in the development, maintenance and treatment of persistent low back pain have been explored extensively in this review. Clinical guidelines recommend that psychologically informed management should be included in multi-disciplinary treatments; however, these are not always readily available and may not be the most cost-effective option. In Aotearoa New Zealand, physiotherapists are the main providers of low back pain care (Hill et al., 2023) and, in many cases, may be the only healthcare practitioner providing treatment to a person with persistent low back pain. Therefore, it is important that physiotherapists can identify and manage psychological risk factors for persistent pain to optimise outcomes.

The research suggests that physiotherapists can provide psychological methods with good effect, so encouraging the uptake of these treatments in physiotherapy could help to improve pain outcomes. Yet, systematic reviews and qualitative research show that physiotherapist implementation of PIP in clinical practice needs further development. Qualitative research has identified several barriers to physiotherapists implementing PIP. These barriers align with many items on the TDF, which is a model that has been successfully used to understand health professional behavioural change.

It is not known how many Aotearoa New Zealand physiotherapists are providing psychologically informed management for persistent low back pain. The factors that are most important to the provision of PIP have been well researched but not studied using quantitative methods. This means it is not known which factors are most associated with PIP delivery. This information would help to direct where attention needs to be placed when facilitating the uptake of PIP in Aotearoa New Zealand.

This research aims to investigate the proportion of Aotearoa New Zealand physiotherapists delivering PIP. The study will also quantify which factors are most associated with the provision of PIP in the management of patients with persistent low back pain. Independent variables will be carefully selected based on qualitative research described above that has identified barriers to the implementation of PIP. This includes use of the DIBQ given it has been successfully used in behavioural change research in the context of physiotherapists management of low back pain.

These aims will be tested using a vignette case study design. Vignettes are a valid, inexpensive and manageable way of measuring adherence to clinical guidelines amongst a large professional group (Rutten et al., 2006) and have been used in other studies examining physiotherapists' clinical decision making in low back pain (do Prado et al., 2022; Gibbs et al., 2021). Vignettes have a moderate and positive correlation with health practitioners' decision making and real-life behaviour (Evans et al., 2015 {Van Liew, 2020 #18; Van Liew & Grimm, 2020). Use of vignettes therefore means a large group of physiotherapists will be able to be recruited, which will provide an insight into what might be occuring in daily practice more generally. The methods of this study are discussed in further detail in the next section.

Chapter 3

Methods

3.1 Introduction

This section describes the methods that were undertaken to determine the proportion of New Zealand physiotherapists that intend to deliver PIP and the factors that are associated with this. The study design, participant recruitment and research survey will be described. A pilot study that tested the feasibility of the survey and the changes that occurred as a result of this study will also be outlined. Finally, the data and statistical analysis will be discussed.

3.2 Study Design

This study addressed the aims of the research using a single cross-sectional online vignette case study survey.

There were two hypotheses:

1. There will be a significant relationship between the intention to deliver PIP and pain knowledge and attitude.

2. There will be a significant relationship between the intention to deliver PIP and the TDF domains.

A pilot study of the protocol was initially conducted with eight participants to check the feasibility of the survey. The population of interest was New Zealand physiotherapists who treat persistent low back pain.

3.2.1 Ethics Approval. The study was granted ethics approval from the Auckland University of Technology Ethics Committee (AUTEC) on 01 June 2023 (reference 23/137). See Appendix A for the Ethics Approval letter. The survey was anonymous and identifying participant information such as name, clinic, and geographical location were not collected. People who were interested in participating were provided with a link to an online information sheet (see Appendix B) with details of the study. Potential participants were informed that the purpose of the study was “to

understand current physiotherapy clinical decision making in treatment of low back pain in Aotearoa/New Zealand", therefore concealing the true aims of the study. The ethics committee were advised that this concealment was necessary to accurately answer the research questions. At the end of the information sheet a link was provided to commence the survey. Their consent was implied by completing the survey.

3.3 Participant Selection

3.3.1 Sample Population. All physiotherapists in New Zealand who are registered with the Physiotherapy Board of New Zealand and currently manage patients with low back pain were considered eligible for this study. There were no limits set on the frequency that they manage patients with low back pain. It was assumed that all practising New Zealand physiotherapists have a good understanding of the English language. There was no exclusion criteria set.

3.3.2 Recruitment. Recruitment of participants took place from July 2023 to October 2024. The research study was advertised on the Physiotherapy New Zealand (PNZ) website and social media platforms such as LinkedIn and Facebook. Potential participants were also made aware of the study by the researchers emailing employers of individual clinics and rehabilitation organisations, asking them to distribute an invitation to their physiotherapist employees. A flyer of the research survey was also distributed by hand to physiotherapy clinics in the Bay of Plenty, Auckland and Wellington regions. Several PNZ branches and special interest groups (SIGs) agreed to email their members an invitation to participate. These included the Te Whatu Ora SIG, Pain SIG, Northland PNZ branch, Waikato and Bay of Plenty PNZ branch, Middle Districts PNZ branch, Nelson/Marlborough PNZ branch, and Tae Ora Tiana (which is a partner organisation of PNZ that represents Māori physiotherapists and is open to all PNZ members). The researchers also promoted the study at the 2023 New Zealand Manipulative Physiotherapists Association conference, the 2023 Pasifika Physiotherapy Association conference, the 2024 New Zealand Pain Society Conference and the 2024 New Zealand Physiotherapy Conference.

On September 15th, 2023, AUTEC granted approval to an amendment to offer all participants an opportunity to enter a prize draw to win a $300 voucher. This incentivised participants to complete the survey. Participants who had already completed the survey were also eligible to enter the prize draw. Halfway through the recruitment phase it was acknowledged that there were no participants that identified as Pasifika and only one participant who identified as Māori. According to the Analysis of Physiotherapy Workforce survey in 2017, 4.9% of physiotherapists are Māori and 1.5% are Pasifika. To improve the representation of New Zealand physiotherapists, the researchers approached AUTEC to incentivise Tae Ora Tinana and Pasifika Physiotherapy Association members a $20 petrol voucher. This was not approved, despite an appeal. Therefore, these organisations were individually contacted to invite their members to participate in the study.

3.3.3 Sample Size. An a priori sample size calculation using a regression model design was undertaken. A power analysis was conducted using G*Power. This demonstrated that for a regression model with 11 predictors an effect size of 0.7, 80% power and 2 tailed probability (p) of 5%, 251 participants would be needed. The effect size was based on a vignette study that examined the influence of physiotherapist beliefs on return to work and activity advice in a persistent back pain population (Gibbs et al., 2021).

3.4 Research Survey

3.4.1 Vignette Case Studies. Two vignettes designed by Rainville et al. (2000) were used for this study. They were also used in the study that served as a basis for calculating the priori sample size (Gibbs et al., 2021). Vignette one describes a 42-year-old administrator who has a history of recurrent mild low back pain in the mid lumbar region. Vignette two describes a 37-year-old factory foreman worker who has right sided low back pain with radiation to the right calf muscle. Further details of these vignettes can be found in Appendix C. The vignettes were selected because they represent typical patients in musculoskeletal practices, have persistent low back pain,

and do not demonstrate any red flags. Both cases could typically be managed conservatively by a physiotherapist without referral to a specialist.

3.4.2 Vignette Survey Questions. Each vignette was presented separately. After reading the vignette, participants were asked in two open-ended questions to list the assessments and treatments they would provide to the patient. Once this question was answered, participants were asked to select the likelihood they would provide a range of specific therapies on a 10-point Likert scale, where 1 = not at all likely and 10 = highly likely. The list of therapies included six psychologically based therapies (pain neuroscience education, graded exposure therapy, relaxation, mindfulness/acceptance and commitment therapy, motivational interviewing and mirimiri/romiromi) and six biomedically based treatments (graded activity, massage, manipulation/joint mobilisations, electrotherapy, exercise and acupuncture). Participants were also given the option to write and select other forms of therapy. Once completed, participants were unable to go back and alter their answers to previous questions. Participants were then presented with the next vignette and the same two questions regarding assessment and treatment. The full vignette survey is located in Appendix C. The order of the vignettes was switched once there were 120 completed surveys (the anticipated halfway point) to control for the possibility that completing one vignette would influence the participants' answers to the second vignette.

3.4.3 Dependent Variable ($\text{Intention}_{\text{PIP}}$ and $\text{Intention}_{\text{NonPIP}}$). The primary outcome measure for the two study aims was the intention to deliver PIP for each vignette. There are no previously validated measures of the intention to provide PIP. In this study, the dependent variable was determined by the responses to the open-ended questions regarding assessment and management. Initially, these were independently scored from 0-2, where 0 = no psychologically informed management, 1 = some psychologically informed management, 2 = substantial psychologically informed management. In this research, PIP encompassed the delivery of any assessment or intervention that addresses the psychological aspect of pain, regardless of whether

traditional biomedical methods were also considered. A score of ‘2’ was provided if the respondent used an assessment procedure that examines psychological components of pain (e.g. STarT back questionnaire, Depression Anxiety Stress Scale) and/or included a psychologically informed intervention that aligned with one of the following: biopsychosocial education, behavioural change, cognitive-behavioural, psychophysiological status, or ACT principles. These criteria have been described in further detail elsewhere (Keefe et al., 2018). A score of ‘1’ was provided if a psychological assessment or intervention was provided but it was ambiguous or poorly described. For example, ‘pain education’ was scored a ‘1’ as it was not possible to determine whether the education provided would be psychologically or biomedically informed. Two researchers individually scored each response, and the scores were then compared. Any differences in scoring were discussed and where an agreement could not be reached, a third researcher determined the most appropriate score for that participant. The open-ended answers for each vignette were assessed separately so that each respondent had a score for the administrator vignette and a score for the foreman vignette. The scores were then used to dichotomise participants into those who scored a ‘2’ ($Intention_{PIP}$ group) and those that did not ($Intention_{NonPIP}$ group). Participants who scored a ‘1’ in the original analysis were assigned to the $Intention_{NonPIP}$ group. The decision to dichotomise the scores occurred during the analysis phase of the study because it was acknowledged that the research questions only required the researchers to determine the proportion of participants intended to provide PIP and a binary approach was more appropriate to provide this answer. It was considered that respondents who scored a ‘2’ convincingly demonstrated their intention to provide PIP, whereas those who scored a ‘1’ had ambiguous answers, thus demonstrating a lack of clear intention and could be appropriately assigned to the $Intention_{NonPIP}$ group. This dependent variable was validated by the 10-point Likert scales that followed the open-ended answers. Participants were given a “psychological score” and a “biomedical score” for each vignette. These were calculated by the participant’s total score of the six psychological variables and the total score of the six

biomedical variables, respectively, to give a maximum score of 60 in each category. The higher the score, the more likely the physiotherapist's treatment was either psychologically or biomedically informed, respectively.

To validate the scoring of the open ended answers and dichotomisation to $Intention_{PIP}$ and $Intention_{NonPIP}$ groups, one-way ANOVAs were performed to compare the "psychological" and "biomedical" scores between the two groups in each of the vignettes. The one-way ANOVA analyses began prior to the decision to dichotomise the answers and the researchers decided to continue using the one-way ANOVA to maintain continuity of the analyses. Prior to proceeding with the ANOVA, the distribution of the biomedical and psychological scores were inspected via descriptive analyses (skewness and kurtosis), histogram and normal probability plots. To address missing data within the Likert scale, multiple imputation was performed using the automatic imputation method and linear regression model.

3.4.4 Independent Variables. To address the second aim of the research, 13 independent variables were selected to examine their association with the dependent variables. These were based on qualitative studies that have identified several barriers and facilitators to physiotherapists providing PIP. We were also interested in whether the physiotherapists' experience, education level and funding model are associated with PIP. In this study, these factors were measured by the Knowledge and Attitudes of Pain (KNAP) questionnaire, 7 domains of the Determinants of Implementation Behaviour Questionnaire (DIBQ), age, and questions pertaining to their experience and workplace factors (see further details below). An outline of the independent variables and how they were assessed is provided below and summarised in Table 3.1.

3.4.4.1 The Knowledge and Attitudes of Pain Scale (KNAP). The KNAP assesses the knowledge and attitude of modern pain neuroscience in healthcare practitioners (Beetsma et al., 2020). This scale was selected to understand the participants' knowledge and attitude towards persistent pain. Higher scores on the KNAP indicate that the participant's knowledge and attitudes are in line with current

pain neuroscience and based on the biopsychosocial model (Beetsma et al., 2020). It has a high test-retest reliability and good internal consistency. Research has shown it has a strong correlation with the Pain Attitudes and Beliefs Scale for Physiotherapists (PABS- PT) biopsychosocial subscale, a strong inverse relationship to the biomedical subscale of the PABS-PT, and a strong correlation with the Neurophysiology of Pain Questionnaire (Beetsma et al., 2020), indicating its validity.

3.4.4.2 The Determinants of Implementation Behaviour Questionnaire.

The DIBQ has been used to study the implementation behaviour of health professionals, including physiotherapists. It was developed from the Theoretical Domains Framework (TDF) Questionnaire, which is a questionnaire used in implementation research for understanding the factors that influence behavioural change in health professionals (Atkins et al., 2017).

Table 3.1

Independent variables and their associated outcomes

Independent variable	Independent measurement tool
Pain attitude and knowledge	KNAP Pain Questionnaire
PIP formal training hours	Demographic question: How many hours of formal training in psychosocial interventions have you had?
Years of experience	Demographic question: How many years have you been practising as a physiotherapist?
PIP Supervision	Demographic question: How frequently do you have supervision with a therapist experienced in PIP?
Time per appointment	Demographic question: How much time do you spend with each patient?
Funding model	Demographic question: How is the majority of your work funded?
Knowledge of PIP	DIBQ subscale 1: Knowledge items
PIP Skills	DIBQ subscale 2: Skills items
Perceived scope of practice	DIBQ subscale 3: Social/professional role
Confidence to deliver PIP	DIBQ subscale 4: Beliefs about capabilities items
Perceived outcomes from PIP	DIBQ subscale 6: Beliefs about consequences
Biomedical orientation	DIBQ subscale 8: Goals
Perceived level of support	DIBQ subscale 11: Organisation items

Note. KNAP = Knowledge and Attitudes of Pain Scale; PIP = psychologically informed physiotherapy; DIBQ = Determinants of Implementation Behaviour Questionnaire.

The DIBQ contains 93 items from 18 domains. The content validity of the TDF has moderate agreement for 79 of the items and strong agreement for the remaining 32 items. Internal consistency of the DIBQ using Cronbach's alpha is acceptable to good and the domains have good discriminant validity (Huijg et al., 2014).

Previous research in health professional's behaviour change has selected relevant domains or items for their study (Rethorn et al., 2021; Ris, Schröder, et al., 2021). In our pilot study, 11 subscales (70 items) were selected that align with the

barriers to delivering PIP identified in previous qualitative research. Due to the strong correlation between several subscales found in the pilot study, four subscales were removed (further details are described below). The final DIBQ questionnaire used in the full survey consisted of seven subscales (Knowledge, Skills, Role, Confidence, Consequences, Goals and Organisation) incorporating 36 items. A five-point Likert scale from “Strongly Disagree” to “Strongly Agree” was used for each item.

3.4.4.3 Demographic Questions. Participants were asked their gender, age, ethnicity, level of qualification, and country of training. Five further questions that pertained to the participants’ experience and workplace characteristics were also included. These were: number of formal hours of training in psychologically informed interventions, years of practice, frequency of supervision with a therapist trained in psychological techniques, time per appointment with patients, and dominant treatment funding model (e.g. ACC, hospital based or privately funded).

3.5 Pilot Study

3.5.1 Recruitment and Methodology. A pilot study was conducted with a small group of physiotherapists to test the feasibility of the original survey. Physiotherapists were recruited from the 1st of June to the 22nd of June 2023 to complete the survey and participate in a post-survey interview. This sample was also used as a trial for scoring the dependent variable and for testing the correlation between questionnaire items so that any unnecessary items could be removed.

Two local physiotherapy organisations were contacted by phone and email. Information on the pilot study was provided to the manager of the organisations, and they were invited to send an email to their colleagues asking whether they would be willing to participate in the pilot study. Interested participants were advised that they would be contacted for a post-survey interview. Eight participants were selected by convenience to participate. Once four surveys were completed the order of the vignette cases was switched to determine if vignette order influenced the range of assessments or interventions included in the open-ended responses.

At the post-survey interview, participants were asked questions related to whether the vignettes and open-ended answers reflected their usual practice, the comprehensiveness and readability of the survey, completeness of information given, and length of time taken to complete the questionnaires (Rutten et al., 2006).

3.5.2 Results of the Pilot Study. All 8 participants reported that their open-ended answers in the vignette portion of the survey reflected their actual practice over a usual course of the treatment for low back pain. Three participants advised that neural mobilisations should be added in the 10-point Likert scale treatment list. Half of the participants wanted clarification of “exercise” in the 10-point Likert scale, since physiotherapists often prescribe several different forms of exercise. It was decided not to change these items on the scale because this would not affect the analysis of the dependent variable. Several participants commented that they were unsure what determined romiromi/mirimiri, and they took time to research this. To reduce participant confusion, the words “Māori traditional therapy” were added to this item in brackets. A progress bar was also added upon the request of several of the physiotherapists. Many of the participants commented that they felt the survey was a test and they were worried about their answers. As a result, a short instruction panel was inserted after the information page advising physiotherapists that there were no right or wrong answers and to write down the first thoughts that came to mind. Switching the order of vignette cases did not influence the range of psychological or biomedical interventions that were selected across the participants.

The relationship between the selection of psychological interventions on the Likert scale and the inclusion of psychological intervention in the open answer section was investigated using a Spearman’s correlation coefficient. There was a strong positive correlation between the two variables (*rho* = .546, *n* = 8, *p* = .162). This suggests that selecting psychologically informed interventions in the 10-point Likert scale was associated with including a psychologically informed component in the open

answer question. This analysis provided initial validation for the use of the open-ended answers as the dependent variable.

The average time for the pilot study participants to complete the survey was 50 minutes. The participants provided feedback that the length of time could prevent future participants from completing the study. The researchers performed an analysis to determine whether any scales or subscales were highly correlated and therefore unnecessary to include in the final questionnaire.

3.5.3 The Healthcare Provider's Pain and Impairment Scale (HC-PAIRS) and Its Removal from the Study. In addition to the measures listed above, pilot study participants also answered the HC-PAIRS questionnaire. The HC-PAIRS measures healthcare professionals' attitudes and beliefs towards low back pain (Houben et al., 2004). The higher the score the greater the belief that low back pain justifies impairment and disability (Slater et al., 2012). In the pilot study, the relationship between the HC-PAIRS and the KNAP was assessed by calculating the Pearson product-moment correlation coefficient. The HC-PAIRS was found to have a negative large correlation with the KNAP (r = -0.79, n = 8, p = .02), with higher levels of pain neuroscience knowledge being inversely related to the belief that low back pain justifies patient impairment and disability. It was determined that its inclusion would not add any further value to the study and was omitted in the final survey questionnaire.

3.5.4 The Removal of Subscales of the DIBQ. The relationships between the subscales of the DIBQ were analysed using the Pearson product-moment correlation coefficient. There were 11 subscales and 70 items included in the pilot survey. Four subscales were highly correlated with at least one other subscale (social, emotional, political and confidence). It was considered that the confidence subscale captured items that reflected in the qualitative research such as time to deliver PIP and patients' willingness to participate. Therefore, it was kept in the final survey. Innovation was negatively associated with skills. It was fed back by the pilot participants that individual items of innovate also appeared to either repeat items in other subscales therefore this

was also removed. In conclusion, the final four subscales of the DIBQ that were removed were innovation, social, emotional and political. This left seven remaining subscales and 36 items in total.

3.6 Data Processing and Analysis

The data were entered into the Statistical Package for Social Sciences (SPSS) Version 29.0.2.0 (IBM Corp, Armonk, NY, USA) software programme. Participants were included in the data analysis if they answered at least one of the first vignette's open-ended questions. Where possible, multiple imputations were performed if there were missing data to help reduce the impact of nonresponse bias. Any cases where there were no completed questions were deleted.

Descriptive analyses were conducted on participant demographic information, the KNAP and DIBQ. For continuous data (age, years of experience, KNAP and DIBQ subscales) the median score and interquartile range were obtained. Frequency analyses were obtained for categorical data. Two open-ended demographic questions were grouped into ordinal categories for ease of analysis: frequency of PIP supervision was dichotomised into whether participants received supervision (yes or no); and hours of formal training was grouped into three categories: none, less than 50 hours and 50 hours or above. In two other demographic questions, categories were merged due to low number of responses in at least one of the categories: post-graduate certificate and post-graduate diploma were combined in 'qualification'; and private and regulation fees were combined in 'funding model'.

A chi-square test was performed to determine whether the order of vignette presentation influenced participant responses. For each vignette, the proportion of participants in the $\text{Intention}_{\text{PIP}}$ group was compared between those who were presented the vignette first and those who were presented the vignette second. A chi-square test was also undertaken to ascertain if there were any differences in the psychologically informed open-ended answer score between those who completed and those who did not complete each of the vignettes.

To address Aim 1 of the study and determine the proportion of physiotherapists providing PIP, frequency statistics of the open-ended answer score were run for both vignettes. To address Aim 2 of the study and determine which factors were associated with providing PIP, a binary regression was undertaken. To decide which variables should be entered into the binary regression, Mann Whitney U and Chi-Square tests were performed to compare each independent variable between the $Intention_{PIP}$ and $Intention_{NonPIP}$ respondents for each vignette. Any variable with a p value of less than .2 was entered into the regression analysis. Spearman rank order correlations were also performed to determine the relationship between the independent variables. Variables with a correlation coefficient greater than .7 were considered to be highly correlated and a pragmatic decision was made about excluding one of them from the logistic regression. In addition, the collinearity statistics for the independent variables were also checked by inspecting the tolerance and variance inflation factor (VIF). These values did not indicate multicollinearity amongst the independent variables that were selected for the binary regression.

Prior to the binary regression, distribution plots were inspected for outliers, which indicated that “years of practice” had one outlier and “KNAP total” had two outliers. “Years of practice” was strongly correlated with “age” and therefore was not entered into the binary regression analysis. The presence of outliers was further checked by inspecting the Mahalanobis distance and running a probability test that the chi-square distribution would be less than the Mahalanobis distance. This demonstrated there was one outlier who had a low KNAP score. The regression models were run with and without this outlier to determine if this case made a difference to the analysis. Continuous variables were also checked to see if they were linearly related to the log odds. This assumption was not violated.

The remaining independent variables were entered into a binary logistic regression model using the forced entry method. To address the missing data within the independent variables, multiple imputation was performed using the automatic imputation method and linear regression model. On analysing the binary logistic

regression variables with a p value < 0.05 were considered significant. The odds ratio and the confidence intervals were also reported.

Chapter 4

Results

4.1 Introduction

This chapter presents the results of the cross-sectional study. The first section will describe the participants and their characteristics. The second section will provide the results of the first research question: What proportion of New Zealand physiotherapists intend to deliver PIP to patients with persistent low back pain? The results of the second research question will be presented in the following section: Which factors are associated with the intention of New Zealand physiotherapists to deliver PIP? Finally, the difference between the survey completers and the non-completers will be presented.

4.2 Participants

The survey was completed in full by 176 physiotherapists and an additional 48 participants provided incomplete surveys, totalling 224 participants. Participant demographic data are displayed in Table 4.1. Two thirds of the participants were female and one third were male. The age of the participants ranged from 22 to 77 with a mean age of 40. Most participants (73%) identified as New Zealand European/Pākehā. There were 4 Māori participants representing 2.3% of the sample population. There were no participants whose ethnicity was of Pasifika origin. The participants had an average of 17 years of experience, ranging from 1 to 53 years. Over two thirds of the sample had a post-graduate certificate or higher qualification, with 39 participants holding a Master's in Health Practice or Health Science, and 3 participants having a Doctor of Philosophy (PhD) qualification. Most participants were trained in Aotearoa New Zealand.

Table 4.1

Demographic data of study participants (N=176)

Participants		N	%
Gender	Male	58	33
	Female	117	67
	Not stated	1	<1
Age	Range	22 - 77	
	Mean (SD)	40 (12)	
Ethnicity	European	155	88
	Māori	4	2
	Pacific Island	0	0
	Asian	15	8
	Other	2	1
Years of	Range	1 – 53	
experience	Mean (SD)	17 (12)	
Qualification	Bachelor's degree	56	32
	Post-graduate cert / diploma	78	44
	Master's degree	39	22
	PhD	3	2
Country of	NZ	138	78
training	Australia	2	1
	UK	18	10
	South Africa	8	5
	Other	10	6

Note. N = Number; % = Percentage; SD = Standard Deviation; cert = certificate; PhD = Doctor of Philosophy; NZ = New Zealand; UK = United Kingdom.

The median and inter-quartile range of the KNAP and DIBQ are presented in Table 4.2. The KNAP was completed by 184 participants and there were 8 participants that dropped out prior to completing the DIBQ. The skewness values for the DIBQ and KNAP were between -1 and +1 and kurtosis was between -2 and +2. Inspection of the DIBQ and KNAP histograms demonstrated that the data were not normally distributed

except for DIBQ Consequences. It was therefore decided to proceed with non-parametric analyses.

Table 4.2

Median and interquartile range of the KNAP and DIBQ

Scale		N	Md	IQR
KNAP Score		184	119.5	11-127
DIBQ	Knowledge	183	3.00	2.25-3.75
	Skills	183	3.00	2.00-4.00
	Role	183	4.00	3.00-5.00
	Confidence	183	2.75	2.13-3.50
	Consequences	179	3.33	2.75-3.83
	Goals	176	2.50	1.50-3.00
	Organisation	176	3.00	2.06-4.00

Note. N = number; Md = median; IQR = interquartile range; KNAP = Knowledge and Attitudes of Pain scale; DIBQ = Determinants of Implementation Behaviour Questionnaire.

Participants' training in PIP and workplace characteristics are presented in Table 4.3. Almost three quarters of the respondents had not received supervision from a psychologically informed therapist, nearly one quarter had no formal training in PIP, and half of the respondents had less than 50 hours training in PIP. All participants answered the questions; however, one answer in frequency of PIP supervision and one answer in PIP formal training hours were not quantifiable.

4.3 Proportion of New Zealand Physiotherapists that Intend to Deliver Psychologically Informed Physiotherapy

One third of participants intended to provide PIP in both vignettes. The number and percentage of participants intending to deliver PIP are presented in Table 4.4.

Table 4.3

Frequencies of workplace characteristics

Variable		Frequency	%
PIP supervision	No	130	74.3
	Yes	45	25.7
PIP formal training hours	None	41	23.4
	< 50	89	50.9
	≥50	45	25.7
Time per appointment (mins)	20-25	25	14.2
	30-35	79	44.9
	40-45	42	23.9
	50-60	30	17.0
Funding	ACC fully funded	68	38.6
	Reg fees/ Private	77	43.7
	Health NZ Te Whatu Ora	31	17.6

Note. % = percentage; PIP = psychologically informed physiotherapy; < = less than; ≥ = greater than; mins = minutes; ACC = Accident Compensation Corporation; Reg = regulation; NZ = New Zealand.

4.3.1 Validation of the Dependent Variable. Mean psychological and biomedical scores for the $Intention_{PIP}$ and $Intention_{NonPIP}$ participants can be found in Table 4.4. In both vignettes, the 'Psychological' score was statistically significantly higher in those who intended to use PIP compared to those participants who did not. In both vignettes, the 'Biomedical' score was significantly higher in participants who did not intend to deliver PIP compared to those that did. In each calculation, there were no changes in statistical significance when the imputed data were included.

Table 4.4

Proportion of physiotherapists' intention to deliver PIP for each vignette

		N	%	Mean Psych score (SE)[a]	Mean Biomed score (SE)[a]
Admin (n=210)[b]	$Intention_{NonPIP}$	141	67.5	28.94 (.90)	34.77 (.67)
	$Intention_{PIP}$	68	32.5	38.60 (1.03)	30.41 (.85)
	F (df)			41.27 (2, 200)*	15.17 (2, 205)*
Foreman (n=204)	$Intention_{NonPIP}$	135	66.5	29.68 (.83)	35.41 (.66)
	$Intention_{PIP}$	68	33.5	39.01 (1.04)	31.5 (.89)
	F (df)			45.51 (2, 200)*	1.14 (2, 200)*

Note. N = number; % = percentage; Psych = psychological; SE = standard error; Biomed = biomedical; Admin = administrator.

[a] Mean psych and biomed scores are pooled imputed data.

[b] One case in administrator vignette did not adequately complete the open-ended answer.

* p < .001 between the groups

4.3.2 Vignette Order. Chi-square tests showed that for the administrator vignette, 20% of participants provided psychologically informed answers if the administrator vignette was presented first and 39% of participants provided psychologically informed answers if the administrator vignette was presented second. This difference was statistically significant (X^2 (1, *n* = 209) = 7.01, *p* = .005, *phi* = -.19).

For the foreman vignette, 36% of participants provided psychologically informed answers if the foreman vignette was presented first and 26% of participants provided psychologically informed answers if the foreman vignette was presented second. This difference was not significant (X^2 (1, *n* = 203) = 1.21, *p* = .20, phi = -.09).

4.4 Factors that are Associated with the Intention to Deliver Psychologically Informed Physiotherapy

4.4.1 Comparison Between Intention$_{PIP}$ and Intention$_{NonPIP}$ Groups.Mann-Whitney U and Chi Square tests were used to select the variables to be entered into the regression model. The results of these tests are presented in Tables 4.5 and 4.6. The variables entered into the regression model are listed in section 4.4.3. For the administrator vignette, Mann-Whitney U tests showed that the Intention$_{PIP}$ group had higher KNAP scores and higher scores for all the DIBQ domains except for Goals, which was significantly lower. There were no significant differences between the Intention$_{PIP}$ group and Intention$_{NonPIP}$ group for age or years of practice. Chi-Square tests demonstrated PIP supervision and PIP formal training hours were higher in the Intention$_{PIP}$ participants, but there were no significant differences between the groups in qualifications, funding model and time per appointment.

For the foreman vignette, Mann-Whitney U tests showed that the Intention$_{PIP}$ group had higher KNAP, DIBQ Knowledge, DIBQ Skills, DIBQ Role, DIBQ Confidence and DIBQ Consequence scores. They had a significantly lower DIBQ Goals score. There were no significant differences between the Intention$_{PIP}$ group and Intention$_{NonPIP}$ group for years of practice, age, and DIBQ Organisation score. Chi-Square Tests demonstrated a statistically significant difference for level of qualification but no significant differences between the groups for PIP supervision, PIP formal training hours, funding model and time per appointment.

4.4.2 Multiple Imputation of Data. There were 10 participants that dropped out between the KNAP questionnaire and completion of the survey. This was missing data not at random, which is known to have bias (Sinharay et al., 2001). Due to the potential bias in the data, these scores were compared to a multiple imputation dataset. Comparing the results of univariate tests between imputed and non-imputed datasets, qualification level was no longer significantly different between the groups in the foreman vignette, but the p value remained under .2 so it was left in the regression

model. Similarly, PIP formal training hours was no longer significant in the administrator vignette but remained under a p value of .2 so it remained in the regression model. The p value for funding model and time per appointment reached greater than .2 in the foreman vignette and therefore were not entered into the regression model. All other independent variables did not have a remarkable change in their significance levels with the imputed data.

Correlation coefficients were calculated amongst the remaining variables to check for co-linearity. Spearman's correlation tests demonstrated that PIP supervision, PIP formal training hours, time per appointment, funding model and qualification were not highly correlated with any other variable. Age was highly correlated with years of practice (r = .93).

Table 4.5

Mann Whitney U and Chi-Square test results comparing the independent variables for the administrator vignette.

	Non-PIP (Md)	(N)	PIP (Md)	(N)	Z/ χ^2	P
KNAP	115	119	126	64	4.85	<.001
DIBQ Know	3.00	118	3.50	64	4.05	<.001
DIBQ Skills	2.67	118	4.00	64	4.13	<.001
DIBQ Role	4.00	118	4.33	64	3.70	<.001
DIBQ Confidence	2.50	118	3.00	64	3.87	<.001
DIBQ Conseq	3.22	115	3.67	64	4.35	<.001
DIB Goals	2.50	113	2.00	63	-2.85	.004
DIBQ Org	3.00	113	3.50	63	2.65	.008
Age	39	113	38	63	-.27	.786
Years of Practice	14	113	15	63	.03	.980

	Non-PIP (Md)	(N)	PIP (Md)	(N)	Z/ χ^2	P
Qualification						
Bachelor's	36.3	113	23.8	63	2.91	.233
PG cert/dip	41.6		49.2			
Masters/PhD	22.1		27.0			
PIP Supervision						
No	81.3	113	61.9	63	6.92	.009
Yes	18.8		38.1			
PIP Training						
0	27.4	113	16.1	63	11.16	.004
<50	54.9		43.5			
≥50	17.7		40.3			
Funding						
ACC full	34.5	113	46.0	63	7.36	.061
ACC part/ private	48.7		34.9			
Te Whatu Ora	16.8		19.0			
Appt Time						
20 - 25	15.9		11.1			
30 – 35	47.8	113	39.7	63	7.05	.070
40 - 45	24.8		22.2			
50 – 60	11.5		27.0			

Note. PIP = psychologically informed physiotherapy; Md = median; N = number; X^2 = chi square; p = probability; KNAP = knowledge and attitudes of pain; DIBQ = determinants of implementation behaviour questionnaire; Know = knowledge; Conseq = consequences; Org = organisation; PG = post-graduate; cert = certificate; PhD = doctor of philosophy; < = less than; ≥ = equal or more than; appt = appointment; ACC = Accident Compensation Corporation.

Table 4.6

Mann Whitney U test and Chi-Square results comparing the independent variables between the PIP and non-PIP groups in the foreman vignette

	Non-PIP (Md / %)	(N)	PIP (Md / %)	(N)	Z/ χ^2	P
KNAP	117.0	120	124.50	64	4.36	<.001
DIBQ Know	3.00	119	3.50	64	3.42	<.001
DIBQ Skills	3.00	119	4.00	64	4.28	<.001
DIBQ Role	4.00	119	4.17	64	3.48	<.001
DIBQ Confidence	2.5	119	3.06	64	3.85	<.001
DIBQ Conseq	3.25	115	3.67	64	4.36	<.001
DIBQ Goals	2.50	113	2.00	63	-1.99	.047
DIBQ Org	3.00	113	3.25	63	1.81	.071
Age	37	113	39	63	1.37	.170
Years of practice	13	113	18	63	1.33	.185
Qualification						
Bachelor's	39.8	113	17.5	63	10.57	.005
PG cert/dip	41.6		49.2			
Masters/PhD	18.6		33.3			
PIP Supervision						
No	78.6	113	66.7	63	2.40	.121
Yes	21.4		33.3			
PIP Training						
0	23.9	113	22.6	63	3.52	.172
<50	54.9		43.5			
≥50	21.2		33.9			
Funding						
ACC full	37.2	113	41.3	63	3.38	.337
ACC part/						

	Non-PIP (Md / %)	(N)	PIP (Md / %)	(N)	Z/ χ^2	P
private	45.2		41.2			
Te Whatu Ora	17.7		17.5			
Appt Time						
20 - 25	14.2	113	14.3	63	5.13	.162
30 – 35	48.7		38.1			
40 - 45	24.8		22.2			
50 – 60	12.4		25.4			

Note. PIP = psychologically informed physiotherapy; Md = median; N = number; p = probability; KNAP = knowledge and attitudes of pain; DIBQ = determinants of implementation behaviour questionnaire; Know = knowledge; Conseq = consequences; Org = organisation; % = percentage; PG = post-graduate; cert = certificate; PhD = doctor of philosophy; < = less than; ≥ = equal or more than; appt = appointment; ACC = Accident Compensation Corporation.

Years of practice was not entered into the regression model due to age being more likely to be reliable. There were also correlations among the DIBQ domains. Knowledge was highly correlated with Skills (r = .85) and Able (r = .78), Skills was highly correlated with Role (r = .72) and Confidence (r = .83), and Role was highly correlated with Confidence (r = .73) and Consequences (r = .74). Pooled analyses of multiple imputed data did not reveal any considerable changes in the correlation data. Due to these high correlations, Knowledge and Consequences were entered into the regression model alongside other uncorrelated variables from the DIBQ, but Skills, Confidence, and Role were excluded from the regression model for the primary analyses.

4.4.3 Binary Regression Analyses. The following variables were entered into the regression model for the administrator vignette: PIP formal training hours, funding model, time per appointment, PIP supervision (dichotomised), DIBQ Knowledge, DIBQ Consequences, DIBQ Organisation, DIBQ Goals, KNAP and vignette order. The full

model of the original data was statistically significant, $\chi 2\ (14, N = 174) = 51.86, p < .001$ indicating that the model was able to distinguish between the participants who intended to use PIP versus those that did not. The model as a whole correctly classified 76.4% of cases. Table 4.7 presents the pooled analysis from the imputed data for the administrator vignette. Two independent variables were significantly associated with providing PIP when the other variables were adjusted for: KNAP and vignette order. The odds ratio for KNAP was 1.05; indicating that each point scored in the 150-point KNAP scale increased the odds of being psychologically informed by 5%. Those who completed the administrator vignette second were 65% less likely to be psychologically informed.

The following variables were entered into the regression model for the foreman vignette: PIP formal training hours, PIP supervision (dichotomised), qualifications, DIBQ Knowledge, DIBQ Consequences, DIBQ Organisation, DIBQ Goals, KNAP and age. The full model of the original data containing all the predictors was statistically significant, $\chi 2\ (11, N = 174) = 43.89, p < .001$ indicating that the model was able to distinguish between the participants who intended to use psychologically informed management of the vignette versus those that did not. The model as a whole correctly classified 75.9% of cases. Table 4.8 presents the pooled analysis of the imputed data for the foreman vignette. Two independent variables were significantly associated with providing PIP when the other variables were adjusted for: KNAP and DIBQ Consequences. KNAP had an odds ratio of 1.05, meaning that for each point scored on the 150-point KNAP scale, the participant was 5% more likely to be psychologically informed. DIBQ Consequences had an odds ratio of 2.15, meaning that for each point scored on the 5-point DIBQ Consequences domain, the participant was 215% more likely to be psychologically informed.

Table 4.7

Logistic regression of factors associated with the delivery of PIP in the administrator vignette

	B	SE	Wald[a]	Df	P	Odds Ratio	95% CI Lower	Upper
KNAP	.04	.02	6.91	1	.015	1.05	1.01	1.08
DIBQ Know	.49	.25	3.27	1	.053	1.63	.99	2.69
DIBQ Conseq	.45	.33	2.12	1	.171	1.57	.82	2.97
DIBQ Goals	-.23	.21	1.44	1	.286	.80	.48	1.21
DIBQ Org	-.30	.22	1.85	1	.167	.74	.27	1.14
Hours			.96	2				
<50	-.27	.53	.22	1	.611	.76	.27	2.16
≥50	.16	.65	.08	1	.802	1.18	.33	4.28
Time			1.71	3				
30-35mins	.07	.60	.07	1	.914	1.07	.33	3.46
40-45mins	-.20	.65	.01	1	.754	.82	.23	2.90
50-60mins	.60	.78	.97	1	.446	1.82	.39	8.50
Supervision	.86	.45	3.00	1	.058	2.36	.97	5.76
Funding			.89	2				
Reg/private	-.46	.42	.88	1	.264	.63	.28	1.42
Te Whatu	-.23	.59	.04	1	.701	.80	.25	2.52
Vignette order	-1.05	.47	4.25	1	.027	.35	.14	.89

Note. SE = standard error; [a] = original data set; df = degrees of freedom; p = probability; % = percentage; CI = confidence interval; KNAP = knowledge and attitudes of pain; DIBQ = determinants of behaviour questionnaire; Know = knowledge; Conseq = consequences; Org = organisation; < = less than, ≥ = greater or equal to; mins = minutes; reg = regulation fees; Te Whatu = Health New Zealand Te Whatu Ora.

Table 4.8

Logistic regression of factors associated with the delivery of PIP in the foreman vignette.

	B	SE	Wald[a]	Df	P	Odds Ratio	95% CI OR Lower	Upper
KNAP	.05	.02	7.32	1	.005	1.05	1.02	1.09
DIBQ Know	.24	.24	.62	1	.311	1.27	.80	2.02
DIBQ Conseq	.76	.33	6.05	1	.021	2.15	1.12	4.11
DIBQ goals	-.08	.197	.17	1	.698	.93	.63	1.36
DIBQ org	-.36	.21	3.01	1	.095	.70	.46	1.06
Hours			1.78	2				
<50	-.66	.49	1.73	1	.177	.52	.21	1.42
≥50	-.60	.61	1.07	1	.321	.55	.17	1.80
Supervision	.51	.45	.98	1	.252	1.70	.69	4.02
Qual			4.98	2	.083			
PgCert/dip	.86	.46	3.67	1	.063	2.36	.96	5.82
M/PhD	.94	.53	4.26	1	.075	2.57	.91	7.26
Age	.01	.02	.14	1	.693	1.01	.97	1.04

Note. SE = standard error; [a] = original data set; df = degrees of freedom; p = probability; % = percentage; CI = confidence interval; OR = Odds ratio; KNAP = knowledge and attitudes of pain; DIBQ = determinants of behaviour questionnaire; Know = knowledge; Conseq = consequences; Org = organisation; < = less than, ≥ = greater or equal to; PgCert/dip = postgraduate certificate or diploma; M/PhD = masters or doctor of philosophy.

4.4.4 Sensitivity Analyses. Due to the high correlation between the DIBQ Role, DIBQ Confidence and DIBQ Consequences domains and the arbitrary decision to retain Consequences in the primary analysis, the regression models were re-run with DIBQ Role and DIBQ Confidence entered instead of DIBQ Consequences for both vignettes. These analyses were run separately using the forced entry method. The tables for these analyses are located in Appendix D.

When DIBQ Role was entered, the overall model performance only increased slightly to 77% for the administrator vignette and reduced to 70.7% for the foreman vignette. DIBQ Role was not statistically significant in either model (both p > .05). KNAP remained significant in both vignettes and vignette order remained significant in the administrator vignette. In the foreman vignette, having a master's or PhD became significant (p = .032) and in the administrator vignette DIBQ Knowledge and PIP supervision became significant (p = .033 and p = .045, respectively).

When DIBQ Confidence was entered, the overall model performance was 78.7% for the administrator vignette and 71.8% for the foreman vignette. DIBQ Confidence was not statistically significant in either model (both p > .05). KNAP remained significant in both vignettes and vignetter order remained significant in the administrator vignette. PIP supervision became significant in the administrator vignette (p = .49)

4.5 Survey Completers and Non-Completers

There were 176 participants that completed the survey and 48 participants that dropped out after completing at least one of the vignette open-ended answers. A chi-square test showed that in the administrator vignette, 15.2% of non-completers were classified as psychologically informed compared to 35.8% of survey completers. This was a statistically significant difference $\chi 2$ (1, n = 209) = 4.50, p = .034, phi = .161. An independent samples t-test showed that the non-completers (M = 37.19, SD = 7.69) scored significantly higher in the biomedical scores than completers (M = 32.70, SD =

7.72); *t*(204) = 2.99, *p* = .003, Cohen's *d* = .58). The Psychological score was not different between completers (*M* = 32.74, *SD* = 10.88) and non-completers (*M* = 29.87, *SD* = 11.80, *t*(199) = -1.32, p = .189, Cohen's *d* = -.26).

In the foreman vignette, 18.5% of non-completers were classified as psychologically informed compared to 35.8% of completers, which was not statistically significant $\chi 2$ (1, *n* = 203), = 2.41, *p* = .121, *phi* = .124. An independent samples t-test showed that non-completers (*M* = 34.71, *SD* = 7.08) had a similar Biomedical score to completers (*M* = 33.86, *SD* = 7.78, *t*(198) = .50, *p* = .62, Cohen's *d* = .11). Psychological score was significantly lower for non-completers (*M* = 28.67, *SD* = 10.05) compared to completers (*M* = 33.41, *SD* = 10.19; *t*(198) = -2.14, *p* = .033, Cohen's *d* = -.47).

Chapter 5

Discussion

5.1 Introduction

This research has provided novel information about Aotearoa New Zealand physiotherapists' uptake of PIP, an approach considered to be superior to traditional physiotherapy in the management of one of the most globally burdensome conditions, persistent low back pain. There is a wealth of qualitative research exploring the barriers to providing PIP, but these do not establish the prevalence of PIP delivery or provide information on the importance of these barriers. This study has determined the proportion of physiotherapists in New Zealand intending to provide PIP. We have also quantitatively tested the facilitators to the implementation of PIP, providing new insight into which factors are most important to PIP delivery. Other studies that have previously used quantitative analyses to explore these barriers to physiotherapists providing specific biopsychosocial care have only used univariate analyses (Ris, Boyle, et al., 2021; Schröder et al., 2020). Therefore, factors that are most associated with PIP were not known prior to our study. In addition, no quantitative studies on PIP delivery have been undertaken in the unique Aotearoa New Zealand context. This chapter will discuss the results of the study and explore how the findings fit within the context of what is already known about physiotherapists uptake of PIP and the biopsychosocial model. The clinical implications of these findings will be then considered, including how the findings can help direct organisations, training institutions and stakeholders and ultimately improve the management of persistent low back pain in Aotearoa New Zealand. Possible future research will then be outlined.

5.2 Proportion of New Zealand Physiotherapists that Intend to Provide Psychologically Informed Physiotherapy

Our research found that only one third of New Zealand physiotherapists intend to deliver PIP. This is despite most participants having post-graduate qualifications or at least some training in PIP. Our research supports qualitative research findings that physiotherapists do not necessarily provide PIP despite training (Holopainen et al., 2020).

These findings are in line with some international studies. Similar to our findings, just under one third of physiotherapists in Canada (do Prado et al., 2022) and one quarter of physiotherapists in Saudia Arabia (Alshehri et al., 2020) reported they intend to provide PIP treatments for non-specific low back pain. These treatments included CFT, education and pain coping skills. Other countries have reported higher rates of PIP delivery (Akindele et al., 2020; Bahns et al., 2021; Díaz-Fernández et al., 2024). Nearly 80% of Netherland physiotherapists reported use of psychological assessments (Hallegraeff et al., 2021) and over half of physiotherapists in Spain reported use of the biopsychosocial model in persistent pain management (Díaz-Fernández et al., 2024). Almost two thirds of German physiotherapists stated they would always or mostly use behavioural therapy for persistent low back pain and just under half of respondents would always or mostly use relaxation techniques (Bahns et al., 2021). Finally, nearly all physiotherapists in Nigeria recorded their intention to use education and counselling in low back pain management (Akindele et al., 2020).

Whether these international findings accurately reflect the physiotherapists' intention to deliver PIP is questionable, meaning that direct comparison to our study is challenging. Most of these studies asked participants to self-report their use of biopsychosocial methods or psychological interventions using close-ended questions (Akindele et al., 2020; Alshehri et al., 2020; Bahns et al., 2021; Díaz-Fernández et al., 2024). These types of questions may have prompted the physiotherapists to select or over-estimate their use of biopsychosocial methods. For example, in the Netherlands

study, over 78% of physiotherapists selected that they would either often or always attend to psychological factors in the assessment phase but there was no evidence of this when clinical records were examined (Hallegraeff et al., 2021). Our study avoided this risk of bias by use of open-ended questions and the concealment of the study's research aims, which may explain the difference in findings from international studies and limit the ability to accurately compare findings across countries. Two studies did not detail what these treatments entail (Akindele et al., 2020; Díaz-Fernández et al., 2024), so it is unclear how much of the psychological aspects would be delivered, and therefore, difficult to compare their findings to our study. Still, considering that low back pain has wide implications on individuals from a biopsychosocial perspective and a high burden, these findings show that the uptake of evidence-based PIP in Aotearoa New Zealand is low. This shows that there is more work to be done on improving the use of psychologically informed practice with New Zealand physiotherapists.

5.3 Factors Associated with the Provision of Psychologically Informed Physiotherapy

5.3.1 Key Findings. Our study found that higher knowledge of pain neuroscience and positive beliefs about the consequences of providing PIP are most strongly associated with the delivery of PIP. Qualitative research has raised many barriers to the delivery of PIP. This includes beliefs of PIP being unacceptable to patients, low confidence, lack of skills and knowledge, perception that it is outside scope of practice, discomfort with dealing with psychosocial aspects of pain, and being sceptical about omitting biomedical assessment (Ballengee et al., 2021; Driver et al., 2017; Gardner et al., 2017; Holopainen et al., 2020). The current study found in the univariate analysis that perception of role, confidence, skills, and PIP knowledge were consistently associated with PIP, which is in line with this qualitative research. Yet, when tested using multivariate models, it was determined that pain neuroscience knowledge and beliefs in the consequences of PIP were more strongly associated with the intent to deliver PIP than the other factors. This means that efforts to improve

delivery of PIP can now be better directed.

Knowledge of pain neuroscience was the factor the most consistently related to the delivery of PIP. For each point scored in the 150-point KNAP scale, the physiotherapist was 5% more likely to deliver PIP. This indicates that even small increments of knowledge are associated with increased likelihood of delivering PIP. These results align with other recent research which found that modern pain neuroscience knowledge is associated with use of a biopsychosocial approach (Díaz-Fernández et al., 2024; Mikamo & Takasaki, 2021). In these studies, pain neuroscience scores predicted frequency of providing a biopsychosocial therapy (Díaz-Fernández et al., 2024) and physiotherapist biopsychosocial orientation (Mikamo & Takasaki, 2021). However, pain neuroscience knowledge was not associated with use of biopsychosocial management of a whiplash sufferer in another study (Takasaki & Ueno, 2024). How biopsychosocial management was tested differed between these studies, which may account for the variation in results. None of these studies examined the provision of specific psychological treatments.

The importance of pain neuroscience in delivery of PIP may be explained by the relationship between pain neuroscience knowledge and orientation of treatment. Prior studies have shown that the KNAP has a moderate inverse relationship with biomedical orientation and a moderate positive correlation with a biopsychosocial orientation (Beetsma et al., 2020). Therefore, it may be assumed that those with higher KNAP scores are bio-psychosocially orientated and less biomedically oriented. Research has shown that biomedical or biopsychosocial orientation directs treatment selection. Healthcare providers with a biomedical orientation are more likely to select biomedical treatments (Alshehri et al., 2020), have less treatment selection in line with clinical guidelines (do Prado et al., 2022), are more likely to advise to reduce activity and work activities (Gibbs et al., 2021; Simmonds et al., 2012), and are more likely to predict a spinal pathology (Simmonds et al., 2012). In one study, biomedical orientation was more important than biopsychosocial orientation, age, gender, years of practice and education in providing return to work and activity advice (Gibbs et al., 2021). Similarly,

in a study using the same vignettes as the current study, physicians' beliefs and attitudes towards pain was a stronger predictor of return-to-work recommendations than education, years of experience and training in low back pain (Rainville et al., 2000). If pain neuroscience knowledge is linked to a more biopsychosocial orientation, then our study supports findings that treatment orientation will help direct treatment selection.

Our study suggests that improving pain neuroscience knowledge will improve physiotherapists' treatment orientation and selection. Therefore, it may be important to understand how pain neuroscience is obtained by physiotherapists and improved. Prior studies show that specific pain neuroscience education can improve pain neuroscience knowledge in physiotherapists (Beetsma et al., 2021) and physiotherapy students (Colleary et al., 2017; Saracoglu et al., 2021). This suggests that pain neuroscience knowledge can improve with education.

Interestingly, our study revealed that Aotearoa New Zealand physiotherapists have higher pain neuroscience knowledge compared to international research. Our sample had a median KNAP score of 119.5 out of a possible 150. This is high compared to other international studies that have reported scores of between 81 and 106 (Beetsma et al., 2021; Díaz-Fernández et al., 2024; Takasaki & Ueno, 2024). This demonstrates there is reasonable knowledge of modern pain neuroscience in Aotearoa New Zealand physiotherapists despite only one third of Aotearoa New Zealand physiotherapists intending to deliver PIP. This may reflect that a very high level of pain neuroscience knowledge is needed for PIP delivery to occur, or it is possible that knowledge alone is not enough to create change and a process of integrating this knowledge in practice is required. Qualitative research found that shifting physiotherapists towards a biopsychosocial practice required not only the acquisition of new knowledge but also reflection of past experiences, reflexive monitoring and testing of new skills (Holopainen et al., 2020). This process of change may be necessary particularly for physiotherapists who have experienced strong biomedical influences in their education, as well as biomedical expectations from patients and other colleagues

(Mescouto et al., 2022). The multivariate analysis showed that belief about consequences of PIP was also relevant to delivery of PIP. Exploring this factor may also help to understand how to improve pain neuroscience knowledge and PIP delivery in physiotherapists.

Belief about consequences is defined as perceived outcomes of a particular behaviour (Cane et al., 2015). In this study, beliefs about consequences involved the perceived outcomes of PIP for the physiotherapist (positive emotions, financial reimbursement, recognition), patient outcomes and improved collaboration with other health professionals. Quantitative research that has used the DIBQ questionnaires to test physiotherapists' implementation of a biopsychosocial intervention for low back pain patients has found beliefs about consequences to be important to the delivery of biopsychosocial methods (Ris, Boyle, et al., 2021; Schröder et al., 2020). But its relevance was not distinguished from the importance of other factors, such as knowledge, skill, confidence, patient expectations and organisation (Ris, Boyle, et al., 2021; Schröder et al., 2020). Neither of these studies ranked importance using a regression model, meaning that it is not known whether our study's findings align with this research. Our study suggests that targeting beliefs about consequences would be more important than attempting to increase the knowledge, confidence and skills of PIP, but no other research is available to support this suggestion.

Interestingly, beliefs about consequences have not featured consistently in qualitative research on physiotherapists adopting biopsychosocial methods. Beliefs about consequences were important to physiotherapists adopting a biopsychosocial approach in one systematic review reviewing overall physiotherapy practice (Gervais-Hupé et al., 2023) but not in another examining barriers to biopsychosocial approach in pain (van Dijk et al., 2023). Out of three qualitative studies that have used the TDF model to examine physiotherapists implementing a specific psychologically informed strategy (Matthews et al., 2015; Moniz et al., 2024; Richmond et al., 2018), beliefs about consequences were only highlighted as a theme in one of the studies (Richmond et al., 2018). This indicates that beliefs about consequences have not been a strong

theme in qualitative research, but this could be due to the limitations of qualitative research, different target interventions or the context of where that intervention is implemented. It also may highlight the value of undertaking both qualitative and quantitative research.

5.3.2 Contextual Factors. In prior research, physiotherapists have cited contextual factors as barriers to provision of psychological care, such as lack of time and organisational support (Holopainen et al., 2020; van Dijk et al., 2023). Our study tested these factors and funding model (i.e., patient, hospital or ACC) quantitatively. The results of this survey showed there was no significant difference between those who did and did not intend to provide PIP in time or funding source for either vignette, nor were these factors significant in the regression model. Perceived organisation support for PIP was significant in one vignette, but it was not significant in the regression model. Therefore, this study does not provide much support for contextual factors being associated with the delivery of PIP. This is in line with the results of another study where demographics and work settings did not influence the use of psychological treatments (Alshehri et al., 2020). Other studies have shown that a high delivery of psychologically informed treatment can occur within 15-20 minutes appointments (Bahns et al., 2021), supporting that time is not barrier to PIP. Organisational factors were not important in implementation of a biopsychosocial intervention (Ris, Boyle, et al., 2021). This may reflect that while physiotherapists perceive external factors as a barrier to implementation, potentially it is other internal factors that drive their behaviour. This suggests that making changes to funding models, improving organisational support and time spent with patients may not improve delivery of PIP.

5.3.3 Age and Experience. This study demonstrated that age and years of experience were not influential in delivery of PIP. In other research, age and years of experience have inconsistent and potentially non-linear associations with the biopsychosocial orientation of physiotherapists. Years of practice did not influence

adherence to clinical guidelines for nonspecific low back pain (do Prado et al., 2022) or implementation of a biopsychosocial intervention (Ris, Boyle, et al., 2021). In contrast, physiotherapists with over 20 years and under 5 years of experience favoured a biomedical approach (Díaz-Fernández et al., 2024), while logistic regression analyses showed significant associations between age and using psychological questionnaires in persistent pain (Hallegraeff et al., 2021). Other studies have shown that more experience leads to a greater biopsychosocial attitude towards persistent pain (Ferreira et al., 2023; Roitenberg, 2019). Potentially, the variation in results may be due to some studies using linear measures and others testing for non-linear effects by grouping participants by age. Therefore, the evidence is mixed in whether age and experience are associated with biopsychosocial practice. In our study, the average age was 40 and years of practice was 17, which is similar to international studies and only slightly higher than the average New Zealand physiotherapist (Physiotherapy Board of New Zealand, 2024).

5.3.4 Training, Qualification and Supervision. This study demonstrated that training, qualifications and supervision were not important to PIP delivery. Univariate analyses showed that receiving PIP supervision, a higher qualification and more hours of formal training in PIP was greater in the psychologically informed group in one vignette but not both. None of these variables were significant in the regression model, suggesting these factors are not the most important factors for delivering PIP.

In other studies, the influence of training and qualifications on clinical reasoning in physiotherapists have had mixed results. There have been positive associations between physiotherapists with higher qualifications or specific pain management training and greater adherence to evidenced-based treatment for low back pain (Akindele et al., 2020; Alshehri et al., 2020; Bahns et al., 2021; Christe et al., 2021; Díaz-Fernández et al., 2024; do Prado et al., 2022; Simmonds et al., 2012). Yet other studies showed no association between higher qualifications and evidence-based management for low back pain (Gibbs et al., 2021; Mikamo & Takasaki, 2021;

Takasaki & Ueno, 2024). In one study where there was a high percentage of physiotherapists delivering psychological informed treatments less than 8% had a master's or PhD qualification (Bahns et al., 2021) suggesting that qualifications are not relevant in the delivery of PIP. All these studies have varied in outcome measures and sample characteristics which may account for some of the variability of results, however, overall results of our findings and the international research suggest that higher training and qualifications alone do not necessarily result in greater PIP delivery.

The lack of association of qualifications or training on PIP delivery may be due to differences in quality or content of the qualifications. It cannot be assumed that postgraduate education is bio-psychosocially oriented or incorporates pain neuroscience knowledge (Mescouto et al., 2022). In one study, specific training in persistent pain predicted frequency of delivering biopsychosocial methods whereas higher education did not (Díaz-Fernández et al., 2024). In another, pain knowledge improved with increasing years of post-graduate study and significantly more so when engagement in pain neuroscience education occurs (Beetsma et al., 2021). KNAP scores in the current study were not correlated with qualification, hours of psychologically informed training or PIP supervision, implying that New Zealand physiotherapists' pain neuroscience knowledge is not necessarily obtained through these means. This shows that to improve PIP delivery, the content of the training needs to be considered. Further research is required to establish how physiotherapists best learn pain neuroscience knowledge. This is discussed below in section 5.6.

5.3.5 Summary of the Results of Research Aims. This study identified that approximately one third of physiotherapists in Aotearoa New Zealand intend to deliver PIP in clinical practice. This is roughly in line with international studies, although methodological differences make direct comparison to other studies difficult. Factors most strongly associated with delivery of PIP include knowledge in pain neuroscience and beliefs around consequences of treatment. The findings of this study mostly support other research. Modern pain neuroscience has previously been shown to be associated with improved beliefs and attitudes towards pain (Beetsma et al., 2020;

Mikamo & Takasaki, 2021) and several studies have found that beliefs about consequences is a barrier to the delivery of a biopsychosocial approach in persistent pain management (Gervais-Hupé et al., 2023; Richmond et al., 2018; Ris, Schröder, et al., 2021; Schröder et al., 2020). Our study was the first to use a multivariate regression model to investigate the unique variance of each of these factors, giving some greater context to the evidence. Our study also confirms other research that contextual factors, such as time and funding, have not been influential with the implementation of biopsychosocial interventions, and challenges research that has shown that age, years of experience or level of training is associated with biopsychosocial orientation. This study provides some useful knowledge that can be added to the body of research on PIP and particularly in the Aotearoa New Zealand health setting.

5.4 Current Study Findings in the Context of Physiotherapists' Shift from the Biomedical to Biopsychosocial Model.

This research implies that while some physiotherapists operate under a biopsychosocial model, many Aotearoa New Zealand physiotherapists are biomedically oriented in their management of low back pain. This is despite there being ample evidence that the biopsychosocial model is superior to biomedical management in persistent low back pain.

This may reflect a profession in the midst of change, where beliefs and attitudes towards a biopsychosocial model of care have improved but this is not fully translated into practice yet. This is evidenced by Aotearoa New Zealand physiotherapists having high pain neuroscience knowledge compared to international research, yet only one third intended to deliver psychologically informed treatment. There were other signs in our study that Aotearoa New Zealand physiotherapists are heading towards the biopsychosocial approach. In the DIBQ, participants' beliefs that PIP is a part of their professional role had a median score of 4 (out of 5), indicating that most physiotherapists believe PIP should be delivered by physiotherapists. This is supported

in other research where attitudes towards PIP were positive despite several barriers to PIP being described (Driver et al., 2017). Also, three quarters of the current participants have had some formal training in PIP, which is higher than the 25-70% reported in international research (Alshehri et al., 2020; Christe et al., 2021; Díaz-Fernández et al., 2024; do Prado et al., 2022; Simmonds et al., 2012). While it is not known why physiotherapists have undertaken this training, it does indicate that PIP has been integrated into the Aotearoa New Zealand physiotherapy profession.

These findings suggest there are three groups of physiotherapists: physiotherapists that are bio-psychosocially oriented and actively intending to provide psychological based treatments, physiotherapists who are bio-psychosocially oriented or trained but not intending to translate this into clinical practice, and physiotherapists who are biomedically oriented. This is reflected in the research where many physiotherapists are being trained in psychological techniques and find them acceptable and feasible to use in clinical practice (Galea Holmes et al., 2021; Haig, 2019; Tatta, 2022), some report low confidence and request further training and support (Driver et al., 2017), and others do not perceive psychosocial factors as part of their role (Holopainen et al., 2020; Synnott et al., 2015).

The literature suggests several reasons for physiotherapists to rely or fall back on biomedically oriented treatment. This could be related to undergraduate physiotherapy training being largely biomedical (Mescouto et al., 2022), discomfort in managing psychological presentations (Synnott et al., 2015), a fear of uncertainty (Simmonds et al., 2012) or meeting patient expectations which are largely biomedically driven (Ris, Boyle, et al., 2021; Synnott et al., 2015). In Aotearoa New Zealand, the responsibility of being a primary care provider may also mean that physiotherapists do not want to exclude the presence of pathology. Further research may be required to understand Aotearoa New Zealand physiotherapists who have a biopsychosocial attitudes and beliefs but struggle to implement psychologically informed strategies in clinical practice.

5.5 Clinical Implications

The results of this study may inform organisations, employers, trainers, educational institutions and stakeholders (e.g. ACC), whose aim is to encourage physiotherapists to deliver high quality care in the management of low back pain. This study suggests that to achieve this, attention could be paid to optimising knowledge of pain neuroscience and beliefs about the consequences of delivering PIP, and that focusing on other factors such as time, funding model, organisational support may not improve delivery of PIP.

How to target these barriers to PIP delivery is not clear from our study. In our research, KNAP was not associated with higher education, hours of PIP training or supervision, therefore simply recommending these methods may not be effective in creating change. Implementation researchers advise that behaviour change is complex and may require a variety of interventions (Gervais-Hupé et al., 2023) or repeated action and ongoing monitoring (Johnson & May, 2015) to facilitate the change that is required. Behaviour change interventions have previously been designed using the behaviour change wheel (COM-B) model (Michie et al., 2011) and determining the appropriate behavioural change techniques for each aspect of the change wheel to achieve the target behaviour (Gervais-Hupé et al., 2023). In our research, knowledge fits within the capability portion and belief in consequences fits within the motivational aspect of the COM-B wheel, indicating that it is appropriate to use this model when designing PIP interventions. Behavioural change techniques could include use of professional champions (Matthews et al., 2015; Thompson et al., 2018; van Dijk et al., 2023), interprofessional education and collaboration (Munneke et al., 2024; Slater et al., 2022; Thompson et al., 2018), undergraduate education (Thompson et al., 2018), developing of core competencies (Munneke et al., 2024) and monitoring of the application of knowledge in real life scenarios (Thompson et al., 2018). This could even involve interventions with policymakers and health insurers (Ng et al., 2021; Thompson et al., 2018). The effectiveness of these interventions for the delivery of PIP in

Aotearoa New Zealand physiotherapists is not known; therefore, further research is required.

As stated earlier, PIP incorporates the development of a strong therapeutic alliance and is often delivered considering the social and cultural context (Main & George, 2011). Future considerations could involve constructing PIP that is specific to Aotearoa New Zealand's context and developing core competencies so that physiotherapists feel supported to deliver this form of biopsychosocial care to those with low back pain. This may encompass demonstrating an understanding of the cultural aspects of pain, sociopolitical landscape and health systems, how these impact on outcomes and how to promote high quality low back pain management in Aotearoa New Zealand. For example, physiotherapists may provide whānau-centred care for Māori due to the understanding that Māori consider thinking for oneself is unhealthy and that their role within the whānau is part of their identity (Durie, 1985). They may promote recovery and coping with pain through facilitating whanaungatanga, and through the acknowledgement of spiritual and ancestral aspects of pain (Morunga et al., 2023). Direct actions may include engaging recipients in Karakia/prayer, connection with others, papakāinga/ancestors and nature, which may promote resilience and strength to manage pain (Morunga et al., 2023), as well as empowering clients with culturally relevant education and resources (Antunovich et al., 2024). This may help to provide Māori with self-efficacy, knowledge, and reduce negative psychological impacts of pain, which is known to impact on low back pain outcomes.

5.6 Future Research Directions

While this study has examined the influential factors in intention to provide PIP in Aotearoa New Zealand, little is known about the actual delivery of PIP, how physiotherapists obtain pain neuroscience knowledge, why some physiotherapists do not deliver PIP despite pain knowledge or the effectiveness of any intervention that aims to increase this PIP delivery. Future research could include the following:

1. Investigating the proportion of physiotherapists delivering PIP in real life through direct observation of clinical practice and retrospectively examining physiotherapy records for evidence of PIP using similar definitions to the current study.
2. A longitudinal cohort study that examines post-graduate physiotherapists' pain neuroscience knowledge before and after pain knowledge is taught, and between those who undertake pain neuroscience papers and those who do not. The intention to deliver PIP could be compared between these two groups.
3. The use of behaviour change strategies could be investigated by a randomised controlled trial comparing actual PIP delivery between an intervention group that receive pain neuroscience knowledge training with specific implementation strategies, reflection practice and supervision/feedback, and a control group who only receive pain neuroscience knowledge training.
4. Qualitative research interviewing physiotherapists who have a high pain neuroscience knowledge score but do not intend to deliver PIP. The TDF domain 'beliefs about consequences' could be utilised to direct the interview.

5.7 Strengths

There are several strengths to this study. Firstly, this study used rigorous research methods to understand the various factors that may influence PIP. These include: the selection of independent variables from qualitative research, using validated research questionnaires such as the KNAP and DIBQ, and exploring the data with univariate analyses and a multi-variate model. Other studies have used the DIBQ model to explore biopsychosocial interventions in physiotherapy management of low back pain but have only examined the domains using univariate analysis (Ris, Boyle, et

al., 2021; Schröder et al., 2020). Therefore, this study was able to provide novel information on the unique variance that these factors have on the provision of PIP.

Use of strategies to avoid prompting physiotherapists to list PIP strategies in the vignette portion of the survey is a strength. Other studies have used self-report to examine the number of physiotherapists providing PIP or biopsychosocial based care, which may place the studies at risk of social desirability bias. Our research aimed to reduce this risk by concealing the true purpose of the study and by using open-ended answers as the dependent variable. We also considered that the presence of the Likert scale after the first vignette may have prompted the respondent to consider psychologically informed treatments in the second vignette. The chi square test examining the potential effect of vignette order was only significant in one vignette, suggesting that responding to the first vignette did not consistently influence the response to the second vignette. Our study also used specific criteria with two independent raters to determine whether participants were psychologically informed, and this had to be demonstrated across both the assessment and treatment answers, making this a robust assessment of physiotherapists' intention to deliver PIP. In addition, statistical analyses showed that the physiotherapists' assessment and treatment answers were validated by the set of 10-point Likert scales. All these factors mean that we can be confident in the results of the first research aim.

The sample representation is another strength of the study. Overall, the sample appeared to be a fair representation of Aotearoa New Zealand physiotherapists and comparable to similar studies, meaning that the results of the study can be generalised to the Aotearoa New Zealand population and compared to international research. Approximately 6350 physiotherapists held an annual practising certificate in 2023 (Physiotherapy Board of New Zealand, 2024); therefore, this data incorporated 3.5% of the physiotherapy population for the first research aim and 2.9% for the second research aim. Other comparable studies that also examined physiotherapist use of biopsychosocial model in persistent pain (Alshehri et al., 2020; Bahns et al., 2021; Díaz-Fernández et al., 2024) had a higher sample size; however, their countries

consist of a larger population and number of practicing physiotherapists. In our study, the age and gender of participants is similar to New Zealand statistics on physiotherapists (Physiotherapy Board of New Zealand, 2024; Physiotherapy New Zealand, 2023). Most other comparable studies had a similar mean age and gender ratios (Bahns et al., 2021; Díaz-Fernández et al., 2024; do Prado et al., 2022; Hallegraeff et al., 2021). The current study sample was also similar to the Aotearoa New Zealand physiotherapy population in place of work and qualifications. In Aotearoa New Zealand, almost one fifth of physiotherapists work for Te Whatu Ora with the remaining working in private or 'other' organisations (Physiotherapy New Zealand, 2023) and just over half have post-graduate qualifications with one quarter have a master's or PhD (Reid & Dixon, 2018). This suggests that we can be confident that the results of our study generally apply to Aotearoa New Zealand physiotherapists in terms of age, gender, qualifications and place of work, but not ethnicity which is discussed in section 5.8.

Exploration of the data using logistic regression was also another strength. When using regression models certain variables may become non-significant or significant based on what else is entered in the model (Kent et al., 2020). Regression models help to screen for prognostic factors rather than providing a definitive strength of association between the factors and the dependent variable (Kent et al., 2020). In this study, the model was explored by entering different variations of variables and careful consideration was taken as to what variables were entered. This confirmed that beliefs about consequences was more relevant in the model than other factors, such as perception of role. This exploration showed that other variables become significant when this is not entered, which could help explain the variation when other studies use regression model analyses using different variables. This is a strength of the study because it allows the results to be interpreted within the body of current or future research.

Another strength was use of multiple imputation, which can improve representation of the population thereby reducing bias, compared to complete case

analysis (Lee & Simpson, 2014). Multiple imputation was used in validation of the dependent variable and for the univariate analysis and regression model. This leads to greater confidence in these results.

5.8 Limitations to this Study

There are several limitations to this study. This study was a cross-sectional design which can be useful in recruiting and retaining a larger sample size, however it can have limitations in interpretation of the results. Cross-sectional studies may only provide an insight into potential associations between prognostic factors and the dependent variable rather than evidence of cause and effect (Kent et al., 2020). This means that we are not able to be certain that PIP is a result of pain neuroscience knowledge and beliefs about consequences. However, the results of this study can be used to inform future research as discussed above.

The use of vignettes may not reflect real-world behaviour and therefore does not test for actual delivery of PIP, although vignettes have been shown to have a moderate and positive correlation with real life clinical behaviour (Evans et al., 2015; Van Liew & Grimm, 2020). Our study aimed to test the intention to deliver PIP to gain an insight into the mindset of Aotearoa New Zealand physiotherapists towards PIP and the use of vignettes allowed a larger recruitment of physiotherapists, although real life clinical interactions with clients may involve factors that may influence physiotherapists' decision making such as patient treatment expectations, pain behaviour and history of mental health concerns.

Self-selection bias is another potentially limiting factor. Physiotherapists who participate in research may be interested in development of the profession and therefore may be inclined to belong to groups where this research was advertised. They also may be more up to date with evidenced based practice, meaning they could be more psychologically informed. Efforts were made to reduce this form of bias by promoting the research on various social media platforms, physiotherapy conferences, contact with various rehabilitation organisations, Te Whatu Ora and visiting smaller, but

local, physiotherapy practices. Yet this effort does not ensure that various physiotherapists will participate or complete the survey. We tested this theory by comparing psychologically informed answers between non-completers and completers of the survey. This analysis showed a tendency for survey non-completers to be less psychologically informed. Therefore, it is likely some bias occurred in the results; however, efforts were made to impute data to help limit the impact of this bias.

Another limitation was that there was a low representation of Māori and Pacific Island groups amongst the sample. Aotearoa New Zealand Māori physiotherapists made up 2.3% of the sample and there were no Pasifika participants. In Aotearoa New Zealand, Māori and Pasifika physiotherapists make up 4% and 2% of the physiotherapy workforce, respectively (Physiotherapy Board of New Zealand, 2024). This means that these groups were under-represented in this study. Efforts were made to increase the representation of these ethnicities in this study. The impact of this on the results of this study cannot be determined but could be studied in future research.

Decisions regarding the statistical analyses may have impacted on the results of the study. For example, the decision to analyse and dichotomise the participants' responses into $Intention_{PIP}$ and $Intention_{NONPIP}$ may have limited the results. Participants who originally scored a '1' may have intended to provide PIP but did not adequately document their intention. An alternative method of undertaking this analysis could have been scoring the participants using a continuous measure and undertaking multiple regression analyses, which may have yielded different results. Due to this research having a novel study design it was not possible to follow protocols from other research or determine which statistical analyses would be most suitable. It is still considered that the study's results are robust, but this is a worthwhile consideration should any future study aim to replicate these findings.

Finally, the sample size did not reach the target of 251 participants. This target was set due to the anticipation that there would be up to 11 variables to enter into the regression model. In the regression model, 186 cases were included, with 10 and 9 variables were entered into the administrator and foreman vignette, respectively. This

indicates that the study may have been slightly underpowered. Given that KNAP and beliefs about consequences continued to be statistically significant within the sensitivity analyses, this indicates that these factors are still most important to delivery of PIP.

5.9 Conclusion

This study provides new and valuable addition to the body of research on Aotearoa New Zealand physiotherapy delivery of PIP in persistent low back pain. As far as we are aware, this is the first study to test the barriers to PIP delivery using a multivariate model, and the first quantitative study in Aotearoa New Zealand to measure PIP delivery. This is relevant in Aotearoa New Zealand where physiotherapists are the most frequently visited healthcare professional by persons with low back pain. Traditionally, low back pain has been managed from a biomedical lens, particularly within physiotherapy. However, in non-specific low back pain there is little evidence of pathology and passive treatments often inadvertently promote the biomedical model to persons with low back pain. Instead, there is greater evidence for the neurobiological, psychological, cultural and social factors that are associated with and contribute to the maintenance of pain, with the literature having an emphasis on psychological factors.

Physiotherapist adoption of the biopsychosocial model has been widely studied. This is largely in the provision of psychological techniques. Evidence suggests that physiotherapist provision of psychological treatment can improve outcomes and in some cases, physiotherapists find this acceptable and feasible to use in practice. Yet there is still some resistance to deliver psychologically informed management in low back pain, with physiotherapists citing several barriers to this in qualitative research.

From this research we now understand that one third of Aotearoa New Zealand physiotherapists intend to deliver PIP, and the factors most strongly associated with this are knowledge of pain neuroscience and beliefs about the consequences of delivering PIP. This knowledge will help to guide institutions, organisations and stakeholders who wish to improve the quality of care in low back pain on what areas to

focus on. For any implementation to be successful it would be important to confirm these results using clinical studies. Further research also needs to be conducted on understanding how pain neuroscience knowledge is acquired in Aotearoa New Zealand physiotherapists, why some physiotherapists don't deliver PIP despite knowledge and test the effectiveness of any planned intervention.

This research is helped to direct the way forward in improving PIP delivery in Aotearoa New Zealand physiotherapists. This will ultimately improve recovery outcomes for those living with persistent low back pain.

References

Akindele, M., Rabiu, M., & Useh, E. (2020). Assessment of the awareness, adherence, and barriers to low back pain clinical practice guidelines by practicing physiotherapists in a low-resourced country. *Physiotherapy Research International*, *25*(1), e1811. https://doi.org/10.1002/pri.1811

Alhowimel, A. S., Alotaibi, M. A., Alenazi, A. M., Alqahtani, B. A., Alshehri, M. A., Alamam, D., & Alodaibi, F. A. (2021). Psychosocial predictors of pain and disability outcomes in people with chronic low back pain treated conservatively by guideline-based intervention: a systematic review. *Journal of Multidisciplinary Healthcare*, 3549-3559. https://doi.org/10.2147/JMDH.S343494

Alkassabi, O., Voogt, L., Andrews, P., Alhowimel, A., Nijs, J., & Alsobayel, H. (2022). Risk factors to persistent pain following musculoskeletal injuries: A systematic literature review. *International Journal of Environmental Research and Public Health*, *19*(15), 9318. https://doi.org/10.3390/ijerph19159318

Almeida, M., Saragiotto, B., Richards, B., & Maher, C. G. (2018). Primary care management of non-specific low back pain: Key messages from recent clinical guidelines. *Medical Journal of Australia*, *208*(6), 272-275. https://doi.org/10.5694/mja17.01152

Alperstein, D., & Sharpe, L. (2016). The efficacy of motivational interviewing in adults with chronic pain: A meta-analysis and systematic review. *The Journal of Pain*, *17*(4), 393-403. https://doi.org/10.1016/j.jpain.2015.10.021

Alshehri, M. A., Alzahrani, H., Alotaibi, M., Alhowimel, A., & Khoja, O. (2020). Physiotherapists' pain attitudes and beliefs towards chronic low back pain and their association with treatment selection: A cross-sectional study. *BMJ Open*, *10*(6), e037159. https://doi.org/10.1136/bmjopen-2020-037159

Anderson, K. O., Green, C. R., & Payne, R. (2009). Racial and ethnic disparities in pain: Causes and consequences of unequal care. *The Journal of Pain*, *10*(12), 1187-1204. https://doi.org/10.1016/j.jpain.2009.10.002

Antunovich, D., Romana, J., Lewis, G., Morunga, E., & Bean, D. (2024). The lived experience of chronic pain for Māori: How can this inform service delivery and clinical practice? A systematic review and qualitative synthesis. *The New Zealand Medical Journal*, *137*(1591), 62-73. https://doi.org/10.26635/6965.6271

Archer, K. R., Coronado, R. A., & Wegener, S. T. (2018). The role of psychologically informed physical therapy for musculoskeletal pain. *Current Physical Medicine and Rehabilitation Reports*, *6*(1), 15-25. https://doi.org/10.1007/s40141-018-0169-x

Asmundson, G. J., & Wright, K. D. (2004). Biopsychosocial approaches to pain. In T. Hadjistavropoulos & K. D. Craig (Eds.), *Pain: Psychological perspectives* (pp. 35-57). Psychology Press. https://d1wqtxts1xzle7.cloudfront.net/

Atkins, L., Francis, J., Islam, R., O'Connor, D., Patey, A., Ivers, N., & ... & Michie, S. (2017). A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implementation Science*, *12*(1), 1-18. https://doi.org/10.1186/s13012-017-0605-9

Aymerich, K., Wilczek, A., Ratanachatchuchai, S., Gilpin, H. R., Spahr, N., Jacobs, C., & Scott, W. (2022). “Living more and struggling less”: A qualitative descriptive study of patient experiences of physiotherapy informed by Acceptance and Commitment Therapy within a multidisciplinary pain management programme. *Physiotherapy*, *116*, 33-41. https://doi.org/10.1016/j.physio.2022.01.004

Babatunde, F., MacDermid, J., & MacIntyre, N. (2017). Characteristics of therapeutic alliance in musculoskeletal physiotherapy and occupational therapy practice: A scoping review of the literature. *BMC Health Services Research*, *17*, 1-23. https://doi.org/10.1186/s12913-017-2311-3

Babatunde, O. O., Jordan, J. L., Van der Windt, D. A., Hill, J. C., Foster, N. E., & Protheroe, J. (2017). Effective treatment options for musculoskeletal pain in primary care: A systematic overview of current evidence. *PloS One, 12*(6), e0178621. https://doi.org/10.1371/journal.pone.0178621

Bahns, C., Happe, L., Thiel, C., & Kopkow, C. (2021). Physical therapy for patients with low back pain in Germany: A survey of current practice. *BMC Musculoskeletal Disorders*, *22*(1), 563. https://doi.org/10.1186/s12891-021-04422-2

Ballengee, L. A., Zullig, L. L., & George, S. Z. (2021). Implementation of psychologically informed physical therapy for low back pain: Where do we stand, where do we go? *Journal of Pain Research*, *14*, 3747. https://doi.org/10.2147/JPR.S311973

Bandura, A. (1977). Self-Efficacy: Toward a Unifying Theory of Behavioral Change. *Psychological Review*, *84*(20), *191*. https://doi.org/10.1037/0033-295X.84.2.191

Bartys, S., Frederiksen, P., Bendix, T., & Burton, K. (2017). System influences on work disability due to low back pain: An international evidence synthesis. *Health Policy*, *121*(8), 903-912. https://doi.org/10.1016/j.healthpol.2017.05.011

Beetsma, A. J., Reezigt, R. R., Paap, D., & Reneman, M. F. (2020). Assessing future health care practitioners' knowledge and attitudes of musculoskeletal pain; development and measurement properties of a new questionnaire. *Musculoskeletal Science and Practice*, *50*, 102236. https://doi.org/10.1016/j.msksp.2020.102236

Beetsma, A. J., Reezigt, R. R., & Reneman, M. F. (2021). Knowledge and attitudes toward musculoskeletal pain neuroscience of manual therapy postgraduate students in the Netherlands. *Musculoskeletal Science and Practice*, *52*, 102350. https://doi.org/10.1016/j.msksp.2021.102350

Beneciuk, J. M., Hill, J. C., Campbell, P., Afolabi, E., George, S. Z., Dunn, K. M., & Foster, N. E. (2017). Identifying treatment effect modifiers in the STarT back trial: A secondary analysis. *The Journal of Pain*, *18*(1), 54-65. https://doi.org/10.1016/j.jpain.2016.10.002

Beyera, G. K., O'Brien, J., & Campbell, S. (2019). Health-care utilisation for low back pain: A systematic review and meta-analysis of population-based observational studies. *Rheumatology International*, *39*(10), 1663-1679. https://doi.org/10.1007/s00296-019-04430-5

Bisconti, M., Esposto, M., Tamborrino, A., Brindisino, F., Giovannico, G., & Salvioli, S. (2024). Is social support associated with clinical outcomes in adults with nonspecific chronic low back pain? A systematic review. *The Clinical Journal of Pain*, *40*(10), 607-617. https://doi.org/10.1097/AJP.0000000000001239

Boersma, K., Linton, S., Overmeer, T., Jansson, M., Vlaeyen, J., & de Jong, J. (2004). Lowering fear-avoidance and enhancing function through exposure in vivo: A multiple baseline study across six patients with back pain. *Pain*, *108*(1-2), 8-16. https://doi.org/10.1016/j.pain.2003.03.001

Bosire, E. N., Cele, L., Potelwa, X., Cho, A., & Mendenhall, E. (2022). God, church water and spirituality: Perspectives on health and healing in Soweto, South Africa. *Global Public Health*, *17*(7), 1172-1185. https://doi.org/10.1080/17441692.2021.1919738

Brosschot, J. F. (2002). Cognitive-emotional sensitization and somatic health complaints. *Scandinavian Journal of Psychology*, *43*(2). https://doi.org/10.1111/1467-9450.00276

Buchbinder, R., Underwood, M., Hartvigsen, J., & Maher, C. G. (2020). The Lancet Series call to action to reduce low value care for low back pain: An update. *Pain*, *161*(1), S57. https://doi.org/10.1097/j.pain.0000000000001869

Bui, Q., Doescher, M., Takeuchi, D., & Taylor, V. (2010). Immigration, acculturation and chronic back and neck problems among Latino-Americans. https://doi.org/10.1007/s10903-010-9371-3

Burri, A., Rice, D., Kluger, N., & Kluger, M. (2018). Ethnic-and sex-related differences in pain characteristics, psychological distress and pain-related disability in patients attending a New Zealand teaching hospital pain service. *The New Zealand Medical Journal (Online)*, *131*(1470), 51-64. www.nzma.org.nz/journal

Bussières, A. E., Patey, A. M., Francis, J. J., Sales, A. E., Grimshaw, J. M., & Team, C. P. P. (2012). Identifying factors likely to influence compliance with diagnostic imaging guideline recommendations for spine disorders among chiropractors in

North America: A focus group study using the Theoretical Domains Framework. *Implementation Science*, *7*, 1-11. https://doi.org/10.1186/1748-5908-7-82

Campbell, C. M., & Edwards, R. R. (2012). Ethnic differences in pain and pain management. *Pain Management*, *2*(3), 219-230. https://doi.org/10.2217/pmt.12.7

Campbell, L. C., Clauw, D. J., & Keefe, F. J. (2003). Persistent pain and depression: A biopsychosocial perspective. *Biological Psychiatry*, *54*(3), 399-409. https://doi.org/10.1016/S0006-3223(03)00545-6

Campbell, P., Wynne-Jones, G., Muller, S., & Dunn, K. M. (2013). The influence of employment social support for risk and prognosis in nonspecific back pain: A systematic review and critical synthesis. *International Archives of Occupational and Environmental Health*, *86*, 119-137. (10.1007/s00420-012-0804-2)

Campbelll, P., Wynne-Jones, G., & Dunn, K. M. (2011). The influence of informal social support on risk and prognosis in spinal pain: A systematic review. *European Journal of Pain*, *15*(5), 444.e1-444.e14. https://doi.org/10.1016/j.ejpain.2010.09.011

Cane, J., Richardson, M., Johnston, M., Ladha, R., & Michie, S. (2015). From lists of behaviour change techniques (BCTs) to structured hierarchies: Comparison of two methods of developing a hierarchy of BCTs. *British Journal of Health Psychology*, *20*(1), 130-150. https://doi.org/10.1111/bjhp.12102

Caneiro, J., Bunzli, S., & O'Sullivan, P. (2021). Beliefs about the body and pain: The critical role in musculoskeletal pain management. *Brazilian Journal of Physical Therapy*, *25*(1), 17-29. https://doi.org/10.1016/j.bjpt.2020.06.003

Carroll, L. J., Lis, A., Weiser, S., & Torti, J. (2016). How well do you expect to recover, and what does recovery mean, anyway? Qualitative study of expectations after a musculoskeletal injury. *Physical Therapy*, *96*(6), 797-807. https://doi.org/10.2522/ptj.20150229

Carron, H., DeGood, D. E., & Tait, R. (1985). A comparison of low back pain patients in the United States and New Zealand: Psychosocial and economic factors

affecting severity of disability. *Pain*, *21*(1), 77-89. https://doi.org/10.1016/0304-3959(85)90079-X

Che, X., Cash, R., Ng, S. K., Fitzgerald, P., & Fitzgibbon, B. M. (2018). A systematic review of the processes underlying the main and the buffering effect of social support on the experience of pain. *The Clinical Journal of Pain*, *34*(11), 1061-1076. https://doi.org/10.1097/AJP.0000000000000624

Chen, Q., Vella, S. P., Maher, C. G., Ferreira, G. E., & Machado, G. C. (2023). Racial and ethnic differences in the use of lumbar imaging, opioid analgesics and spinal surgery for low back pain: A systematic review and meta-analysis. *European Journal of Pain*, *27*(4), 476-491. https://doi.org/10.1002/ejp.2075

Chen, S., Chen, M., Wu, X., Lin, S., Tao, C., Cao, H., Shao, Z., & Xiao, G. (2022). Global, regional and national burden of low back pain 1990–2019: A systematic analysis of the Global Burden of Disease study 2019. *Journal of Orthopaedic Translation*, *32*, 49-58. https://doi.org/10.1016/j.jot.2021.07.005

Cheng, J. O. S., & Cheng, S.-T. (2019). Effectiveness of physical and cognitive-behavioural intervention programmes for chronic musculoskeletal pain in adults: A systematic review and meta-analysis of randomised controlled trials. *PloS One*, *14*(10), e0223367. https://doi.org/10.1371/journal.pone.0223367

Chou, R., Fu, R., Carrino, J. A., & Deyo, R. A. (2009). Imaging strategies for low-back pain: Systematic review and meta-analysis. *The Lancet*, *373*(9662), 463-472.

Chou, R., Qaseem, A., Owens, D. K., Shekelle, P., & Clinical Guidelines Committee of the American College of Physicians*. (2011). Diagnostic imaging for low back pain: Advice for high-value health care from the American College of Physicians. *Annals of Internal Medicine 154*(3), 181-189. https://doi.org/10.7326/0003-4819-154-3-201102010-000

Chowdhury, A. R., Graham, P. L., Schofield, D., Cunich, M., & Nicholas, M. (2022). Cost-effectiveness of multidisciplinary interventions for chronic low back pain: A narrative review. *The Clinical Journal of Pain*, *38*(3), 197-207. https://doi.org/10.1097/AJP.0000000000001009

Christe, G., Nzamba, J., Desarzens, L., Leuba, A., Darlow, B., & Pichonnaz, C. (2021). Physiotherapists' attitudes and beliefs about low back pain influence their clinical decisions and advice. *Musculoskeletal Science and Practice*, *53*, 102382. https://doi.org/10.1016/j.msksp.2021.102382

Coady, A., Godard, R., & Holtzman, S. (2024). Understanding the link between pain invalidation and depressive symptoms: The role of shame and social support in people with chronic pain. *Journal of Health Psychology*, *29*(1), 52-64. https://doi.org/10.1177/13591053231191919

Colleary, G., O'Sullivan, K., Griffin, D., Ryan, C., & Martin, D. (2017). Effect of pain neurophysiology education on physiotherapy students' understanding of chronic pain, clinical recommendations and attitudes towards people with chronic pain: A randomised controlled trial. *Physiotherapy*, *103*(4), 423-429. https://doi.org/10.1016/j.physio.2017.01.006

Cormack, B., Stilwell, P., Coninx, S., & Gibson, J. (2023). The biopsychosocial model is lost in translation: From misrepresentation to an enactive modernization. *Physiotherapy Theory and Practice 39*(11), 2273-2288. https://doi.org/10.1080/09593985.2022.2080130

Coronado, R. A., Brintz, C. E., McKernan, L. C., Master, H., Motzny, N., Silva, F. M., Goyal, P. M., Wegener, S. T., & Archer, K. R. (2020). Psychologically informed physical therapy for musculoskeletal pain: Current approaches, implications, and future directions from recent randomized trials. *Pain Reports*, *5*(5), e847. https://doi.org/10.1097/PR9.0000000000000847

Cowell, I., McGregor, A., O'Sullivan, P., O'Sullivan, K., Poyton, R., Schoeb, V., & Murtagh, G. (2021). How do physiotherapists solicit and explore patients' concerns in back pain consultations: A conversation analytic approach. *Physiotherapy Theory and Practice*, *37*(6), 693-709. https://doi.org/10.1080/09593985.2019.1641864

Cowell, I., O'Sullivan, P., O'Sullivan, K., Poyton, R., McGregor, A., & Murtagh, G. (2019). The perspectives of physiotherapists on managing nonspecific low back

pain following a training programme in cognitive functional therapy: A qualitative study. *Musculoskeletal Care*, *17*(1), 79-90. https://doi.org/10.1002/msc.1370

Craig, K. D., Holmes, C., Hudspith, M., Moor, G., Moosa-Mitha, M., Varcoe, C., & Wallace, B. (2020). Pain in persons who are marginalized by social conditions. *Pain*, *161*(2), 261-265. https://doi.org/10.1097/j.pain.0000000000001719

Crombez, G., Eccleston, C., Van Damme, S., Vlaeyen, J. W., & Karoly, P. (2012). Fear-avoidance model of chronic pain: The next generation. *The Clinical Journal of Pain*, *28*(6), 475-483. https://doi.org/10.1037/11474-006

Crone, R. (2022). *Sense of self, social functioning and response to multidisciplinary treatment for chronic pain* (Publication no. 30730682) [Doctoral thesis, University of Manchester – United Kingdom]. ProQuest Dissertations and Theses Global.

Darlow, B., Fullen, B. M., Dean, S., Hurley, D. A., Baxter, G. D., & Dowell, A. (2012). The association between health care professional attitudes and beliefs and the attitudes and beliefs, clinical management, and outcomes of patients with low back pain: A systematic review. *European Journal of Pain*, *16*(1), 3-17. https://doi.org/10.1016/j.ejpain.2011.06.006

Davey, A., Chilcot, J., Driscoll, E., & McCracken, L. M. (2020). Psychological flexibility, self-compassion and daily functioning in chronic pain. *Journal of Contextual Behavioral Science*, *17*, 79-85. https://doi.org/10.1016/j.jcbs.2020.06.005

den Bandt, H. L., Paulis, W. D., Beckwée, D., Ickmans, K., Nijs, J., & Voogt, L. (2019). Pain mechanisms in low back pain: A systematic review with meta-analysis of mechanical quantitative sensory testing outcomes in people with nonspecific low back pain. *Journal of Orthopaedic & Sports Physical Therapy*, *49*(10), 698-715. https://doi.org/10.2519/jospt.2019.8876

Denneny, D., Frijdal, A., Bianchi-Berthouse, N., Greenwood, J., McLoughlin, R., Peterson, K., & ... & Williams, A. C. D. C. (2020). The application of psychologically informed practice: Observations of experienced

physiotherapists working with people with chronic pain. *Physiotherapy*, *106*, 163-173. https://doi.org/10.1016/j.physio.2019.01.014

Devonshire, J. J., Wewege, M. A., Hansford, H. J., Odemis, H. A., Wand, B. M., Jones, M. D., & McAuley, J. H. (2023). Effectiveness of cognitive functional therapy for reducing pain and disability in chronic low back pain: A systematic review and meta-analysis. *Journal of Orthopaedic & Sports Physical Therapy*, *53*(5), 244-285. https://doi.org/10.2519/jospt.2023.11447

Diamantoglou, N. (2014). *Effects of motivational interviewing on outcome in physiotherapy interventions: A systematic review* [Master's thesis, Karolinska Institute]. Core. http://hdl.handle.net/10616/41932

Díaz-Fernández, Á., Cortés-Pérez, I., Obrero-Gaitán, E., Ortega-Martínez, A. R., Osuna-Pérez, M. C., Zagalaz-Anula, N., & Lomas-Vega, R. (2024). Chronic pain management approaches among Spanish physiotherapists: Influences, practices, barriers, and challenges. *Journal of Personalized Medicine*, *14*(9), 903. https://doi.org/10.3390/jpm14090903

DiClemente, C. C., & Velasquez, M. M. (2002). Motivational interviewing and the stages of change. In *Motivational interviewing: Preparing people for change.* (Second edition ed.). The Guilford Press. https://bluepeteraustralia.wordpress.com/wp-content/uploads/2012/12/motivational-interviewing.pdf#page=222

Dishman, J. D., & Bulbulian, R. (2000). Spinal reflex attenuation associated with spinal manipulation. *Spine*, *25*(19), 2519-2525. https://journals.lww.com

Dixon, T. W., O'Brien, D. W., Terry, G., Baldwin, J. N., Ruakere, T., Mekkelholt, T., & Larmer, P. J. (2021). The lived experiences of ngā tāne Māori with hip and knee osteoarthritis Te Whatarangi. *New Zealand Journal of Physiotherapy*, *49*(3), 127–133. https://doi.org/10.15619/NZJP/49.3.03

do Prado, T., Parsons, J., & Ripat, J. (2022). Evidence-based practice for non-specific low back pain: Canadian physiotherapists' adherence, beliefs, and

perspectives. *Physiotherapy Canada*, *74*(1), 44-53. https://doi.org/10.3138/ptc-2020-0038

Driver, C., Kean, B., Oprescu, F., & Lovell, G. P. (2017). Knowledge, behaviors, attitudes and beliefs of physiotherapists towards the use of psychological interventions in physiotherapy practice. A systematic review. *Disability and Rehabilitation*, *39*(22), 2237-2249. https://doi.org/10.1080/09638288.2016.1223176

Durie, M. H. (1985). A Maori perspective of health. *Social Science & Medicine*, *20*(5), 483-486. https://doi.org/10.1016/0277-9536(85)90363-6

Dyson, J., & Cowdell, F. (2021). How is the Theoretical Domains Framework applied in designing interventions to support healthcare practitioner behaviour change? A systematic review. *International Journal for Quality in Health Care*, *33*(3), mzab106. https://doi.org/10.1093/intqhc/mzab106

Edwards, R. R., Dworkin, R. H., Sullivan, M. D., Turk, D. C., & Wasan, A. D. (2016). The role of psychosocial processes in the development and maintenance of chronic pain. *The Journal of Pain*, *17*(9), T70-T92. https://doi.org/10.1016/j.jpain.2016.01.001

Epstein, R. M., & Borrell-Carrio, F. (2005). The biopsychosocial model: Exploring six impossible things. *Families, Systems, & Health*, *23*(4), 426. https://doi.org/10.1037/1091-7527.23.4.426

Escorpizo, R., Kostanjsek, N., Kennedy, C., Robinson Nicol, M. M., Stucki, G., & Üstün, T. B. (2013). Harmonizing WHO's International Classification of Diseases (ICD) and International Classification of Functioning, Disability and Health (ICF): Importance and methods to link disease and functioning. *BMC Public Health*, *13*(1), 742. https://doi.org/10.1186/1471-2458-13-742

Evans, S. C., Roberts, M., C., Keelay, J. W., Blossom, J. B., Amaro, C. M., Garcia, A. M., ... , & Reed, G. M. (2015). Vignette methodologies for studying clinicians' decision-making: Validity, utility, and application in ICD-11 field studies.

International Journal of Clinical and Health Psychology, *15*(1), 160-170. https://doi.org/10.1016/j.ijchp.2014.12.001

Fardi, D., Mohammadi, S., Kazemi, S. S., & Montazeri, A. (2023). Psychological interventions in patients with chronic low back pain: A scoping review. *Payesh (Health Monitor)*, *22*(1), 29-38. https://doi.org/10.52547/payesh.22.1.29

Ferreira, L. S., e Silva, M. P., Saragiotto, B. T., & Magalhães, M. O. (2023). Attitudes and beliefs of Brazilian physical therapists about chronic nonspecific low back pain and its impact on clinical decision-making: An online survey study. *Musculoskeletal Science and Practice*, *67*, 102832. https://doi.org/10.1016/j.msksp.2023.102832

Finucane, L. M., Downie, A., Mercer, C., Greenhalgh, S. M., Boissonnault, W. G., Pool-Goudzwaard, A. L., Beneciuk, J. M., Leech, R. L., & Selfe, J. (2020). International framework for red flags for potential serious spinal pathologies. *Journal of Orthopaedic & Sports Physical Therapy*, *50*(7), 350-372. https://doi.org/10.2519/jospt.2020.9971

Flor, H., Braun, C., Elbert, T., & Birbaumer, N. (1997). Extensive reorganization of primary somatosensory cortex in chronic back pain patients. *Neuroscience Letters*, *224*(1), 5-8. https://doi.org/10.1016/S0304-3940(97)13441-3

Flynn, T. W., Smith, B., & Chou, R. (2011). Appropriate use of diagnostic imaging in low back pain: A reminder that unnecessary imaging may do as much harm as good. *Journal of Orthopaedic & Sports Physical Therapy*, *41*(11), 838-846. https://doi.org/10.2519/jospt.2011.3618

Foster, N. E., Anema, J. R., Cherkin, D., Chou, R., Cohen S. P., Gross, D. P., & ... & Woolf, A. (2018). Prevention and treatment of low back pain: Evidence, challenges, and promising directions. *The Lancet*, *391*(10137), 2368-2383. https://doi.org/10.1016/S0140-6736(18)30489-6

Foster, N. E., & Delitto, A. (2011). Embedding psychosocial perspectives within clinical management of low back pain: Integration of psychosocially informed management principles into physical therapist practice—challenges and

opportunities. *Physical Therapy*, *91*(5), 790-803. https://doi.org/10.2522/ptj.20100326

French, S. D., Green, S. E., O'Connor, D. A., McKenzie, J. E., Francis, J. J., Michie, S., Buchbinder, R., Schattner, P., Spike, N., & Grimshaw, J. M. (2012). Developing theory-informed behaviour change interventions to implement evidence into practice: a systematic approach using the Theoretical Domains Framework. *Implementation Science*, *7*, 1-8. https://doi.org/10.1186/1748-5908-7-38

Frey Law, L. A., Evans, S., Knudtson, J., Nus, S., Scholl, K., & Sluka, K. A. (2008). Massage reduces pain perception and hyperalgesia in experimental muscle pain: A randomized, controlled trial. *The Journal of Pain*, *9*(8), 714-721. https://doi.org/10.1016/j.jpain.2008.03.009

Fritz, J., Söderlund, A., & Sandborgh, M. (2018). The complexity of integrating a behavioral medicine approach into physiotherapy clinical practice. *Physiotherapy Theory and Practice*. *35*(12), 1182–1193. https://doi.org/10.1080/09593985.2018.1476996

Galea Holmes, M. N., Wileman, V., Hassan, S., Denning, J., Critchley, D., Norton, S., McCracken, L. M., & Godfrey, E. (2022). Physiotherapy informed by acceptance and commitment therapy for chronic low back pain: A mixed-methods treatment fidelity evaluation. *British Journal of Health Psychology*, *27*(3), 935-955. https://doi.org/10.1111/bjhp.12583

Galea Holmes, M. N., Wileman, V., McCracken, L. M., Critchley, D., March, M. K., Norton, S., Moss-Morris, R., Noonan, S., Barcellona, M., & Godfrey, E. (2021). Experiences of training and delivery of Physical therapy informed by Acceptance and Commitment Therapy (PACT): A longitudinal qualitative study. *Physiotherapy*, *112*, 41-48. https://doi.org/10.1016/j.physio.2020.12.004

Gardner, T., Refshauge, K., Smith, L., McAuley, J., Hubshcer, M., & Goodall, S. (2017). Physiotherapists' beliefs and attitudes influence clinical practice in chronic low back pain: A systematic review of quantitative and qualitative studies. *Journal of*

Physiotherapy, *63*(3), 132-143. https://doi.org/10.1016/j.jphys.2017.05.017_1836-9553

Gatchel, R. J., Peng, Y. B., Peters, M. L., Fuchs, P. N., & Turk, D. C. (2007). The biopsychosocial approach to chronic pain: Scientific advances and future directions. *Psychological Bulletin*, *133*(4), 581. https://doi.org/10.1037/0033-2909.133.4.581

Gentili, C., Rickardsson, J., Zetterqvist, V., Simons, L. E., Lekander, M., & Wicksell, R. K. (2019). Psychological flexibility as a resilience factor in individuals with chronic pain. *Frontiers in Psychology*, *10*, 2016. https://doi.org/10.3389/fpsyg.2019.02016

George, S. (2008). What is the effectiveness of a biopsychosocial approach to individual physiotherapy care for chronic low back pain? *Internet Journal of Allied Health Sciences and Practice*, *6*(1), 4. https://doi.org/10.46743/1540-580X/2008.1179

Gervais-Hupé, J., Filleul, A., Perreault, K., & Hudon, A. (2023). Implementation of a biopsychosocial approach into physiotherapists' practice: A review of systematic reviews to map barriers and facilitators and identify specific behavior change techniques. *Disability and Rehabilitation*, *45*(14), 2263-2272. https://doi.org/10.1080/09638288.2022.2094479

Gibbs, M. T., Morrison, N. M., & Marshall, P. W. (2021). Biomedical beliefs explain the clinical decision made by exercise-based practitioners for people with chronic low back pain. *Spine*, *46*(2), 114-121. https://doi.org/10.1097/BRS.0000000000003698

Godfrey, E., Wileman, V., Holmes, M. G., McCracken, L. M., Norton, S., Moss-Morris, R., Noonan, S., Barcellona, M., & Critchley, D. (2020). Physical therapy informed by acceptance and commitment therapy (PACT) versus usual care physical therapy for adults with chronic low back pain: A randomized controlled trial. *The Journal of Pain*, *21*(1-2), 71-81. https://doi.org/10.1016/j.jpain.2019.05.012

Grooten, W. J. A., Boström, C., Dedering, Å., Halvorsen, M., Kuster, R. P., Nilsson-Wikmar, L., Olsson, C. B., Rovner, G., Tseli, E., & Rasmussen-Barr, E. (2022). Summarizing the effects of different exercise types in chronic low back pain – A systematic review of systematic reviews. *BMC Musculoskeletal Disorders*, *23*(1), 801. https://doi.org/10.1186/s12891-022-05722-x

Haig, L. J. (2019). Can a training programme in motivational interviewing change musculoskeletal physiotherapists' practice? The example of low back pain. The Chartered Society of Physiotherapy UK Conference 2018, Birmingham, UK, 19-20 October 2018. *Physiotherapy*, *105*, e194-e195. https://doi.org/10.1016/j.physio.2018.11.208

Hajihasani, A., Rouhani, M., Salavati, M., Hedayati, R., & Kahlaee, A. H. (2019). The influence of cognitive behavioral therapy on pain, quality of life, and depression in patients receiving physical therapy for chronic low back pain: A systematic review. *PM&R*, *11*(2), 167-176. https://doi.org/10.1016/j.pmrj.2018.09.029

Hall, A., Richmond, H., Copsey, B., Hansen, Z., Williamson, E., Jones, G., Fordham, B., Cooper, Z., & Lamb, S. (2018). Physiotherapist-delivered cognitive-behavioural interventions are effective for low back pain, but can they be replicated in clinical practice? A systematic review. *Disability and Rehabilitation*, *40*(1), 1-9. https://doi.org/10.1080/09638288.2016.1236155

Hall, A. M., Scurrey, S. R., Pike, A. E., Albury, C., Richmond, H. L., Matthews, J., Toomey, E., Hayden, J. A., & Etchegary, H. (2019). Physician-reported barriers to using evidence-based recommendations for low back pain in clinical practice: a systematic review and synthesis of qualitative studies using the Theoretical Domains Framework. *Implementation Science*, *14*, 1-19. https://doi.org/10.1186/s13012-019-0884-4

Hallegraeff, J., Krijnen, W. P., van der Schans, C., & de Greef, M. (2012). Expectations about recovery from acute non-specific low back pain predict absence from usual work due to chronic low back pain. *Journal of Physiotherapy, 58*(3), 165-172. https://doi.org/10.1016/s1836-9553(12)70107-8

Hallegraeff, J. M., Van Zweden, L., Oostendorp, R. A., & Van Trijffel, E. (2021). Psychological assessments by manual physiotherapists in the Netherlands in patients with nonspecific low back pain. *Journal of Manual & Manipulative Therapy*, *29*(5), 310-317. https://doi.org/10.1080/10669817.2021.1919283

Hardt, S., Griefahn, A., Aasdahl, L., & Armijo-Olivo, S. (2025). Effectiveness of motivational interviewing on pain-related outcomes in patients with musculoskeletal pain: A systematic review and meta-analysis. *Disability and Rehabilitation*, *47*, 1-25. https://doi.org/10.1080/09638288.2025.2462773

Hartvigsen, J., Hancock, M. J., Kongsted, A., Louw, Q., Ferreira, M. L., Genevay, S., & ... Woolf, A. (2018). What low back pain is and why we need to pay attention. *The Lancet*, *391*(10137), 2356-2367. https://doi.org/10.1016/S0140-6736(18)30480-X

Hashmi, J. A., Baliki, M. N., Huang, L., Baria, A. T., Torbey, S., Hermann, K. M., Schnitzer, T. J., & Apkarian, A. V. (2013). Shape shifting pain: Chronification of back pain shifts brain representation from nociceptive to emotional circuits. *Brain*, *136*(9), 2751-2768. https://doi.org/10.1093/brain/awt211

Hayden, J. A., Wilson, M. N., Riley, R. D., Iles, R., Pincus, T., & Ogilvie, R. (2019). Individual recovery expectations and prognosis of outcomes in non-specific low back pain: Prognostic factor review. *Cochrane Database of Systematic Reviews*(11). https://doi.org/10.1002/14651858.CD011284.pub2

Haythornthwaite, J. A., Campbell, C. M., & Edwards, R. R. (2024). When thinking about pain contributes to suffering: The example of pain catastrophizing. *Pain*, *165*(11S), S68-S75. https://doi.org/10.1097/j.pain.0000000000003372

Hayward, R., & Stynes, S. (2021). Self-efficacy as a prognostic factor and treatment moderator in chronic musculoskeletal pain patients attending pain management programmes: A systematic review. *Musculoskeletal Care*, *19*(3), 278-292. https://doi.org/10.1002/msc.1533

Hill, J., Kay, D., Gordon, J., Niazi, I. K., & Saywell, N. (2023). New Zealanders with low back pain seeking health care: A retrospective descriptive analysis of Accident

Compensation Corporation-funded low back pain healthcare service usage. *Journal of Primary Health Care*, *15*(3), 206-214. https://doi.org/10.1071/HC23010

Ho, E. K.-Y., Chen, L., Simic, M., Ashton-James, C. E., Comachio, J., Wang, D. X. M., Hayden, J. A., Ferreira, M. L., & Ferreira, P. H. (2022). Psychological interventions for chronic, non-specific low back pain: Systematic review with network meta-analysis. *BMJ*, *376*. https://doi.org/10.1136/bmj-2021-067718

Hoheisel, U., Unger, T., & Mense, S. (2007). Sensitization of rat dorsal horn neurons by NGF-induced subthreshold potentials and low-frequency activation. A study employing intracellular recordings in vivo. *Brain Research*, *1169*, 34-43. https://doi.org/10.1016/j.brainres.2007.06.054

Holopainen, R., Piirainen, A., Karppinen, J., Linton, S. J., & O'Sullivan, P. (2022). An adventurous learning journey. Physiotherapists' conceptions of learning and integrating cognitive functional therapy into clinical practice. *Physiotherapy Theory and Practice*, *38*(2), 309-326. https://doi.org/10.1080/09593985.2020.1753271

Holopainen, R., Simpson, P., Piirainen, A., Karppinen, J., Schutze, R., Smith, A., & ... & Kent, P. (2020). Physiotherapists' perceptions of learning and implementing a biopsychosocial intervention to treat musculoskeletal pain conditions: A systematic review and metasynthesis of qualitative studies. *Pain*, *161*(6), 1150-1168. https://doi.org/10.1097/j.pain.0000000000001809

Houben, R. M. A., Vlaeyen, J. W. S., Peters, M., Ostelo, R. W. J. G., Wolters, P. M. J. C., & Stomp-Van Den Berg, S. G. M. (2004). Health care providers' attitudes and beliefs towards common low back pain: Factor structure and psychometric properties of the HC-PAIRS. *The Clinical Journal of Pain*, *20*(1), 37-44. https://doi.org/10.1097/00002508-200401000-00008

Hoy, D., March, L., Brooks, P., Blyth, F., Woolf, A., Bain, C., Williams, G., Smith, E., Vos, T., & Barendregt, J. (2014). The global burden of low back pain: Estimates

from the Global Burden of Disease 2010 study. *Annals of the Rheumatic Diseases*, *73*(6), 968-974. https://doi.org/10.1136/annrheumdis-2013-204428

Hruschak, V., & Cochran, G. (2018). Psychosocial predictors in the transition from acute to chronic pain: A systematic review. *Psychology, health & medicine*, *23*(10), 1151-1167. https://doi.org/10.1080/13548506.2018.1446097

Hughes, L. S., Clark, J., Colclough, J. A., Dale, E., & McMillan, D. (2017). Acceptance and commitment therapy (ACT) for chronic pain: A systematic review and meta-analyses. *The Clinical Journal of Pain*, *33*(6), 552-568. https://doi.org/10.1097/AJP.0000000000000425

Huijg, J. M., Gebhardt, W. A., Dusseldorp, E., Verheijden, M. W., Van Der Zouwe, N., Middelkoop, B. J., & Crone, M. R. (2014). Measuring determinants of implementation behavior: Psychometric properties of a questionnaire based on the theoretical domains framework. *Implementation Science*, *9*(1), 33. https://doi.org/10.1186/1748-5908-9-33

Hush, J. M., Stanton, T. R., Siddall, P., Marcuzzi, A., & Attal, N. (2013). Untangling nociceptive, neuropathic and neuroplastic mechanisms underlying the biological domain of back pain. *Pain Management*, *3*(3), 223-236. https://doi.org/10.2217/pmt.13.11

Igwesi-Chidobe, C. N., Kitchen, S., Sorinola, I. O., & Godfrey, E. L. (2017). “A life of living death”: the experiences of people living with chronic low back pain in rural Nigeria. *Disability and Rehabilitation*, *39*(8), 779-790. https://doi.org/10.3109/09638288.2016.1161844

Iles, R. A., Davidson, M., & Taylor, N. F. (2008). Psychosocial predictors of failure to return to work in non-chronic non-specific low back pain: A systematic review. *Occupational and Environmental Medicine*, *65*(8), 507-517. https://doi.org/10.1136/oem.2007.036046

Iles, R. A., Davidson, M., Taylor, N. F., & O’Halloran, P. (2009). Systematic review of the ability of recovery expectations to predict outcomes in non-chronic non-

specific low back pain. *Journal of Occupational Rehabilitation*, *19*, 25-40. https://doi.org/10.1007/s10926-008-9161-0

Irandoost, F. (2015). The effectiveness of Group Acceptance and Commitment Therapy (ACT) on pain related anxiety and depression in women with chronic low back pain. *International Journal of Behavioral Sciences*, *9*(1), 1-8. https://www.behavsci.ir/article_67897.html

Jack, K., McLean, S. M., Moffett, J. K., & Gardiner, E. (2010). Barriers to treatment adherence in physiotherapy outpatient clinics: A systematic review. *Manual Therapy*, *15*(3), 220-228. https://doi.org/10.1016/j.math.2009.12.004

Jackson, T., Wang, Y., Wang, Y., & Fan, H. (2014). Self-efficacy and chronic pain outcomes: A meta-analytic review. *The Journal of Pain*, *15*(8), 800-814. https://doi.org/10.1016/j.jpain.2014.05.002

Jamil, A., Javed, A., & Iqbal, M. A. (2021). Effects of motivational interviewing with conventional physical therapy on rehabilitation of chronic musculoskeletal disorders: A quasi-experimental study. *JPMA*, *71*(1123). https://doi.org/10.47391/JPMA.873

Jarvik, J. G., Hollingworth, W., Heagerty, P. J., Haynor, D. R., Boyko, E. J., & Deyo, R. A. (2005). Three-year incidence of low back pain in an initially asymptomatic cohort: Clinical and imaging risk factors. *Spine*, *30*(13), 1541-1548. https://doi.org/10.1097/01.brs.0000167536.60002.87

Johnson, M. I., Bonacaro, A., Georgiadis, E., & Woodall, J. (2022). Reconfiguring the biomedical dominance of pain: Time for alternative perspectives from health promotion? *Health Promotion International*, *37*(4), daac128. https://doi.org/10.1093/heapro/daac128

Kamper, S. J., Apeldoorn, A. T., Chiarotto, A., Smeets, R. J., Ostelo, R. W., Guzman, J., & van Tulder, M. W. (2014). Multidisciplinary biopsychosocial rehabilitation for chronic low back pain. *Cochrane Database of Systematic Reviews*(9). https://doi.org/10.1002/14651858.CD000963.pub3

Karel, Y. H., Verkerk, K., Endenburg, S., Metselaar, S., & Verhagen, A. P. (2015). Effect of routine diagnostic imaging for patients with musculoskeletal disorders: A meta-analysis. *European Journal of Internal Medicine*, *26*(8), 585-595. https://doi.org/10.1016/j.ejim.2015.06.018

Karran, E. L., Grant, A. R., & Moseley, G. L. (2020). Low back pain and the social determinants of health: a systematic review and narrative synthesis. *Pain*, *161*(11), 2476-2493. https://doi.org/10.1097/j.pain.0000000000001944

Keefe, F. J., Main, C. J., & George, S. Z. (2018). Advancing psychologically informed practice for patients with persistent musculoskeletal pain: Promise, pitfalls, and solutions. *Physical Therapy*, *98*(5), 398-407. https://doi.org/10.1093/ptj/pzy024

Kent, P., Cancelliere, C., Boyle, E., Cassidy, J. D., & Kongsted, A. (2020). A conceptual framework for prognostic research. *BMC Medical Research Methodology*, *20*, 1-13. https://doi.org/10.1186/s12874-020-01050-7

Kent, P. M., & Keating, J. L. (2008). Can we predict poor recovery from recent-onset nonspecific low back pain? A systematic review. *Manual Therapy*, *13*(1), 12-28. https://doi.org/10.1016/j.math.2007.05.009

Kidd, J., Came, H., Doole, C., & Rae, N. (2022). A critical analysis of te Tiriti o Waitangi application in primary health organisations in Aotearoa New Zealand: Findings from a nationwide survey. *Health & Social Care in the Community*, *30*(1), e105-e112. https://doi.org/10.1111/hsc.13417

Kinney, M., Seider, J., Beaty, A. F., Coughlin, K., Dyal, M., & Clewley, D. (2020). The impact of therapeutic alliance in physical therapy for chronic musculoskeletal pain: A systematic review of the literature. *Physiotherapy Theory and Practice*, *36*(8), 886-898. https://doi.org/10.1080/09593985.2018.1516015

Kirsh, B., Slack, T., & King, C. A. (2012). The nature and impact of stigma towards injured workers. *Journal of Occupational Rehabilitation*, *22*, 143-154. https://doi.org/10.1007/s10926-011-9335-z

Krahé, C., Springer, A., Weinman, J. A., & Fotopoulou, A. (2013). The social modulation of pain: Others as predictive signals of salience– A systematic

review. *Frontiers in Human Neuroscience*, *7*, 386. https://doi.org/10.3389/fnhum.2013.00386

Kregel, J., Meeus, M., Malfliet, A., Dolphens, M., Danneels, L., Nijs, J., & Cagnie, B. (2015). Structural and functional brain abnormalities in chronic low back pain: A systematic review. Seminars in Arthritis and Rheumatism,

Kroska, E. B. (2016). A meta-analysis of fear-avoidance and pain intensity: The paradox of chronic pain. *Scandinavian Journal of Pain*, *13*(1), 43-58. https://doi.org/10.1016/j.sjpain.2016.06.011

Krupić, F., Čustović, S., Jašarević, M., Šadić, S., Fazlić, M., Grbic, K., & Samuelsson, K. (2018). Ethnic differences in the perception of pain: A systematic review of qualitative and quantitative research. *Medicinski Glasnik*, *16*(1), 108-114. https://doi.org/10.17392/966-19

Lane, P., & Smith, D. (2018). Culture, ageing and the construction of pain. *Geriatrics*, *3*(3), 40. https://doi.org/10.3390/geriatrics3030040

Latremoliere, A., & Woolf, C. J. (2009). Central sensitization: A generator of pain hypersensitivity by central neural plasticity. *The Journal of Pain*, *10*(9), 895-926. https://doi.org/10.1016/j.jpain.2009.06.012

Laura, G., & Jones, G. (2020). Effectiveness of graded exercise & graded exposure for chronic nonspecific low back pain: A rapid review. *Physiotherapy*, *107*, e102. https://doi.org/10.1016/j.physio.2020.03.145

Lee, K. J., & Simpson, J. A. (2014). Introduction to multiple imputation for dealing with missing data. *Respirology*, *19*(2), 162-167. https://doi.org/10.1111/resp.12226

Leeuw, M., Goossens, M. E., van Breukelen, G. J., de Jong, J. R., Heuts, P. H., Smeets, R. J., Köke, A. J., & Vlaeyen, J. W. (2008). Exposure in vivo versus operant graded activity in chronic low back pain patients: Results of a randomized controlled trial. *Pain*, *138*(1), 192-207. https://doi.org/10.1016/j.pain.2007.12.009

Leonhardt, C., Kuss, K., Becker, A., Basler, H.-D., de Jong, J., Flatau, B., Laekeman, M., Mattenklodt, P., Schuler, M., Vlaeyen, J., & Quint, S. (2017). Graded

exposure for chronic low back pain in older adults: A pilot study. *Journal of Geriatric Physical Therapy*, *40*(1), 51-59. https://doi.org/10.1519/JPT.0000000000000083

Lewis, G. N., & Bean, D. J. (2021). What Influences Outcomes From Inpatient Multidisciplinary Pain Management Programs?: A Systematic Review and Meta-analysis. *The Clinical Journal of Pain*, *37*(7), 504-523. https://doi.org/10.1097/AJP.0000000000000941

Lewis, G. N., & Rice, D. A. (2014). Chronic pain: We should not underestimate the contribution of neural plasticity. *Critical Reviews in Physical and Rehabilitation Medicine*, *26*(1-2). https://doi.org/10.1615/CritRevPhysRehabilMed.2013010295

Lewis, G. N., Shaikh, N., Wang, G., Chaudhary, S., Bean, D. J., & Terry, G. (2023). Chinese and Indian interpretations of pain: A qualitative evidence synthesis to facilitate chronic pain management. *Pain Practice*, *23*(6), 647-663. https://doi.org/10.1111/papr.13226

Lewis, G. N., & Upsdell, A. (2018). Ethnic disparities in attendance at New Zealand's chronic pain services. *The New Zealand Medical Journal (Online)*, *131*(1472), 21-28. www.nzma.org.nz/journal

Lewis, J., & O'Sullivan, P. (2018). Is it time to reframe how we care for people with non-traumatic musculoskeletal pain? *British Journal of Sports Medicine*, *52*(24), 1543-1544. https://doi.org/10.1136/bjsports-2018-099198

Lin, I., Wiles, L., Waller, R., Goucke, R., Nagree, Y., Gibberd, M., Straker, L., Maher, C. G., & O'Sullivan, P. P. (2020). What does best practice care for musculoskeletal pain look like? Eleven consistent recommendations from high-quality clinical practice guidelines: A systematic review. *British Journal of Sports Medicine* *54*(2), 79-86. https://doi.org/10.1136/bjsports-2018-099878

Linton, S. J., Boersma, K., Jansson, M., Overmeer, T., Lindblom, K., & Vlaeyen, J. W. (2008). A randomized controlled trial of exposure in vivo for patients with spinal pain reporting fear of work-related activities. *European Journal of Pain*, *12*(6), 722-730. https://doi.org/10.1016/j.ejpain.2007.11.001

Loftus, S. (2011). Pain and its metaphors: A dialogical approach. *Journal of Medical Humanities*, *32*(3), 213-230. https://doi.org/10.1007/s10912-011-9139-3

López-de-Uralde-Villanueva, I., Muñoz-García, D., Gil-Martínez, A., Pardo-Montero, J., Munoz-Plata, R., Angulo-Díaz-Parreño, S., Gomez-Martinez, M., & La Touche, R. (2016). A systematic review and meta-analysis on the effectiveness of graded activity and graded exposure for chronic nonspecific low back pain. *Pain Medicine*, *17*(1), 172-188. https://doi.org/10.1111/pme.12882

Lovering, S. (2014). The crescent of care: A nursing model to guide the care of Arab muslim patients. In *Diversity and Equality in Health and Care*, *9*(3), 171-178. https://www.researchgate.net/publication/278302925

Ma, T.-W., Yuen, A. S.-K., & Yang, Z. (2023). The efficacy of acceptance and commitment therapy for chronic pain: A systematic review and meta-analysis. *The Clinical Journal of Pain*, *39*(3), 147-157. https://doi.org/10.1097/AJP.0000000000001096

Ma, X., Chen, R., Li, W., & Huang, P. (2024). A systematic review and meta-analysis of pain neuroscience education for chronic low back pain: Short-term outcomes of pain and disability. *Physiotherapy Theory and Practice*, *40*(9), 2130-2149. https://doi.org/10.1080/09593985.2023.2232003

Macedo, L., Smeets, R., Maher, C., Latimer, J., & McAuley, J. (2010). Graded activity and graded exposure for persistent nonspecific low back pain: A systematic review. *Physical Therapy*, *90*(6), 860-879. https://doi.org/10.2522/ptj.20090303

Maher, C., Underwood, M., & Buchbinder, R. (2017). Non-specific low back pain. *The Lancet*, *389*(10070), 736-747. https://doi.org/10.1016/S0140-6736(18)30488-4

Main, C. J., & George, S. Z. (2011). Psychologically informed practice for management of low back pain: Future directions in practice and research. *Physical Therapy*, *91*(5), 820-824. https://doi.org/10.2522/ptj.20110060

Malfliet, A., Ickmans, K., Huysmans, E., Coppieters, I., Willaert, W., Van Bogaert, W., & ... & Nijs, I. (2019). Best evidence rehabilitation for chronic pain part 3: Low

back pain. *Journal of Clinical Medicine*, *8*(7), 1063. https://doi.org/10.3390/jcm8071063

Markfelder, T., & Pauli, P. (2020). Fear of pain and pain intensity: Meta-analysis and systematic review. *Psychological Bulletin*, *146*(5), 411-450. https://doi.org/10.1037/bul0000228

Marmot, M. (2015). The health gap: The challenge of an unequal world. *The Lancet*, *386*(10011), 2442-2444. https://doi.org/10.1016/S0140-6736(15)00150-6

Martinez-Calderon, J., García-Muñoz, C., Rufo-Barbero, C., Matias-Soto, J., & Cano-García, F. J. (2024). Acceptance and commitment therapy for chronic pain: An overview of systematic reviews with meta-analysis of randomized clinical trials. *The Journal of Pain*, *25*(3), 595-617. https://doi.org/10.1016/j.jpain.2023.09.013

Martinez-Calderon, J., Zamora-Campos, C., Navarro-Ledesma, S., & Luque-Suarez, A. (2018). The role of self-efficacy on the prognosis of chronic musculoskeletal pain: A systematic review. *The Journal of Pain*, *19*(1), 10-34. https://doi.org/10.1016/j.jpain.2017.08.008

Mathieu, J., Roy, K., Robert, M.-È., Akeblersane, M., Descarreaux, M., & Marchand, A.-A. (2024). Sociodemographic determinants of health inequities in low back pain: A narrative review. *Frontiers in Public Health*, *12*, 1392074. https://doi.org/10.3389/fpubh.2024.1392074

Matthews, J., Hall, A. M., Hernon, M., Murray, A., Jackson, B., Taylor, I., Toner, J., Guerin, S., Lonsdale, C., & Hurley, D. A. (2015). A brief report on the development of a theoretically-grounded intervention to promote patient autonomy and self-management of physiotherapy patients: Face validity and feasibility of implementation. *BMC Health Services Research*, *15*, 1-9. https://doi.org/10.1186/s12913-015-0921-1

McCracken, L. M. (2007). A contextual analysis of attention to chronic pain: What the patient does with their pain might be more important than their awareness or vigilance alone. *The Journal of Pain*, *8*(3), 230-236. https://doi.org/10.1016/j.jpain.2006.08.004

McCracken, L. M., & Eccleston, C. (2006). A comparison of the relative utility of coping and acceptance-based measures in a sample of chronic pain sufferers. *European Journal of Pain*, *10*(1), 23-29. https://doi.org/10.1016/j.ejpain.2005.01.004

McCracken, L. M., & Vowles, K. E. (2014). Acceptance and commitment therapy and mindfulness for chronic pain: Model, process, and progress. *American Psychologist*, *69*(2), 178. https://doi.org/10.1037/a0035623

McCracken, L. M., Vowles, K. E., & Gauntlett-Gilbert, J. (2007). A prospective investigation of acceptance and control-oriented coping with chronic pain. *Journal of Behavioral Medicine*, *30*(4), 339-349. https://doi.org/10.1007/s10865-007-9104-9

McGavock, Z. C., Barnes, H. M., & McCreanor, T. (2012). Māori and pain: A literature review. *AlterNative: An International Journal of Indigenous Peoples*, *8*(2), 163-175. https://doi.org/10.1177/117718011200800205

McGowan, L. J., Powell, R., & French, D. P. (2020). How can use of the Theoretical Domains Framework be optimized in qualitative research? A rapid systematic review. *British Journal of Health Psychology*, *25*(3), 677-694. https://doi.org/10.1111/bjhp.12437

McGruer, N., Baldwin, J. N., Ruakere, B. T., & Larmer, P. J. (2019). Māori lived experience of osteoarthritis: A qualitative study guided by Kaupapa Māori principles. *Journal of Primary Health Care*, *11*(2), 128-137. https://doi.org/10.1071/HC18079

McKillop, A. B., Carroll, L. J., Jones, C. A., & Battié, M. C. (2017). The relation of social support and depression in patients with chronic low back pain. *Disability and Rehabilitation*, *39*(15), 1482-1488. https://doi.org/10.3389/fpsyg.2019.02016

McNaughton, H. K., Sims, A., & Taylor, W. J. (2000). Prognosis for people with back pain under a no-fault 24-hour-cover compensation scheme. *Spine*, *25*(10), 1254-1258. https://journals.lww.com/spinejournal/

Medrano-Escalada, Y., Plaza-Manzano, G., Fernández-De-Las-Peñas, C., & Valera-Calero, J. A. (2022). Structural, functional and neurochemical cortical brain changes associated with chronic low back pain. *Tomography*, *8*(5), 2153-2163. https://doi.org/10.3390/tomography8050180

Melzack, R. (2001). Pain and the neuromatrix in the brain. *Journal of Dental Education*, *65*(12), 1378-1382. https://doi.org/10.1002/j.0022-0337.2001.65.12.tb03497.x

Mescouto, K., Olson, R. E., Hodges, P. W., Costa, N., Patton, M. A., Evans, K., Walsh, K., Lonergan, K., & Setchell, J. (2022). Physiotherapists both reproduce and resist biomedical dominance when working with people with low back pain: A qualitative study towards new praxis. *Qualitative Health Research*, *32*(6), 902-915. https://doi.org/10.1177/10497323221084358

Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, *6*, 1-12. https://doi.org/10.1186/1748-5908-6-42

Mikamo, Y., & Takasaki, H. (2021). Pain neurophysiology knowledge enhances attitudes toward biopsychosocial management of low back pain among Japanese physical therapists. *Progress in Rehabilitation Medicine*, *6*, 20210039. https://doi.org/10.2490/prm.20210039

Miller, W. R., & Rose, G. S. (2009). Toward a theory of motivational interviewing. *American Psychologist*, *64*(6), 527. https://doi.org/10.1037/a0016830

Ministry of Health. (2021). New Zealand Health Survey Annual Data Explorer. In: Ministry of Health Wellington, New Zealand.

Moens, M., Jansen, J., De Smedt, A., Roulaud, M., Billot, M., Laton, J., Rigoard, P., & Goudman, L. (2022). Acceptance and commitment therapy to increase resilience in chronic pain patients: A clinical guideline. *Medicina*, *58*(4), 499. https://doi.org/10.3390/medicina58040499

Moniz, A., Duarte, S. T., Aguiar, P., Caeiro, C., Pires, D., Fernandes, R., Moço, D., Marques, M. M., Sousa, R., & Canhão, H. (2024). Physiotherapists' barriers and facilitators to the implementation of a behaviour change-informed exercise

intervention to promote the adoption of regular exercise practice in patients at risk of recurrence of low back pain: A qualitative study. *BMC Primary Care*, *25*(1), 39. https://doi.org/10.1186/s12875-024-02274-y

Morunga, E., Bean, D., Tuahine, K., Hohepa, K., Lewis, G., Ripia, D., & Terry, G. (2023). Kaumātua (elders') insights into indigenous Māori approaches to understanding and managing pain: A qualitative Māori-centred study. https://doi.org/10.21203/rs.3.rs-3222400/v1

Moseley, G. L., & Butler, D. S. (2015). Fifteen years of explaining pain: the past, present, and future. *The Journal of Pain*, *16*(9), 807-813. https://doi.org/10.1016/j.jpain.2015.05.005

Munneke, W., Demoulin, C., Nijs, J., Morin, C., Kool, E., Berquin, A., Meeus, M., & De Kooning, M. (2024). Development of an interdisciplinary training program about chronic pain management with a cognitive behavioural approach for healthcare professionals: Part of a hybrid effectiveness-implementation study. *BMC Medical Education*, *24*(1), 331. https://doi.org/10.1186/s12909-024-05308-2

Murillo, C., Vo, T.-T., Vansteelandt, S., Harrison, L. E., Cagnie, B., Coppieters, I., Chys, M., Timmers, I., & Meeus, M. (2022). How do psychologically based interventions for chronic musculoskeletal pain work? A systematic review and meta-analysis of specific moderators and mediators of treatment. *Clinical Psychology Review*, *94*, 102160. https://doi.org/10.1016/j.cpr.2022.102160

National Health Committee. (2015). *Low back pain: A pathway to prioritisation – consultation.* https://www.health.govt.nz/publication/lowback-pain-pathway-prioritisation-consultation

Ng, W., Slater, H., Starcevich, C., Wright, A., Mitchell, T., & Beales, D. (2021). Barriers and enablers influencing healthcare professionals' adoption of a biopsychosocial approach to musculoskeletal pain: A systematic review and qualitative evidence synthesis. *Pain*, *162*(8), 2154-2185. https://doi.org/10.1097/j.pain.0000000000002217

Nicholas, M. K., Asghari, A., Corbett, M., Smeets, R. J., Wood, B. M., Overton, S., Perry, C., Tonkin, L. E., & Beeston, L. (2012). Is adherence to pain self-management strategies associated with improved pain, depression and disability in those with disabling chronic pain? *European Journal of Pain*, *16*(1), 93-104. https://doi.org/10.1016/j.ejpain.2011.06.005

Nielsen, M., Keefe, F. J., Bennell, K., & Jull, G. A. (2014). Physical therapist–delivered cognitive-behavioral therapy: A qualitative study of physical therapists' perceptions and experiences. *Physical Therapy*, *94*(2), 197-209. https://doi.org/10.2522/ptj.20130047

Nijs, J., Wijma, A. J., Willaert, W., Huysmans, E., Mintken, P., Smeets, R., Goossens, M., van Wilgen, C. P., Van Bogaert, W., & Louw, A. (2020). Integrating motivational interviewing in pain neuroscience education for people with chronic pain: A practical guide for clinicians. *Physical Therapy*, *100*(5), 846-859. https://doi.org/10.1093/ptj/pzaa021

O'Sullivan, P. B., Caneiro, J. P., O'Keeffe, M., Smith, A., Dankaerts, W., Fersum, K., & O'Sullivan, K. (2018). Cognitive functional therapy: An integrated behavioral approach for the targeted management of disabling low back pain. *Physical Therapy*, *98*(5), 408-423. https://doi.org/10.1093/ptj/pzy022

Oliveira, C. B., Pinheiro, M. B., Teixeira, R. J., Franco, M. R., Silva, F. G., Hisamatsu, T. M., Ferreira, P. H., & Pinto, R. Z. (2019). Physical activity as a prognostic factor of pain intensity and disability in patients with low back pain: A systematic review. *European Journal of Pain*, *23*(7), 1251-1263. https://doi.org/10.1002/ejp.1395

Orhan, C., Van Looveren, E., Cagnie, B., Mukhtar, N. B., Lenoir, D., & Meeus, M. (2018). Are pain beliefs, cognitions, and behaviors influenced by race, ethnicity, and culture in patients with chronic musculoskeletal pain: A systematic review. *Pain Physician*, *21*(6), 541-558. https://www.painphysicianjournal.com/

Otero-Ketterer, E., Peñacoba-Puente, C., Ferreira Pinheiro-Araujo, C., Valera-Calero, J. A., & Ortega-Santiago, R. (2022). Biopsychosocial factors for chronicity in

individuals with non-specific low back pain: An umbrella review. *International Journal of Environmental Research and Public Health*, *19*(16), 10145. https://doi.org/10.3390/ijerph191610145

Palmer, B., Macfarlane, G., Afzal, C., Esmail, A., Silman, A., & Lunt, M. (2007). Acculturation and the prevalence of pain amongst South Asian minority ethnic groups in the UK. *Rheumatology*, *46*(6), 1009-1014. https://doi.org/10.1093/rheumatology/kem037

Pandav, C. S., & Kumar, R. (2018). Spiritual health: Need for its mainstreaming in health-care delivery in India. In (Vol. 62, pp. 251-252): Medknow.

Paschali, M., Lazaridou, A., Sadora, J., Papianou, L., Garland, E. L., Zgierska, A. E., & Edwards, R. R. (2024). Mindfulness-based Interventions for chronic low back pain: A Systematic Review and Meta-analysis. *The Clinical Journal of Pain*, *40*(2), 105-113. https://doi.org/10.1097/AJP.0000000000001173

Perl, E. R. (2011). Pain mechanisms: A commentary on concepts and issues. *Progress in Neurobiology*, *94*(1), 20-38. https://doi.org/10.1016/j.pneurobio.2011.03.001

Petrie, K. J., Faasse, K., Crichton, F., & Grey, A. (2014). How common are symptoms? Evidence from a New Zealand national telephone survey. *BMJ Open*, *4*(6), e005374. https://doi.org/10.1136/bmjopen-2014-005374

Petrini, L., & Arendt-Nielsen, L. (2020). Understanding pain catastrophizing: Putting pieces together. *Frontiers in Psychology*, *11*, 603420. https://doi.org/10.3389/fpsyg.2020.603420

Petrucci, G., Papalia, G. F., Russo, F., Vadalà, G., Piredda, M., De Marinis, M. G., Papalia, R., & Denaro, V. (2021). Psychological approaches for the integrative care of chronic low back pain: A systematic review and metanalysis. *International Journal of Environmental Research and Public Health*, *19*(1), 60. https://doi.org/10.3390/ijerph19010060

Phillips, C. J., Marshall, A. P., Chaves, N. J., Jankelowitz, S. K., Lin, I. B., Loy, C. T., Rees, G., Sakzewski, L., Thomas, S., & To, T.-P. (2015). Experiences of using the Theoretical Domains Framework across diverse clinical environments: A

qualitative study. *Journal of Multidisciplinary Healthcare*, 139-146. https://doi.org/10.2147/JMDH.S78458

Physiotherapy Board of New Zealand. (2024). *Annual Report 2023/24*. https://www.physioboard.org.nz/wp-content/uploads/2024/07/Physiotherapy-Board-Annual-Report-2024_web.pdf

Physiotherapy New Zealand. (2023). *Remuneration Survey 2023*. https://pnz.org.nz/about-pnz

Pike, A., Patey, A., Lawrence, R., Aubrey-Bassler, K., Grimshaw, J., Mortazhejri, S., Dowling, S., Jasaui, Y., De-implementing Wisely Research Group, & Hall, A. (2022). Barriers to following imaging guidelines for the treatment and management of patients with low-back pain in primary care: A qualitative assessment guided by the Theoretical Domains Framework. *BMC Primary Care*, *23*(1), 143. https://doi.org/10.1186/s12875-022-01751-6

Pincus, T., Burton, A. K., Vogel, S., & Field, A. P. (2002). A Systematic Review of Psychological Factors as Predictors of Chronicity/Disability in Prospective Cohorts of Low Back Pain. *Spine*, *27*(5), E109-E120. https://journals.lww.com/spinejournal/pages/default.aspx

Pincus, T., Kent, P., Bronfort, G., Loisel, P., Pransky, G., & Hartvigsen, J. (2013). Twenty-five years with the biopsychosocial model of low back pain—is it time to celebrate? A report from the twelfth international forum for primary care research on low back pain. *Spine*, *38*(24), 2118-2123. https://doi.org/10.1097/BRS.0b013e3182a8c5d6

Pinheiro, M. B., Ferreira, M. L., Refshauge, K., Maher, C. G., Ordoñana, J. R., Andrade, T. B., Tsathas, A., & Ferreira, P. H. (2016). Symptoms of depression as a prognostic factor for low back pain: A systematic review. *The Spine Journal*, *16*(1), 105-116. https://doi.org/10.1016/j.spinee.2015.10.037

Puschmann, A.-K., Drießlein, D., Beck, H., Arampatzis, A., Moreno Catalá, M., Schiltenwolf, M., Mayer, F., & Wippert, P.-M. (2020). Stress and self-efficacy as

long-term predictors for chronic low back pain: A prospective longitudinal study. *Journal of Pain Research*, *13*, 613-621. https://doi.org/10.2147/JPR.S223893

Rainville, J., Carlson, N., Polatin, P., Gatchel, R. J., & Indahl, A. (2000). Exploration of physicians' recommendations for activities in chronic low back pain. *Spine*, *25*(17), 2210-2220. https://www.thespinejournalonline.com/

Ramond, A., Bouton, C., Richard, I., Roquelaure, Y., Baufreton, C., Legrand, E., & Huez, J. F. (2011). Psychosocial risk factors for chronic low back pain in primary care-- A systematic review. *Family Practice*, *28*(1), 12-21. https://doi.org/10.1093/fampra/cmq072

Rathbone, T., Truong, C., Haldenby, H., Riazi, S., Kendall, M., Cimek, T., & Macedo, L. G. (2020). Sex and gender considerations in low back pain clinical practice guidelines: A scoping review. *BMJ Open Sport & Exercise Medicine*, *6*(1). https://doi.org/10.1136/bmjsem-2020-000972

Reid, A., & Dixon, H. (2018). *Making Sense of the Numbers: Analysis of the Physiotherapy Workforce*. https://pnz.org.nz/about-pnz

Reid, D., & Larmer, P. (2007). The New Zealand health priorities: Where do New Zealand private practice physiotherapists fit? *NZ Journal of Physiotherapy*, *35*(2), 42. https://nzjp.org.nz/nzjp

Rethorn, Z. D., Cook, C., & Reneker, J. C. (2019). Social determinants of health: If you aren't measuring them, you aren't seeing the big picture. *Journal of Orthopaedic & Sports Physical Therapy*, *49*(12), 872-874. https://doi.org/10.2519/jospt.2019.0613

Rethorn, Z. D., Covington, J. K., Cook, C. E., & Bezner, J. R. (2021). Physical activity promotion attitudes and practices among outpatient physical therapists: Results of a national survey. *Journal of Geriatric Physical Therapy*, *44*(1), 25-34. https://doi.org/10.1519/jpt.0000000000000289

Richmond, H., Hall, A. M., Hansen, Z., Williamson, E., Davies, D., & Lamb, S. E. (2018). Exploring physiotherapists' experiences of implementing a cognitive behavioural approach for managing low back pain and identifying barriers to

long-term implementation. *Physiotherapy*, *104*(1), 107-115. https://doi.org/10.1016/j.physio.2017.03.007

Riley, S. P., Bialosky, J., & Coronado, R. A. (2020). Are changes in fear-avoidance beliefs and self-efficacy mediators of function and pain at discharge in patients with acute and chronic low back pain? *Journal of Orthopaedic & Sports Physical Therapy*, *50*(6), 301-308. https://doi.org/10.2519/jospt.2020.8982

Ris, I., Boyle, E., Myburgh, C., Hartvigsen, J., Thomassen, L., & Kongsted, A. (2021). Factors influencing implementation of the GLA:D Back, an educational/exercise intervention for low back pain: A mixed-methods study. *JBI Evidence Implementation*, *19*(4), 394-408. https://doi.org/10.1097/XEB.0000000000000284

Ris, I., Schröder, K., Kongsted, A., Abbott, A., Nilsen, P., Hartvigsen, J., & Öberg, B. (2021). Adapting the determinants of implementation behavior questionnaire to evaluate implementation of a structured low back pain programme using mixed-methods. *Health Science Reports*, *4*(2), e266.

Robinson, K., Kennedy, N., & Harmon, D. (2013). Constructing the experience of chronic pain through discourse. *Scandinavian Journal of Occupational Therapy*, *20*(2), 93-100. https://doi.org/10.3109/11038128.2012.720275

Roitenberg, N. (2019). Physiotherapists' attitudes toward low back pain treatment: Do work setting and clinical experience with low back patients matter? *Journal of Evaluation in Clinical Practice*, *25*(2), 224-229. https://doi.org/10.1111/jep.13038

Romano, J. M., & Turner, J. A. (1985). Chronic pain and depression: does the evidence support a relationship? *Psychological Bulletin*, *97*(1), 18. https://doi.org/psycnet.apa.org

Roussel, N. A., Nijs, J., Meeus, M., Mylius, V., Fayt, C., & Oostendorp, R. (2013). Central sensitization and altered central pain processing in chronic low back pain: Fact or myth? *The Clinical Journal of Pain*, *29*(7), 625-638. https://doi.org/10.1097/AJP.0b013e31826f9a71

Rubak, S., Sandbæk, A., Lauritzen, T., & Christensen, B. (2005). Motivational interviewing: A systematic review and meta-analysis. *British Journal of General Practice*, *55*(513), 305-312. bjgp.org/

Rutten, G. M., Harting, J., Rutten, S. T., Bekkering, G. E., & Kremers, S. P. (2006). Measuring physiotherapists' guideline adherence by means of clinical vignettes: A validation study. *Journal of Evaluation in Clinical Practice*, *12*(5), 491-500. https://onlinelibrary.wiley.com/journal/13652753

Ryum, T., & Stiles, T. C. (2023). Changes in pain catastrophizing, fear-avoidance beliefs, and pain self-efficacy mediate changes in pain intensity on disability in the treatment of chronic low back pain. *Pain Reports*, *8*(5), e1092. https://doi.org/10.1097/pr9.0000000000001092

Saadat, S., Hosseininezhad, M., Khatami, S. S., & Ghasemi Jobaneh, R. (2021). Psychological Interventions in chronic low back pain: A systematic review. *Iranian Journal of Neurosurgery*, *7*(2), 67-74. https://doi.org/10.32598/irjns.7.2.1

Sanabria-Mazo, J. P., Colomer-Carbonell, A., Borràs, X., Castaño-Asins, J. R., McCracken, L. M., Montero-Marin, J., Pérez-Aranda, A., Edo, S., Sanz, A., & Feliu-Soler, A. (2023). Efficacy of videoconference group Acceptance and Commitment Therapy (ACT) and Behavioral Activation Therapy for Depression (BATD) for chronic low back pain (CLBP) plus comorbid depressive symptoms: A randomized controlled trial (IMPACT study). *The Journal of Pain*, *24*(8), 1522-1540. https://doi.org/10.1016/j.jpain.2023.04.008

Saracoglu, I., Aksoy, C. C., Afsar, E., & Arik, M. I. (2021). Does pain neuroscience education improve pain knowledge, beliefs and attitudes in undergraduate physiotherapy students? *Physiotherapy Research International*, *26*(2), e1898. https://doi.org/10.1002/pri.1898

Schofield, D. J., Callander, E. J., Shrestha, R. N., Percival, R., Kelly, S. J., & Passey, M. E. (2012). Labor force participation and the influence of having back problems on income poverty in Australia. *Spine*, *37*(13), 1156-1163. https://doi.org/10.1097/BRS.0b013e31824481ee

Schröder, K., Öberg, B., Enthoven, P., Kongsted, A., & Abbott, A. (2020). Confidence, attitudes, beliefs and determinants of implementation behaviours among physiotherapists towards clinical management of low back pain before and after implementation of the BetterBack model of care. *BMC Health Services Research*, *20*, 1-14. https://doi.org/10.1186/s12913-020-05197-3

Scott, W., Yu, L., Patel, S., & McCracken, L. M. (2019). Measuring stigma in chronic pain: Preliminary investigation of instrument psychometrics, correlates, and magnitude of change in a prospective cohort attending interdisciplinary treatment. *The Journal of Pain*, *20*(10), 1164-1175. https://doi.org/10.1016/j.jpain.2019.03.011

Sheng, J., Liu, S., Wang, Y., Cui, R., & Zhang, X. (2017). The link between depression and chronic pain: Neural mechanisms in the brain. *Neural Plasticity*, *2017*(1), 9724371. https://doi.org/10.1155/2017/9724371

Sherriff, B., Clark, C., Killingback, C., & Newell, D. (2022). Impact of contextual factors on patient outcomes following conservative low back pain treatment: Systematic review. *Chiropractic & Manual Therapies*, *30*(1), 20. https://doi.org/10.1186/s12998-022-00430-8

Shraim, B. A., Shraim, M. A., Ibrahim, A. R., Elgamal, M. E., Al-Omari, B., & Shraim, M. (2021). The association between early MRI and length of disability in acute lower back pain: A systematic review and narrative synthesis. *BMC Musculoskeletal Disorders*, *22*, 1-12. https://doi.org/0.1186/s12891-021-04863-9

Simmonds, M. J., Derghazarian, T., & Vlaeyen, J. W. (2012). Physiotherapists' knowledge, attitudes, and intolerance of uncertainty influence decision making in low back pain. *The Clinical Journal of Pain*, *28*(6), 467-474. https://doi.org/10.1097/AJP.0b013e31825bfe65

Simpson, P., Holopainen, R., Schuetze, R., O'Sullivan, P., Smith, A., & Kent, P. (2024). Becoming confidently competent: A qualitative investigation of training in

cognitive functional therapy for persistent low back pain. *Physiotherapy Theory and Practice*, *40*(4), 804-816. https://doi.org/10.1080/09593985.2022.2151333

Sinharay, S., Stern, H. S., & Russell, D. (2001). The use of multiple imputation for the analysis of missing data. *Psychological Methods*, *6*(4), 317. https://doi.org/10.1037/1082-989X.6.4.317

Slater, H., Davies, S. J., Parsons, R., Quintner, J. L., & Schug, S. A. (2012). A policy-into-practice intervention to increase the uptake of evidence-based management of low back pain in primary care: A prospective cohort study. *PloS One*, *7*(5), e38037. https://doi.org/10.1371/journal.pone.0038037

Slater, H., Jordan, J. E., O'Sullivan, P. B., Schütze, R., Goucke, R., Chua, J., Browne, A., Horgan, B., De Morgan, S., & Briggs, A. M. (2022). “Listen to me, learn from me”: A priority setting partnership for shaping interdisciplinary pain training to strengthen chronic pain care. *Pain*, *163*(11), e1145-e1163. https://doi.org/10.1097/j.pain.0000000000002647

Soleimani, R., Mirpour, Z. S., Sheikholeslami, F., Khiali, A., Rafiee, E., Gholami, A., & Shafiei Rezvani Nejad, K. (2022). The effectiveness of acceptance and commitment group therapy on pain in patients with chronic low back pain. *Journal of Health System Research*, *18*(1), 39-45. https://doi.org/10.48305/jhsr.v18i1.1446

Steenstra, I. A., Munhall, C., Irvin, E., Oranye, N., Passmore, S., Van Eerd, D., Mahood, Q., & Hogg-Johnson, S. (2017). Systematic review of prognostic factors for return to work in workers with sub acute and chronic low back pain. *Journal of Occupational Rehabilitation*, *27*, 369-381. https://doi.org/10.1007/s10926-016-9666-x

Steffens, D., Hancock, M., Maher, C., Williams, C., Jensen, T. S., & Latimer, J. (2014). Does magnetic resonance imaging predict future low back pain? A systematic review. *European Journal of Pain*, *18*(6), 755-765. https://doi.org/10.1002/j.1532-2149.2013.00427.x

Sterling, M., Jull, G., & Wright, A. (2001). Cervical mobilisation: concurrent effects on pain, sympathetic nervous system activity and motor activity. *Manual Therapy*, *6*(2), 72-81. https://doi.org/10.1054/math.2000.0378

Stevenson, K., Lewis, M., & Hay, E. (2006). Does physiotherapy management of low back pain change as a result of an evidence-based educational programme? *Journal of Evaluation in Clinical Practice*, *12*(3), 365-375. https://doi.org/10.1111/j.1365-2753.2006.00565.x

Stilwell, P., & Harman, K. (2019). An enactive approach to pain: Beyond the biopsychosocial model. *Phenomenology and the Cognitive Sciences*, *18*(4), 637-665. https://doi.org/10.1007/s11097-019-09624-7

Sullivan, M. J. (2012). The communal coping model of pain catastrophising: Clinical and research implications. *Canadian Psychology/Psychologie canadienne*, *53*(1), 32. https://doi.org/10.1037/a0026726

Sullivan, M. J. L., Bishop, S. R., & Pivik, J. (1995). The Pain Catastrophizing scale: Development and validation. *Psychological Assessment*, *7*(4), 524-532. https://doi.org/10.1037/1040-3590.7.4.524

Synnott, A., O'Keeffe, M., Bunzli, S., Dankaerts, W., O'Sullivan, P., Robinson, K., & O'Sullivan, K. (2016). Physiotherapists report improved understanding of and attitude toward the cognitive, psychological and social dimensions of chronic low back pain after cognitive functional therapy training: A qualitative study. *Journal of Physiotherapy*, *62*(4), 215-221. https://doi.org/10.1016/j.jphys.2016.08.002

Synnott, S., O'Keeffe, M., Bunzli, S., Dankaerts, W., O'Sullivan, P., & O'Sullivan, K. (2015). Physiotherapists may stigmatise or feel unprepared to treat people with low back pain and psychosocial factors that influence recovery: A systematic review [article]. *Journal of Physiotherapy*, *61*(2), 68-76. https://doi.org/10.1016/j.jphys.2015.02.016

Takasaki, H., & Ueno, T. (2024). Japanese clinical physical therapists with the mechanical diagnosis and therapy license are more competent and confident in

pain management than those without it: A cross-sectional study. *Cureus*, *16*(10), e70652. https://doi.org/10.7759/cureus.70652

Tamrakar, M., Kharel, P., Traeger, A., Maher, C., O'Keeffe, M., & Ferreira, G. (2021). Completeness and quality of low back pain prevalence data in the Global Burden of Disease Study 2017. *BMJ Global Health*, *6*(5), e005847. https://doi.org/10.1136/bmjgh-2021-005847

Tardif, H., Allingham, S. F., & White, J. M. (2021). Characteristics and outcomes of individuals reporting low back pain, ePPOC Information Series No. 2.

Tatta, J. (2022). Introducing a physical therapist-led acceptance and commitment therapy training for pain: A clinical perspective. *Internet Journal of Allied Health Sciences and Practice*, *20*(4), 16. https://doi.org/10.46743/1540-580X/2022.2061

Tegner, H., Frederiksen, P., Esbensen, B. A., & Juhl, C. (2018). Neurophysiological pain education for patients with chronic low back pain: A systematic review and meta-analysis. *The Clinical Journal of Pain*, *34*(8), 778-786. https://doi.org/10.1097/AJP.0000000000000594

Tenti, M., Raffaeli, W., & Gremigni, P. (2022). A narrative review of the assessment of depression in chronic pain. *Pain Management Nursing*, *23*(2), 158-167. https://doi.org/10.1016/j.pmn.2021.03.009

The Institute For Health Metrics and Evaluation. (2019). *Global health data exchange: Global burden of disease results* https://vizhub.healthdata.org/gbd-results/

Thompson, K., Johnson, M. I., Milligan, J., & Briggs, M. (2018). Twenty-five years of pain education research—what have we learned? Findings from a comprehensive scoping review of research into pre-registration pain education for health professionals. *Pain*, *159*(11), 2146-2158. https://doi.org/10.1097/j.pain.0000000000001352

Thompson, M., & McCracken, L. M. (2011). Acceptance and related processes in adjustment to chronic pain. *Current Pain and Headache Reports*, *15*, 144-151. https://doi.org/10.1007/s11916-010-0170-2

To, D., Hall, A., Bussières, A., French, S. D., Lawrence, R., Pike, A., Patey, A. M., Brake-Patten, D., O'Keefe, L., & Elliott, B. (2022). Exploring factors influencing chiropractors' adherence to radiographic guidelines for low back pain using the Theoretical Domains Framework. *Chiropractic & Manual Therapies*, *30*(1), 23. https://doi.org/10.1186/s12998-022-00433-5

Tousignant-Laflamme, Y., Martel, M. O., Joshi, A. B., & Cook, C. E. (2017). Rehabilitation management of low back pain – It's time to pull it all together! *Journal of Pain Research*, 2373-2385. https://doi.org/10.2147/JPR.S146485

Toye, F., & Barker, K. (2012). Persistent non-specific low back pain and patients' experience of general practice: a qualitative study. *Primary Health Care Research & Development*, *13*(1), 72-84. https://doi.org/10.1017/S1463423611000387

Treede, R.-D., Rief, W., Barke, A., Aziz, Q., Bennett, M. I., Benoliel, R., Cohen, M., Evers, S., Finnerup, N. B., & First, M. B. (2019). Chronic pain as a symptom or a disease: the IASP Classification of Chronic Pain for the International Classification of Diseases (ICD-11). *Pain*, *160*(1), 19-27. https://doi.org/10.1097/j.pain.0000000000001384

Trindade, I. A., Guiomar, R., Carvalho, S. A., Duarte, J., Lapa, T., Menezes, P., Nogueira, M. R., Patrão, B., Pinto-Gouveia, J., & Castilho, P. (2021). Efficacy of online-based acceptance and commitment therapy for chronic pain: A systematic review and meta-analysis. *The Journal of Pain*, *22*(11), 1328-1342. https://doi.org/10.1016/j.jpain.2021.04.003

Trouvin, A.-P., & Perrot, S. (2019). New concepts of pain. *Best Practice & Research Clinical Rheumatology*, *33*(3), 101415. https://doi.org/10.1016/j.berh.2019.04.007

Vachon-Presseau, E., Tétreault, P., Petre, B., Huang, L., Berger, S. E., Torbey, S., Baria, A. T., Mansour, A. R., Hashmi, J. A., & Griffith, J. W. (2016). Corticolimbic anatomical characteristics predetermine risk for chronic pain. *Brain*, *139*(7), 1958-1970. https://doi.org/10.1093/brain/aww100

van der Hulst, M., Vollenbroek-Hutten, M. M., & IJzerman, M. J. (2005). A systematic review of sociodemographic, physical, and psychological predictors of multidisciplinary rehabilitation — or, back school treatment outcome in patients with chronic low back pain. *Spine*, *30*(7), 813-825. https://doi.org/10.1097/01.brs.0000157414.47713.78

van Dijk, H., Köke, A. J., Elbers, S., Mollema, J., Smeets, R. J., & Wittink, H. (2023). Physiotherapists using the biopsychosocial model for chronic pain: Barriers and facilitators—A scoping review. *International Journal of Environmental Research and Public Health*, *20*(2), 1634. https://doi.org/10.3390/ijerph20021634

van Hooff, M. L., Vriezekolk, J. E., Kroeze, R. J., O'Dowd, J. K., van Limbeek, J., & Spruit, M. (2021). Targeting self-efficacy more important than dysfunctional behavioral cognitions in patients with longstanding chronic low back pain: A longitudinal study. *BMC Musculoskeletal Disorders*, *22*, 1-9. https://doi.org/10.1186/s12891-021-04637-3

Van Liew, C., Leon, G. A., , & Grimm, K. J., & Cronan, T. A. (2020). Vignette responses and future intentions in a health decision-making context: How well do they correlate? *Families, Systems, & Health*, *38*(1), 26. https://doi.org/10.1037/fsh0000464

Veillon, J., Preuilh, A., & Wormser, J. (2024). Cognitive behavioural interventions led by a physiotherapist in chronic non-specific low back pain: A systematic review and meta-analysis. *Journal of Bodywork and Movement Therapies*, *39*, 634-644. https://doi.org/10.1016/j.jbmt.2024.03.057

Vlaeyen, J. W., De Jong, J. R., Onghena, P., Kerckhoffs-Hanssen, M., & Kole-Snijders, A. M. (2002). Can pain-related fear be reduced? The application of cognitive-behavioural exposure in vivo. *Pain Research and Management*, *7*(3), 144-153. https://doi.org/10.1155/2002/493463

Vlaeyen, J. W., & Linton, S. J. (2000). Fear-avoidance and its consequences in chronic musculoskeletal pain: A state of the art. *Pain*, *85*(3), 317-332. https://doi.org/10.1016/S0304-3959(99)00242-0

Vlaeyen, J. W., & Linton, S. J. (2012). Fear-avoidance model of chronic musculoskeletal pain: 12 years on. *Pain*, *153*(6), 1144-1147. https://doi.org/10.1016/j.jpain.2016.01.001

Von Korff, M., & Simon, G. (1996). The relationship between pain and depression. *The British Journal of Psychiatry*, *168*(S30), 101-108. https://doi.org/10.1192/S0007125000298474

Vos, T., Lim, S. S., Abbafati, C., Abbas, K. M., Abbasi, M., Abbasifard, M., Abbasi-Kangevari, M., Abbastabar, H., Abd-Allah, F., & Abdelalim, A. (2020). Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*, *396*(10258), 1204-1222. https://doi.org/10.1016/S0140-6736(20)30925-9

Vowles, K. E., McCracken, L. M., & Eccleston, C. (2008). Patient functioning and catastrophizing in chronic pain: The mediating effects of acceptance. *Health Psychology*, *27*(2S), S136. https://doi.org/10.1037/0278-6133.27.2

Waddell, G. (1987). 1987 Volvo award in clinical sciences: A new clinical model for the treatment of low-back pain. *Spine*, *12*(7), 632-644. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=ovfta&NEWS=N&AN=00007632-198709000-00002

Wand, B. M., & O'Connell, N. E. (2008). Chronic non-specific low back pain–sub-groups or a single mechanism? *BMC Musculoskeletal Disorders*, *9*, 1-15. https://doi.org/10.1186/1471-2474-9-11

Wáng, Y. X. J., Wáng, J.-Q., & Káplár, Z. (2016). Increased low back pain prevalence in females than in males after menopause age: Evidences based on synthetic literature review. *Quantitative Imaging in Medicine and Surgery*, *6*(2), 199. https://doi.org/10.21037/qims.2016.04.06

Watson, J. A., Ryan, C. G., Cooper, L., Ellington, D., Whittle, R., Lavender, M., Dixon, J., Atkinson, G., Cooper, K., & Martin, D. J. (2019). Pain neuroscience education for adults with chronic musculoskeletal pain: A mixed-methods

systematic review and meta-analysis. *The Journal of Pain*, *20*(10), 1140. e1141-1140. e1122. https://doi.org/10.1016/j.jpain.2019.02.011

Webster, F., Connoy, L., Longo, R., Ahuja, D., Amtmann, D., Anderson, A., Ashton-James, C. E., Boyd, H., Chambers, C. T., & Cook, K. F. (2023). Patient responses to the term pain catastrophizing: Thematic analysis of cross-sectional international data. *The Journal of Pain*, *24*(2), 356-367. https://doi.org/10.1016/j.jpain.2022.10.001

Weiser, S., Lis, A., Ziemke, G., & Hiebrt, R., Faaulkner, D., Brennan, T., ... & Campello, M. (2018). Feasibility of training physical therapists to implement a psychologically informed physical therapy programe for deployed US Sailors and Marines with musculoskeletal injuries. *Military Medicine*, *183*, 503-509. https://doi.org/10.1093/milmed/usx229

Wenzel, A. (2017). Basic strategies of cognitive behavioral therapy. *Psychiatric Clinics*, *40*(4), 597-609. https://doi.org/10.1016/j.psc.2017.07.001

Wertli, M. M., Burgstaller, J. M., Weiser, S., Steurer, J., Kofmehl, R., & Held, U. (2014). Influence of catastrophizing on treatment outcome in patients with nonspecific low back pain: A systematic review. *Spine*, *39*(3), 263-273. https://doi.org/10.1097/BRS.0000000000000110

Wertli, M. M., Eugster, R., Held, U., Steurer, J., Kofmehl, R., & Weiser, S. (2014). Catastrophizing—a prognostic factor for outcome in patients with low back pain: a systematic review. *The Spine Journal*, *14*(11), 2639-2657. https://doi.org/10.1016/j.spinee.2014.03.003

Wertli, M. M., Rasmussen-Barr, E., Held, U., Weiser, S., Bachmann, L. M., & Brunner, F. (2014). Fear-avoidance beliefs—a moderator of treatment efficacy in patients with low back pain: A systematic review. *The Spine Journal*, *14*(11), 2658-2678. https://doi.org/10.1016/j.spinee.2014.02.033

Wertli, M. M., Rasmussen-Barr, E., Weiser, S., Bachmann, L. M., & Brunner, F. (2014). The role of fear avoidance beliefs as a prognostic factor for outcome in patients

with nonspecific low back pain: A systematic review. *The Spine Journal*, *14*(5), 816-836. e814. https://doi.org/10.1016/j.spinee.2013.09.036

White, C., Green, R. A., Ferguson, S., Anderson, S. L., Howe, C., Sun, J., & Buys, N. (2019). The influence of social support and social integration factors on return to work outcomes for individuals with work-related injuries: A systematic review. *Journal of Occupational Rehabilitation*, *29*, 636-659. https://doi.org/10.1007/s10926-018-09826-x

WHO Commission on Social Determinants of Health, & Organization, W. H. (2008). *Closing the gap in a generation: Health equity through action on the social determinants of health: Commission on Social Determinants of Health final report*. World Health Organization.

Wijma, A. J., van Wilgen, C. P., Meeus, M., & Nijs, J. (2016). Clinical biopsychosocial physiotherapy assessment of patients with chronic pain: The first step in pain neuroscience education. *Physiotherapy Theory and Practice*, *32*(5), 368-384. https://doi.org/10.1080/09593985.2016.1194651

Wiles, L. K., Hibbert, P. D., Stephens, J. H., Molloy, C., & Maher, C. G., Buchbinder, R., ... & Runchiman, W. B. (2022). What constitutes "appropriate care" for low back pain: Point-of-care clinical indicators from guideline evidence and experts (the STANDING Collaboration Project). *Spine*, *47*(12), 879-891. https://doi.org/10.1097/BRS.0000000000004274

Williams, A. C. d. C., Fisher, E., Hearn, L., & Eccleston, C. (2020). Psychological therapies for the management of chronic pain (excluding headache) in adults. *Cochrane Database of Systematic Reviews*(8). https://doi.org/10.1002/14651858.CD007407.pub4

Wong, J. J., Tricco, A. C., Cote, P., Liang, C. Y., Lewis, J. A., Bouck, Z., & Rosella, L. C. (2022). Association between depressive symptoms or depression and health outcomes for low back pain: A systematic review and meta-analysis. *Journal of General Internal Medicine*, *37*(5), 1233-1246. https://doi.org/10.1007/s11606-021-07079-8

Wood, L., & Hendrick, P. A. (2019). A systematic review and meta-analysis of pain neuroscience education for chronic low back pain: Short-and long-term outcomes of pain and disability. *European Journal of Pain*, *23*(2), 234-249. https://doi.org/10.1002/ejp.1314

World Health Organization. (2022). *International statistical classification of diseases and related health problems*. Retrieved from https://icd.who.int/

World Health Organization. (2024). *Operational framework for monitoring social determinants of health equity*. World Health Organization.

Yang, J., Lo, W. L. A., Zheng, F., Cheng, X., Yu, Q., & Wang, C. (2022). Evaluation of cognitive behavioral therapy on improving pain, fear avoidance, and self-efficacy in patients with chronic low back pain: A systematic review and meta-analysis. *Pain Research and Management*, *2022*, 4276175. https://doi.org/10.1155/2022/4276175

Yang, Y., Lai, X., Li, C., Yang, Y., Gu, S., Hou, W., Zhai, L., & Zhu, Y. (2023). Focus on the impact of social factors and lifestyle on the disease burden of low back pain: findings from the global burden of disease study 2019. *BMC Musculoskeletal Disorders*, *24*(1), 679. https://doi.org/10.1186/s12891-023-06772-5

Ye, L., Li, Y., Deng, Q., Zhao, X., Zhong, L., & Yang, L. (2024). Acceptance and commitment therapy for patients with chronic pain: A systematic review and meta-analysis on psychological outcomes and quality of life. *PloS One*, *19*(6), e0301226. https://doi.org/10.1371/journal.pone.0301226

Zeidan, F., Grant, J., Brown, C., McHaffie, J., & Coghill, R. (2012). Mindfulness meditation-related pain relief: Evidence for unique brain mechanisms in the regulation of pain. *Neuroscience Letters*, *520*(2), 165-173. https://doi.org/10.1016/j.neulet.2012.03.082

Zhang, Q., Jiang, S., Young, L., & Li, F. (2019). The effectiveness of group-based physiotherapy-led behavioral psychological interventions on adults with chronic low back pain: A systematic review and meta-analysis. *American Journal of*

Physical Medicine & Rehabilitation, *98*(3), 215-225. https://doi.org/10.1097/PHM.0000000000001053

Zimney, K., Van Bogaert, W., & Louw, A. (2023). The biology of chronic pain and its implications for pain neuroscience education: State of the art. *Journal of clinical medicine*, *12*(13), 4199. https://doi.org/10.3390/jcm12134199

Appendix A

Ethics Approval

Auckland University of Technology Ethics Committee (AUTEC)

6 June 2023

Debbie Bean

Faculty of Culture and Society

Dear Debbie

Re Ethics Application: **23/137 Physiotherapist factors that predict the intention to deliver psychologically informed physiotherapy in persistent low back pain: A vignette study**

Thank you for your responses to AUTEC's conditions.

Your ethics application has been approved in stages for three years until 1 June 2026.

Standard Conditions of Approval

1. The research is to be undertaken in accordance with the Auckland University of Technology Code of Conduct for Research and as approved by AUTEC.
2. All public facing documents must have the AUTEC approval number and be of a high standard of spelling and grammar. Dates on the Information Sheet(s) and Consent Form(s) must be consistent.
3. Any amendments to the project must be approved by AUTEC prior to being implemented.
4. A progress report is due annually on the anniversary of the approval date.
5. A final report is due at the expiration of the approval period, or, upon completion of project.
6. Any serious or adverse events must be reported to AUTEC, this includes unforeseen issues that might affect continued ethical acceptability of the project.
7. AUTEC grants ethical approval only. You are responsible for obtaining management permission for access from any institution or organisation at which

your research is being conducted and you need to meet all ethical, legal, public health, and locality obligations or requirements for the jurisdictions in which the research is being undertaken.

The application number and title need to be referenced on all correspondence related to this project. All forms are available online

http://www.aut.ac.nz/research/researchethics

For any enquiries, please contact ethics@aut.ac.nz

(This is a computer-generated letter for which no signature is required)

The AUTEC Secretariat

Auckland University of Technology Ethics Committee

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Appendix B

Participant Informtion Sheet

Date Information Sheet Produced: 18/04/2023

Hi, my name is Claire Earl. I am a physiotherapist and a Master of Health Science Student at AUT University. I would like to invite you to participate in my vignette study which will investigate physiotherapists' clinical practice in patients with low back pain.

Research Title

Physiotherapist clinical decision making in persistent low back pain in New Zealand: A Vignette Study.

What is the purpose of this research? The purpose of this research is to understand current physiotherapy clinical decision making in treatment of low back pain in New Zealand. Most of the research in this area is conducted overseas and little information is known on how New Zealand physiotherapists assess and treat low back pain. This research will contribute to my receiving of my Master of Health Science qualification. The findings of this research may be used for academic publications and presentations.

How was I identified and why am I being invited to participate in this research? All physiotherapists with a current annual practising certificate and work with patients with low back pain are eligible for this study. There are no exclusion criteria. We have asked Physiotherapy New Zealand to distribute information on this study to all their members and we have used the 'find a physio' function on the Physiotherapy New Zealand Website to search for potential participants. You may have received a direct email from us or through your employer asking whether you would like to participate in this study.

How do I agree to participate in this research? You agree to participate simply by clicking on the link to the survey and completing the survey. A consent form is not supplied because submission of the survey implies consent. Your participation in this research is voluntary (it is your choice) and whether you choose to participate will neither advantage nor disadvantage you. You are able to withdraw from the study at any time during the survey itself. The survey is anonymous so once you submit your response your own personal data cannot be identified or removed from the dataset.

What will happen in this research? You will be asked to read two case studies and provide a description of your assessment and treatment for these two patients. You will then be asked to provide information on your clinical experience, area of practice, and answer three questionnaires that pertain to your knowledge, behaviours, and training. The data that is collected is only used for the purpose of this research and will not be used in any other way.

What are the discomforts and risks? There should be no risk to you as a participant.

What are the benefits? The benefit of this study is to understand current New Zealand physiotherapists' clinical practice for patients with persistent pain. This will impact on education and training for physiotherapists in New Zealand which will ultimately improve outcomes for patients with low back pain. There is no direct benefit to you as a participant, but it may allow you an opportunity to reflect on your practice and methods used when treating patients with low back pain.

How will my privacy be protected? All survey answers will be anonymous. The questions (including demographic questions) do not require you to provide any identifiable information.

What are the costs of participating in this research? The survey takes approximately 30 minutes to complete.

What opportunity do I have to consider this invitation? The survey will be open until we have reached the target number of participants. It is expected that this will be several months.

Will I receive feedback on the results of this research? A summary of the findings will be made available once the research is complete. If you wish to receive a copy of the findings you will be invited to supply your email address at the end of the survey. This will be provided in a separate link so that your survey answers are not identifiable.

What do I do if I have concerns about this research? Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Debbie Bean at AUT University, Office 921 9999 ext. 7157, debbie.bean@aut.ac.nz Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC at AUT University, ethics@aut.ac.nz, (+649) 921 9999 ext. 6038.

Whom do I contact for further information about this research? Please keep this Information Sheet for your future reference. You are also able to contact the research team as follows: Researcher Contact Details: Claire Earl; claire.earl85@gmail.com. Project Supervisor Contact Details: Debbie Bean at AUT University, Office 921 9999 ext. 7157, debbie.bean@aut.ac.nz

Please click on link below to start the survey (by completing the survey you confirm that you have a current annual practising certificate and treat patients with low back pain) [link to survey here]

Approved by the Auckland University of Technology Ethics Committee on 01 June 2023 final ethics approval was granted, AUTEC Reference number (23/137)

Appendix C

Vignette Survey

A 37-year-old a factory foreman has complained of right low back pain radiating into the right calf since being rear-ended in a motor vehicle accident 9-months ago. They describe their back and leg pain symptoms as being moderate to severe, without improvement over the last 6-months. Neurological exam is normal. A recent MRI of the lumbosacral spine showed a central disc bulge at L4-5. The patient returned to work several months after the accident, but discontinued working within 2-weeks after complaining that standing and walking at work aggravated their back and leg pain syndrome.

Q1. In the space below please **list** the steps you would take to assess this patient as a physiotherapist.

_____

_____

_____

_____

_____

Q2. In the space below please **list** the full range of treatments that you may deliver as a physiotherapist throughout the course of treatment (with the understanding that this depends on the assessment).

_____

_____

_____

_____

_____

How likely are **you** to deliver each of the following interventions to this patient? (0 = not at all likely,10 = highly likely). The vignette is repeated below for your reference. *Some of these may be unfamiliar to you because they are traditionally used by other disciplines*

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Pain Neuroscience Education	o	o	o	o	o	o	o	O	o	o
Graded Activity (e.g. increasing activities of daily living)	o	o	o	o	o	o	o	O	o	o
Exercise (aerobic, strengthening, sensorimotor etc)	o	o	o	o	o	o	o	O	o	o
Massage	o	o	o	o	o	o	o	O	o	o
Manipulation / joint mobilisations	o	o	o	o	o	o	o	O	o	o
Relaxation	o	o	o	o	o	o	o	O	o	o
Mindfulness / Acceptance Commitment Therapy approach	o	o	o	o	o	o	o	O	o	o
Motivational Interviewing	o	o	o	o	o	o	o	O	o	o
Electrotherapies (USS, TENS, biofeedback)	o	o	o	o	o	o	o	O	o	o
Graded Exposure Therapy (including hierarchical list of feared movement/activity)	o	o	o	o	o	o	o	O	o	o

Acupuncture	o	o	o	o	o	o	o	O	o	o
Mirimiri/romiromi (Māori traditional therapy)	o	o	o	o	o	o	o	O	o	o
Other (please state) _____	o	o	o	o	o	o	o	O	o	o
Other (please state) _____	o	o	o	o	o	o	o	O	o	o

A 42-year-old administrator presents with a 4-year history of mild low back pain, with multiple exacerbations each year. They have been out of work for the last month with a typical exacerbation. They describe their pain as a constant ache with occasional sharp, stabbing pains in the mid-lumbar region. Their symptoms are improving. There are no neurological deficits on physical exam. Imaging studies are unremarkable.

Q1. In the space below please **list** the steps you would take to assess this patient as a physiotherapist.

_____

_____

_____

_____

Q2. In the space below please **list** the full range of treatments that you may deliver as a physiotherapist throughout the course of treatment (with the understanding that this depends on the assessment).

_____

_____

_____

_____

How likely are **you** to deliver each of the following interventions to this patient? (0 = not at all likely,10 = highly likely). The vignette is repeated below for your reference. *Some of these may be unfamiliar to you because they are traditionally used by other disciplines*

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Pain Neuroscience Education	o	o	o	o	o	o	o	O	o	o
Graded Activity (e.g. increasing activities of daily living)	o	o	o	o	o	o	o	O	o	o
Exercise (aerobic, strengthening, sensorimotor etc)	o	o	o	o	o	o	o	O	o	o
Massage	o	o	o	o	o	o	o	O	o	o
Manipulation / joint mobilisations	o	o	o	o	o	o	o	O	o	o
Relaxation	o	o	o	o	o	o	o	O	o	o
Mindfulness / Acceptance Commitment Therapy approach	o	o	o	o	o	o	o	O	o	o
Motivational Interviewing	o	o	o	o	o	o	o	O	o	o
Electrotherapies (USS, TENS, biofeedback)	o	o	o	o	o	o	o	O	o	o
Graded Exposure Therapy (including hierarchical list of feared movement/activity)	o	o	o	o	o	o	o	O	o	o

Acupuncture	o	o	o	o	o	o	o	O	o	o
Mirimiri/romiromi (Māori traditional therapy)	o	o	o	o	o	o	o	O	o	o
Other (please state) _____	o	o	o	o	o	o	o	O	o	o
Other (please state) _____	o	o	o	o	o	o	o	O	o	o

Please read each statement below and indicate how much **you** agree or disagree with each statement.

	Completely disagree (1)	To a large extent disagree (2)	Somewhat disagree (3)	Somewhat agree (4)	To a large extent agree (5)	Completely agree (6)
1. When tissue damage or inflammation has fully healed, the pain disappears.	O	O	O	O	O	O
2. The pain system can adapt; therefore, the pain system can become hypersensitive.	O	O	O	O	O	O
3. Pain sensitivity can persist, even if there is no longer an injury or tissue damage.	O	O	O	O	O	O

	Completely disagree (1)	To a large extent disagree (2)	Somewhat disagree (3)	Somewhat agree (4)	To a large extent agree (5)	Completely agree (6)
4. In persistent pain, the pain can be caused by adaptation of the pain system itself.	O	O	O	O	O	O
5. The brain releases chemicals, which can make the pain system less sensitive.	O	O	O	O	O	O
6.Hypersensitivity of the pain system can sometimes be beneficial.	O	O	O	O	O	O
7. Pain is always an output of the brain.	O	O	O	O	O	O
8. The brain has an internal pain reduction system for different signals, to relieve pain.	O	O	O	O	O	O

	Completely disagree (1)	To a large extent disagree (2)	Somewhat disagree (3)	Somewhat agree (4)	To a large extent agree (5)	Completely agree (6)
9. Brain activity is influenced by psychological and social processes (e.g. stress) which in turn influences the sensitivity of the pain system.	o	o	o	o	o	o
10. The brain has a mechanism that can amplify nerve signals throughout the body.	o	o	o	o	O	o
11. If nerve signals from the body are interpreted as dangerous, this probably leads to the experience of pain.	o	o	o	o	O	o
12. Negative thoughts about the cause of	o	o	o	o	o	o

	Completely disagree (1)	To a large extent disagree (2)	Somewhat disagree (3)	Somewhat agree (4)	To a large extent agree (5)	Completely agree (6)
pain, can amplify the pain.						
13. In persistent pain, it is important to know that pain isn't dangerous.	o	o	o	o	O	o
14. In persistent pain, it is important to know why the pain persists.	o	o	o	o	O	o
15. Because pain is influenced by psychological factors, persistent pain is likely to be not real or partially made up.	o	o	o	o	O	o
16. The pain that a person feels is influenced by their thoughts about the cause of pain.	o	o	o	o	O	o

	Completely disagree (1)	To a large extent disagree (2)	Somewhat disagree (3)	Somewhat agree (4)	To a large extent agree (5)	Completely agree (6)
17. Persistent pain is often the result of nerve compression.	o	o	o	o	O	o
18. Unexplained pain is not real pain.	o	o	o	o	O	o
19. When in pain, it is dangerous to move or exercise.	o	o	o	o	O	o
20. As long as tissue damage is visible on an x-ray or MRI, there will be pain.	o	o	o	o	O	o
21. Pain indicates that you should reduce your activity level.	o	o	o	o	O	o
22. Treatment for persistent pain is aimed at reducing the	o	o	o	o	o	o

	Completely disagree (1)	To a large extent disagree (2)	Somewhat disagree (3)	Somewhat agree (4)	To a large extent agree (5)	Completely agree (6)
sensitivity of the pain system.						
23.Treatment of pain is always most effective when it focusses on finding and fixing tissue damage or inflammation.	o	o	o	o	O	o
24. Exercise is a good treatment option for persistent pain.	o	o	o	o	O	o
25. Pain medication is effective for persistent pain.	o	o	o	o	O	o
26. Correcting poor posture reduces persistent pain.	o	o	o	o	O	o
27. The physiotherapist can reduce persistent pain by	o	o	o	o	o	o

	Completely disagree (1)	To a large extent disagree (2)	Somewhat disagree (3)	Somewhat agree (4)	To a large extent agree (5)	Completely agree (6)
correcting a misaligned spine.						
28. During a physiotherapy treatment, pain-provoking exercises should be avoided.	o	o	o	o	O	o
29. Learning more about pain through education, reduces the impact of persistent pain.	o	o	o	o	O	o
30. In persistent pain, the level of activity should be increased depending on the pain experienced.	o	o	o	o	O	o

Psychologically informed physiotherapy includes any technique that aims to address the psychosocial aspect of persistent pain. This includes an enhanced therapeutic relationship and a focus on a person's thoughts, beliefs and emotions related to their pain. Strategies that physiotherapists may use include pain neuroscience education, and **components of** motivational interviewing, acceptance and commitment therapy, cognitive behavioural therapy, cognitive functional therapy and graded exposure. In Aotearoa, psychologically informed physiotherapy may also be provided in a culturally appropriate manner that addresses spiritual and social dimensions. Please read each statement and indicate on the scale to what extent you agree with the statement.

	Completely disagree (1)	(2)	(3)	(4)	Completely agree (5)
1. I know how to deliver psychologically informed physiotherapy.	O	O	O	O	O
2. Objectives of psychologically informed physiotherapy and my role in this are clearly defined for me.	O	O	O	O	O
3. With regard to psychologically informed physiotherapy,	O	O	O	O	O

	Completely disagree (1)	(2)	(3)	(4)	Completely agree (5)
I know what my responsibilities are.					
4. In my work with psychologically informed physiotherapy, I know exactly what is expected from me.	O	O	O	O	O
5. I have been trained in delivering psychologically informed physiotherapy.	O	O	O	O	O
6. I have the skills to deliver psychologically informed physiotherapy.	O	O	O	O	O
7. I have practiced delivering psychologically	O	O	O	O	O

	Completely disagree (1)	(2)	(3)	(4)	Completely agree (5)
informed physiotherapy.					
8. Delivering psychologically informed physiotherapy is part of my work as a physiotherapist.	O	O	O	O	O
9. As a physiotherapist it is my job to deliver psychologically informed physiotherapy.	O	O	O	O	O
10. It is my responsibility as a physiotherapist to deliver psychologically informed physiotherapy.	O	O	O	O	O
11. I am confident that I can provide	O	O	O	O	O

	Completely disagree (1)	(2)	(3)	(4)	Completely agree (5)
psychologically informed physiotherapy.					
12. I am confident that I can deliver psychologically informed physiotherapy even when other professionals with whom I work with do not do this.	O	O	O	O	O
13. I am confident that I can deliver psychologically informed physiotherapy even when there is little time.	O	O	O	O	O
14. I am confident that I can deliver	O	O	O	O	O

	Completely disagree (1)	(2)	(3)	(4)	Completely agree (5)
psychologically informed physiotherapy even when the participants are not motivated.					
15. For me, reporting about psychologically informed physiotherapy to the referring professional is very easy.	O	O	O	O	O
16. I have control over delivering psychologically informed physiotherapy.	O	O	O	O	O
17. For me, delivering psychologically informed physiotherapy is very easy.	O	O	O	O	O

	Completely disagree (1)	(2)	(3)	(4)	Completely agree (5)
18. For me attending to participants use of psychological strategies outside of sessions is very easy.	O	O	O	O	O
19. For me, delivering psychologically informed physiotherapy is very useful.	O	O	O	O	O
20. For me, delivery of psychologically informed physiotherapy is very worthwhile.	O	O	O	O	O
21. For me, delivering psychologically informed physiotherapy	O	O	O	O	O

	Completely disagree (1)	(2)	(3)	(4)	Completely agree (5)
is very interesting.					
22. For me, delivering psychologically informed physiotherapy is very pleasurable.	O	O	O	O	O
23. If I deliver psychologically informed physiotherapy it will be most effective.	O	O	O	O	O
24. If I deliver psychologically informed physiotherapy the patients will appreciate this.	O	O	O	O	O
25. If I deliver psychologically informed physiotherapy this will strengthen the	O	O	O	O	O

	Completely disagree (1)	(2)	(3)	(4)	Completely agree (5)
collaboration with professionals with whom I deliver psychologically informed physiotherapy.					
26. If I deliver psychologically informed physiotherapy I will feel satisfied.	O	O	O	O	O
27. If I deliver psychologically informed physiotherapy it will help participants to be more physically active.	O	O	O	O	O
28. When I deliver psychologically informed	O	O	O	O	O

	Completely disagree (1)	(2)	(3)	(4)	Completely agree (5)
physiotherapy I get financial reimbursement.					
29. When I deliver psychologically informed physiotherapy I get recognition from participants.	O	O	O	O	O
30. When I deliver psychologically informed physiotherapy I get recognition from my workplace.	O	O	O	O	O
31. Working on biomedical issues is a higher priority than delivering psychologically informed physiotherapy.	O	O	O	O	O

	Completely disagree (1)	(2)	(3)	(4)	Completely agree (5)
32. Working on biomedical issues is more urgent than delivering psychologically informed physiotherapy.	O	O	O	O	O
33. In the organisation I work in all necessary resources are available to deliver psychologically informed physiotherapy.	O	O	O	O	O
34. I can count on support from the management of the organisation I work in, with things get tough when	O	O	O	O	O

	Completely disagree (1)	(2)	(3)	(4)	Completely agree (5)
delivering psychologically informed physiotherapy.					
35. The management of the organisation I work in is willing to listen to my problems with delivering psychologically informed physiotherapy.	O	O	O	O	O
36. The management of the organisation I work in is helpful with delivering psychologically informed physiotherapy.	O	O	O	O	O

Q1. Please state your exact age in years.

_____

Q2. Please select your gender.

- ○ Male
- ○ Female
- ○ Non-binary / third gender
- ○ Prefer not to say

Q3. Which ethnic group do you belong to?

- ○ NZ European / Pakeha
- ○ Māori
- ○ Samoan
- ○ Cook Islands Māori
- ○ Tongan
- ○ Niuean
- ○ Chinese
- ○ Indian
- ○ Other, please state

_____

Q4 Which country did you undertake your undergraduate physiotherapy training?

- ○ New Zealand
- ○ Australia
- ○ United Kingdom
- ○ South Africa
- ○ Other (please state)

_____

Q5 What is your highest level of qualification?

- ○ Bachelor's degree
- ○ Post-graduate certificate
- ○ Post-graduate diploma
- ○ Master’s in health Practice / Science
- ○ PHD

Q6 How many hours of formal training in psychosocial interventions have you had? (e.g. motivational interviewing, CBT, ACT therapy, relaxation, providing pain neuroscience education)

_____

Q7 How many years have you been practising as a physiotherapist?

_____

Q8 How frequently do you have supervision with a therapist experienced in psychologically informed physiotherapy?

_____

Q9 How much time do you spend with a typical low back pain patient per appointment? Please select one answer

- ○ 20-25 mins
- ○ 30-35 mins
- ○ 40-45 mins
- ○ 50-60 mins

Q10 How is the majority of your low back pain work funded? Please select one answer.

- ○ ACC or other Insurer fully funded programmes
- ○ Regulation fees physiotherapy (with co-payment from patient)
- ○ Private only (patient pays full amount)
- ○ Hospital (funded by public health system)

Appendix D

Sensitivity Analyses Tables

Logistic regression of factors associated with the delivery of PIP in the administrator vignette (DIBQ Role entered instead of DIBQ Consequences)

	B	SE	Wald[a]	Df	P	Odds Ratio	95% CI Lower	Upper
KNAP Total	.05	.02	8.33	1	.008	1.05	1.01	1.09
DIBQ Know	.60	.28	4.29	1	.033	1.82	1.05	3.14
DIBQ Role	.02	.30	.00	1	.959	1.02	.57	1.82
DIBQ Goals	-.22	.21	1.38	1	.295	.80	.53	1.21
DIBQ Org	-.20	.21	.84	1	.337	.82	.54	1.24
Hours			1.13	2				
<50	-.34	.53	.42	1	.519	.71	.25	2.00
≥50	.11	.65	.03	1	.861	1.12	.31	4.03
Time			1.56	3				
30-35mins	.14	.60	.15	1	.820	1.15	.35	3.70
40-45mins	-.09	.64	.01	1	.891	.92	.26	3.22
50-60mins	.63	.77	1.08	1	.417	1.87	.41	8.52
Supervision	.90	.45	3.42	1	.045	2.47	1.02	5.97
Funding			.96	2				
Reg/private	-.47	.42	.86	1	.258	.65	.28	1.41
Te Whatu	-.16	.59	.00	1	.784	.85	.27	2.70
Vignette order	-1.03	.47	4.15	1	.028	.36	.14	.90

Note. SE = standard error; [a] = original data set; df = degrees of freedom; p = probability; % = percentage; CI = confidence interval; KNAP = knowledge and attitudes of pain; DIBQ = determinants of behaviour questionnaire; Know = knowledge; Org = organisation; < = less than, ≥ = greater or equal to; mins = minutes; reg = regulation fees; Te Whatu = Health New Zealand Te Whatu Ora.

Logistic regression of factors associated with the delivery of PIP in the foreman vignette (DIBQ Role entered instead of DIBQ Consequences)

	B	SE	Wald[a]	Df	P	Odds Ratio	95% CI OR Lower	Upper
KNAP Total	.06	.02	9.76	1	.002	1.06	1.02	1.09
DIBQ Know	.35	.26	1.85	1	.179	1.42	.85	2.02
DIBQ Role	.14	.28	.08	1	.610	1.15	.67	2.00
DIBQ Goals	-.07	.19	.15	1	.698	.93	.64	1.36
DIBQ Org	-.22	.20	1.13	1	.271	.81	.55	1.06
Hours			2.53	2				
<50	-.75	.48	2.46	1	.119	.47	.18	1.21
≥50	-.68	.60	1.51	1	.262	.51	.16	1.66
Supervision	.65	.44	1.79	1	.137	1.92	.81	4.51
Qual			6.15	2	.			
PgCert/dip	.86	.46	3.76	1	.060	2.36	.96	5.77
M/PhD	1.12	.52	5.82	1	.032	3.06	1.10	8.51
Age	.01	.02	.13	1	.689	1.01	.97	1.04

Note. SE = standard error; [a] = original data set; df = degrees of freedom; p = probability; % = percentage; CI = confidence interval; OR = Odds ratio; KNAP = knowledge and attitudes of pain; DIBQ = determinants of behaviour questionnaire; Know = knowledge; Org = organisation; < = less than, ≥ = greater or equal to; PgCert/dip = postgraduate certificate or diploma; M/PhD = masters or doctor of philosophy.

Logistic regression of factors associated with the delivery of PIP in the administrator vignette (DIBQ Confidence entered instead of DIBQ Consequences)

	B	SE	Wald[a]	Df	P	Odds Ratio	95% CI Lower	Upper
KNAP Total	.05	.02	8.72	1	.006	1.05	1.01	1.09
DIBQ Know	.52	.31	2.24	1	.095	1.69	.91	3.12
DIBQ Confidence	.13	.33	.38	1	.959	1.14	.59	2.19
DIBQ Goals	-.22	.21	1.33	1	.298	.80	.53	1.21
DIBQ Org	-.22	.21	1.10	1	.296	.80	.53	1.21
Hours			1.10	2				
<50	-.34	.52	.43	1	.511	.71	.25	1.98
≥50	.10	.65	.02	1	.878	1.11	.31	4.00
Time			1.67	3				
30-35mins	.11	.60	.10	1	.859	1.11	.34	3.64
40-45mins	-.13	.65	.00	1	.840	.88	.25	3.13
50-60mins	.62	.77	1.03	1	.420	1.87	.41	8.52
Supervision	.89	.45	3.21	1	.049	2.43	1.00	5.89
Funding			.99	2				
Reg/private	-.47	.41	.89	1	.254	.62	.28	1.41
Te Whatu	-.16	.58	.00	1	.788	.86	.27	2.67
Vignette order	-1.03	.47	4.19	1	.028	.36	.14	.894

Note. SE = standard error; [a] = original data set; df = degrees of freedom; p = probability; % = percentage; CI = confidence interval; KNAP = knowledge and attitudes of pain; DIBQ = determinants of behaviour questionnaire; Know = knowledge; Able = confidence; Org = organisation; < = less than, ≥ = greater or equal to; mins = minutes; reg = regulation fees; Te Whatu = Health New Zealand Te Whatu Ora.

Logistic regression of factors associated with the delivery of PIP in the foreman vignette (DIBQ Confidence entered instead of DIBQ Consequences)

	B	SE	Wald[a]	Df	P	Odds Ratio	95% CI OR Lower	Upper
KNAP Total	.06	.02	10.68	1	.001	1.07	1.03	1.11
DIBQ Know	.20	.29	.18	1	.487	1.22	.70	2.15
DIBQ Confidence	.38	.32	2.16	1	.234	1.46	.78	2.73
DIBQ Goals	-.06	.19	.11	1	.738	.94	.64	1.37
DIBQ Org	-.26	.20	1.81	1	.204	.77	.52	1.15
Hours			2.60	2				
<50	-.77	.48	2.51	1	.112	.47	.18	1.20
≥50	-.71	.60	1.62	1	.241	.49	.15	1.62
Supervision	.59	.44	1.34	1	.181	1.81	.76	4.31
Qual			4.85	2	.			
PgCert/dip	.82	.46	3.41	1	.074	2.26	.92	5.54
M/PhD	.98	.54	4.31	1	.068	2.67	.93	7.64
Age	.01	.02	.14	1	.690	1.01	.97	1.04

Note. SE = standard error; [a] = original data set; df = degrees of freedom; p = probability; % = percentage; CI = confidence interval; OR = Odds ratio; KNAP = knowledge and attitudes of pain; DIBQ = determinants of behaviour questionnaire; Know = knowledge; Org = organisation; < = less than, ≥ = greater or equal to; PgCert/dip = postgraduate certificate or diploma; M/PhD = masters or doctor of philosophy.

pain management for Māori. *New Zealand Medical Journal*, *134*(1543), 19-29. www.nzma.org.nz/journal

Hoeta, T. J., Baxter, G. D., Bryant, K. A. P., & Mani, R. (2020). Māori pain experiences and culturally valid pain assessment tools for Māori: A systematic narrative review. *New Zealand Journal of Physiotherapy*, *48*(1), 37-50. https://doi.org/10.15619/NZJP/48.1.05

Jones, D. K., Mowat, R. M., Lewis, G. N., & Cook, C. M. (2025). Improving outcomes from pain management programmes in Aotearoa New Zealand: Listening to the voices of Māori. *AlterNative: An International Journal of Indigenous Peoples*. https://doi.org/10.1177/11771801251334566

Lewis, G. N., Borotkanics, R., & Upsdell, A. (2021). Inequity in outcomes from New Zealand chronic pain services. *New Zealand Medical Journal*, *134*(1533), 11-20. www.nzma.org.nz/journal

Lewis, G. N., Shaikh, N., Wang, G., Chaudhary, S., Bean, D. J., & Terry, G. (2023). Chinese and Indian interpretations of pain: A qualitative evidence synthesis to facilitate chronic pain management. *Pain Practice*, *23*(6), 647-663. https://doi.org/10.1111/papr.13226

Lewis, G. N., & Upsdell, A. (2018). Ethnic disparities in attendance at New Zealand's chronic pain services. *The New Zealand Medical Journal (Online)*, *131*(1472), 21-28. www.nzma.org.nz/journal

Ludeke, M., Puni, R., Cook, L., Pasene, M., Abel, G., & Sopoaga, F. (2012). Access to general practice for Pacific peoples: A place for cultural competency. *Journal of Primary Health Care*, *4*(2), 123-130. https://doi.org/10.1071/HC12123

Palmer, S. C., Gray, H., Huria, T., Lacey, C., Beckert, L., & Pitama, S. G. (2019). Reported Māori consumer experiences of health systems and programs in qualitative research: A systematic review with meta-synthesis. *International journal for equity in health*, *18*(1), 163. https://doi.org/10.1186/s12939-019-1057-4