Exploration of the effectiveness of a three-week multidisciplinary chronic pain programme at Queen Elizabeth Health, New Zealand

October 2020

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A Doctorate was submitted to AUT University in fulfilment of the requirements for the degree of

Doctor of Health Science (DHSc)

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ABBREVIATIONS

AUTEC	Auckland University of Technology Ethics Committee
BPI	Brief Pain Inventory
CHOIR	Collaborative Health
CBT	Cognitive Behavioural Therapy
DASS	Depression Anxiety Stress Survey
DHB	District Health Board
EQ-5D	EuroQuol-5D
HADS	Hospital Anxiety and Depression
IASP	International Association for the Study of Pain
IMMPACT	Methods Measurement Pain Assessment Clinical Trials
MPQ	McGill Pain Questionnaire
MOH	Ministry of Health
MPMP	Multidisciplinary Pain Management Programme
NZ	New Zealand
OA	Osteo Arthritis
PCS	Pain Catastrophising Scale
PSEQ	Pain Self-Efficacy Questionnaire
RCT	Randomised Control Trial
RA	Rheumatoid Arthritis
RADLS	Recreational Activities of Daily Living
SPSS	Statistical Package for the Social Sciences
QE	Queen Elizabeth
WHO	World Health Organisation

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 material that 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

October 2020

ACKNOWLEDGMENTS

Fall down seven times, get up eight

Japanese proverb

I would like to dedicate this thesis to QE Health, which truly is a place of kindness, and has brought hope to the hundreds and thousands of people who have attended over the years. I would particularly like to thank Dr Aaron Randell and Rose Mansel, who made this journey so memorable. Also, Sue Whitby and Rachel Gregory for their assistance, and all the patients who returned surveys to make this research possible.

Additionally to my supervisor, Dr Gwyn Lewis, for her amazing and constant support from the beginning to end. This would not have been possible without her. And to Dr Robert Borotkanics for helping me to understand statistics and making it fun. I have learnt so much from you both and am very grateful for your shared knowledge.

Also to Dr Stephen Neville for the opportunity that he has given me; now I have my driver's licence I am looking forward to joining the research world.

And thank you to my son, Hugo. I love you more than the whole world.

AUTEC Secretariat

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28 March 2018

Gwyn Lewis
Faculty of Health and Environmental Sciences

Dear Gwyn

Ethics Application: **18/123 How id changing the three-week multidisciplinary chronic pain programme at Queen Elizabeth Health (QE Health) Rotorua, impact patient outcomes**

Thank you for submitting your application for ethical review. I am pleased to advise that a subcommittee of the Auckland University of Technology Ethics Committee (AUTEC) approved your ethics application, subject to the following conditions:

1. Justification of the exclusion of persons with psychiatric illness, and explain in practical terms how such persons will be omitted from the data-set;
2. Provision of evidence that the researchers have undertaken appropriate consultation with cultural and/or with other relevant groups, and those consulted support this proposed use of routinely collected patient information without individual consent.

Please provide me with a response to the points raised in these conditions, indicating either how you have satisfied these points or proposing an alternative approach. AUTEC also requires copies of any altered documents, such as Information Sheets, surveys etc. You are not required to resubmit the application form again. Any changes to responses in the form required by the committee in their conditions may be included in a supporting memorandum.

Please note that the Committee is always willing to discuss with applicants the points that have been made. There may be information that has not been made available to the Committee, or aspects of the research may not have been fully understood.

Once your response is received and confirmed as satisfying the Committee's points, you will be notified of the full approval of your ethics application. Full approval is not effective until all the conditions have been met. Data collection may not commence until full approval has been confirmed. If these conditions are not met within six months, your application may be closed and a new application will be required if you wish to continue with this research.

To enable us to provide you with efficient service, we ask that you use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

I look forward to hearing from you,

Yours sincerely

Kate O'Connor
Executive Manager
Auckland University of Technology Ethics Committee

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11 April 2018

Gwyn Lewis
Faculty of Health and Environmental Sciences

Dear Gwyn

Re Ethics Application: **18/66 Exploring the effectiveness of the pain management programme at Queen Elizabeth Health (QE Health), Rotorua, New Zealand**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 10 April 2021.

Non-Standard Conditions of Approval

1. Ensure the Information sheet qualifies 'major' psychiatric illness.

Non-standard conditions must be completed before commencing your study. Non-standard conditions do not need to be submitted to or reviewed by AUTEC before commencing your study.

Standard Conditions of Approval

1. A progress report is due annually on the anniversary of the approval date, using form EA2, which is available online through http://www.aut.ac.nz/researchethics.
2. A final report is due at the expiration of the approval period, or, upon completion of project, using form EA3, which is available online through http://www.aut.ac.nz/researchethics.
3. Any amendments to the project must be approved by AUTEC prior to being implemented. Amendments can be requested using the EA2 form: http://www.aut.ac.nz/researchethics.
4. Any serious or unexpected adverse events must be reported to AUTEC Secretariat as a matter of priority.
5. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTEC Secretariat as a matter of priority.

Please quote the application number and title on all future correspondence related to this project.

AUTEC grants ethical approval only. If you require management approval for access for your research from another institution or organisation then you are responsible for obtaining it. You are reminded that it is your responsibility to ensure that the spelling and grammar of documents being provided to participants or external organisations is of a high standard.

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

Yours sincerely,

ABSTRACT

Multidisciplinary chronic pain programmes are well known to help those with chronic pain. However, there is still much to understand about what components work and for whom. This doctoral thesis involved two studies. Study one explored whether programme treatment was more effective delivered in a group-based approach compared to a more individual approach and study two explored whether patients' baseline characteristics at admission could predict three-month outcome.

Methods: The first study was a retrospective cohort study. A total of 231 patients were surveyed; 112 patients were on a programme where more individually based components were delivered, and 119 patients in the group-based components programme. HADS anxiety and depression, and the QE Health Scale were compared at baseline and at discharge from the 3-week programme. The second study was a prospective cohort study where 165 patients completed the three-week programme, of whom 100 patients returned the three month follow up survey. Demographic data were collected at baseline, while clinical outcome measures (BPI intensity and interference, DASS-21 depression, anxiety and stress, PCS rumination, helplessness and magnification and PSEQ pain self-efficiency questionnaire) data were collected three times: at baseline, programme discharge, and 3-month follow up. Regression analysis was utilised to determine if baseline demographic or clinical characteristics were associated with outcomes at 3-months.

Results: Study one found that there were no significant differences in any outcome measures between the group and individual delivery. Those patients who had RA and OA in the group delivery had statistically significant improvement in the QE Health score and HADS depression then those receiving individual delivery. The second study found that all the clinical outcome

measures that were high at baseline were also high at follow up. PCS rumination and BPI intensity and interference were more predictive of multiple poorer outcomes at 3 months than any other outcomes. As far as demographics were concerned, being Māori was associated with poorer outcomes at three months in relation to BPI Interference and PCS magnification. Those with fibromyalgia had a significant increase in PSEQ but decrease in DASS-21 depression at 3 months. Part time workers had a reduction in PCS helplessness and rumination.

Conclusion: These results provide an opportunity for targeted intervention to groups of people in the future, adding to the body of knowledge regarding the effectiveness of a variety of multidisciplinary pain management programmes.

Chapter 1. INTRODUCTION

1.1. **Rationale**

Chronic pain is defined as pain that is present daily and has lasted or is expected to last more than three months (International Association for the Study of Pain, 2019a). Chronic pain affects 19.4% of New Zealand's adult population, making it one of the most prevalent health conditions in New Zealand (Ministry of Health, 2019). Collectively, chronic pain accounts for a reduction of life expectancy by 5% due to ill-health, disability or early death, and is comparable with the results of anxiety and depressive disorders (Ministry of Health, 2018a). The personal and societal effects of chronic pain are immense, with individuals having to deal with associated stigma, depression and social breakdown, as well as losses related to work absenteeism and the loss of work productivity (Turk et al., 2011; Bair et al., 2008). Chronic pain also has a significant impact on society in terms of fiscal losses, resulting from doctors' visits, medications and time taken to make a diagnosis. Chronic pain was estimated to cost New Zealand $13-14.9 billion in 2016, and this cost is expected to exceed $21.2-23.3 billion in 2048 (Moore & Davies, 2018).

Many barriers exist for people with a diagnosis of chronic pain in gaining access to evidence-based chronic pain management; these extend across primary, secondary and tertiary sectors of health care (National Pain Summit Initiative, 2010). In New Zealand there is a shortage of pain specialists (Moore & Davies, 2018). International recommendations state a need for one full time pain specialist per 100,000 patients, which would mean New Zealand would need to have around 47 specialists. Currently, there are 11 pain specialists practicing in New Zealand (Moore & Davies, 2018). Another barrier is that there are only three tertiary multidisciplinary

pain management programmes (MPMPs) in New Zealand. These are: The Burwood Pain Management Centre located in Canterbury, the Auckland Regional Pain Service (TARPs) in Auckland, and Queen Elizabeth (QE) Health, which is based in Rotorua.

There is strong evidence from randomised controlled studies that MPMPs are an effective and well-accepted method to manage chronic pain, and they are considered the gold standard for treating chronic, non-malignant pain (Scascighini et al., 2008). However, there are still gaps in our understanding of MPMP success. For example, the International Association for the Study of Pain (IASP) has established basic guidelines of what MPMPs should comprise, including the qualifications required by staff, the assessment tools, and treatment options (IASP, 2019). No specific guidelines exist for effective programme content, such as programme structure and format, which components are most effective, the process of each component, nor the treatment duration.

Although MPMPs have positive effects on chronic pain patients, not everyone benefits. A number of studies (Tota-Faucette et al., 1993; Bremander et al., 2011; Gough & Frost, 1996; King & Snow, 1989; Keel et al., 1998; Angst et al., 2014; Hampel et al., 2009; Neuner et al., 2013) have evaluated patient characteristics, such as age, physical condition, duration of pain, and social background, and how these relate to treatment outcomes. However, there is still a need to identify individual or subgroup characteristics that are more responsive to treatment than others (Carr et al., 2008). Further, understanding the New Zealand chronic pain population with its distinct culture that is predominantly European, Māori, Asian and Pacific ethnicities (Statistics NZ, 2020), allied with New Zealand's unique health care system, where many services are free or subsidised but need referrals for specialised chronic pain care (MOH, 2011) still needs investigation.

Based on these gaps in understanding of MPMPs, this doctoral thesis comprises of two interrelated studies evaluating the outcome of patients attending QE Health, a three-week inpatient MPMP in Rotorua, New Zealand. The first study evaluates the impact of a change in the programme that went from largely delivering content via individual components, such as one-on-one counselling, massage and physical therapy, to group-based delivery, including group exercise and education sessions. The second study evaluates the outcomes at three months after discharge of the participants attending the MPMP at QE Health, and whether these outcomes can be predicted based on patient characteristics on admission to the treatment.

This thesis is divided into five chapters. The first chapter defines the importance of this research to the field of MPMP and affirms the two research questions. Chapter 2 is a review of the literature, articulating the nature of chronic pain and the impact it has physiologically and psychologically. This will be followed by a discussion of how chronic pain impacts the lives of New Zealanders. The chapter additionally provides an overview of the history of MPMPs globally and in New Zealand, with a summary of QE Health and its program. Components of MPMPs will be examined through a literature search to identify the content and structure of MPMPs that have been previously published. A second review of the literature will explore predictors of outcome from MPMPs, followed by an evaluation of outcome measures utilised by MPMPs.

Chapter 3 describes study one in detail and answers the research question of whether the modified three-week chronic pain programme at QE Health changed patient outcomes compared to the previous programme. This retrospective cohort study examined whether a program with predominantly individual components or predominantly group based

components, resulted in different patient outcomes. This chapter will introduce the rationale for the change in programme that occurred, evaluate the components of the current and former MPMP, and look at the specific patient outcomes. It will explain the methodology, methods and study design, and finish with the results, discussion, strengths and limitations.

Chapter 4 describes study two, which explored the second research question of this doctoral thesis; whether three-month outcomes from the MPMP at QE Health are predictive from patient characteristics at admission. This is a prospective cohort study, evaluating participant demographic, clinical, or psychosocial characteristics. Similarly to Chapter 3, this chapter will detail the methodology, methods and study design used, including participants, outcome measures, data analysis through to results, strengths and limitations and discussion.

Chapter 5 will conclude the thesis with an overall discussion and summarise the clinical recommendations.

1.2. **Aims**

This thesis intends to inform the following two research questions:

1. Did the modified three-week predominantly group based chronic pain programme at QE Health result in different patient outcomes compared to the previous, individually based programme?
2. Can the outcomes from the chronic pain programme at QE Health be predicted based on patient characteristics on admission?

The findings from the first study will help to inform whether the change in programme is maintained at QE Health, when considered alongside costs, patient volume, and practical aspects. Group therapy has many theoretical benefits and means programme content is

delivered in a cost-effective manner, ensuring that more individuals are able to receive care at a lower cost per case (British Pain Society, 2014; Corey, 2011; Turk & Gatchel, 2018). Furthermore, the findings will be applicable more globally to MPMPs.

The second question of this thesis is significant because if the MPMP team can predict who will gain the most, this, in turn, could help identify individuals in the future who will benefit the most and need prioritising, or suggest ways to alter the QE Health programme for those who are currently not receiving as much benefit. Knowledge of which patients achieve good or poor outcomes will help to design more effective programmes and align patients with available treatments (Boonstra et al., 2015; Scascighini et al., 2008). This study is novel in that it will encompass New Zealand's unique cultural make up and will examine the impact of ethnicity on patient outcomes in a New Zealand context. The findings could have international application to MPMPs, particularly those that serve minority and indigenous populations.

Chapter 2. LITERATURE REVIEW

2.1. **Introduction**

This literature review will explore the definition of chronic pain and the impact chronic pain has for the individual and the wider society, with an emphasis on chronic pain in the New Zealand context. The review will then examine the scientific basis of chronic pain and examine the history and current treatment options. The content of inpatient chronic pain programmes will be explored, with emphasis given to group and individual delivery. A comprehensive review will also explore previous predictor studies that have examined what baseline characteristics such as age, gender, pain intensity, psychosocial and catastrophising have more programme success in inpatient MPMP than others. The review will then further explore QE Health, an inpatient chronic pain programme in Rotorua, discussing its unique history and components of treatment, including recent changes in programme delivery and the outcome measures used.

2.2. **Definition and magnitude of chronic pain**

Pain is defined as 'an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage' (Merskey & Bogduk, 1994) and chronic pain as 'recurrent or persistent pain that has lasted longer than three months' (Merskey & Bogduk, 1994). This definition is used for classifying chronic pain because it is clear and easily understood; however, often the aetiology of pain cannot be explained and is not clear. For example, conditions such as fibromyalgia, irritable bowel syndrome, and back pain often have no clear musculoskeletal or neuropathic origin (Treede et al., 2015).

In order to recognise and classify pain conditions, the World Health Organisation (WHO) has updated the International Classification of Disease to include chronic pain in its most recent version (ICD-11) (WHO, 2018). There are now seven key conditions which represent all specific pain classifications. These are: primary chronic pain, chronic cancer pain, chronic postsurgical and post traumatic pain, chronic neuropathic pain, chronic headache, chronic visceral pain and chronic musculoskeletal pain (Treede et al., 2015). Chronic primary pain is used to classify conditions with no clear aetiology and describes pain that is found in one or more places, and which is associated with emotional distress or significant functional disability. In comparison, chronic secondary pain is linked to other diseases. The acknowledgement that chronic pain has psychosocial elements as part of the definition is hypothesised to make diagnosis and therefore treatment pathways easier to implement (Treede et al., 2015).

Chronic pain is a worldwide phenomenon. Estimates suggest that globally 10% of adults are newly diagnosed with chronic pain each year, and at any one time 20% of the adult population suffer from long-term pain (Goldberg & McGee, 2011). It can arise from illness, injury, or disease (Dahlhamer et al., 2018; Tsang et al., 2008; Elzahaf et al., 2012; Jackson et al., 2016; Vos et al., 2016) and is one of the most common reasons adults seek medical care (Smith et al., 2004; Schappert & Burt, 2006). It is linked to poor quality of life and limitations in daily functioning (Dominick et al., 2011). Chronic pain changes a person's ability to undertake normal tasks, it affects coping mechanisms, sleep patterns, and the ability to attend and undertake work (Pergolizzi, 2013). One quarter of those with chronic pain lose their jobs, and 16% feel their chronic pain is so bad that they sometimes want to die (Donaldson, 2009). Chronic pain is also a risk factor for premature death (Macfarlane et al., 2017) as well as accelerated cognitive decline (Whitlock et al., 2017).

Stigma is also often associated with chronic pain. Stigma is defined as when others view a person in a negative and devaluing way (Goffman, 2086). Stigmatising attitudes can lead to poor treatment, anxiety, isolation and a decrease in life satisfaction (Wilbers, 2014). Chronic pain patients may be perceived as gaining a social advantage, such as accessing financial benefits, avoiding work obligations, gaining sympathy or access to drugs (Fishbain, 1996). Because there is often no evidence of pathology associated with chronic pain, the patient's experience can be invisible to those looking on, and therefore they are often not believed or are labelled as malingerers (Glenton, 2003; Holloway et al., 2007; Slade, 2009). Double stigmatisation can occur if people rely on pain medication as these people may be labelled as potential drug seekers (Gardner & Sandhu, 1997). There are financial pressures also. Pain management is very costly, not only to the individual, but also to significant others and society (Ministry of Health, 2009). Costs are not just related to paying for health care, but there are indirect costs such as loss of productivity and tax revenue and disability compensation (Ministry of Health, 2009).

The new classification, chronic primary pain, mentioned by Treede et al (2019) is integral because it acknowledges that emotional distress that cannot be accounted for by another diagnosis of chronic pain, should be considered as a diagnosis in its own right. As psychosocial factors are predominant in those with chronic pain this acknowledges that those presenting with chronic pain may not only present with just a physical component but also psychosocial elements, such as anxiety and depression (Patten et al., 2003; McWilliams et al., 2006; Gatchel et al., 2007; Langley, 2011). Chronic pain is often considered to be comorbid with depression (Burke et al., 2015). It is estimated that the general population experiences depression at a rate of 7.6% (Pratt, 2014). However, between 12-72% of chronic pain patients experience

depression (Atkinson et al., 1991; Banks & Kerns 1996). Chronic pain patients also can maintain a state of stress (Reiss et al., 1986). One of the rationalisations for this is that pain indicates danger, so the body perceives pain as a threat and therefore this often manifests as fear and anxiety (Reiss et al., 1986). When pain is constant, hypervigilance can develop around not wanting to cause more perceived harm, thus the person becomes disabled in relation to performing day to day activities and has a fear of movement (McCracken, 1997). McCracken and Gross (1998) found that anxiety has an impact not only on a person's degree of disability but also in regard to increased depression and medication use.

2.3. **Chronic pain in the New Zealand context**

According to the New Zealand Health Survey (Ministry of Health, 2019), almost one in five adults (19.4%) experienced chronic pain that is expected to last or has lasted more than six months and is present almost every day. This equates to 763,000 adults experiencing pain almost every day, and is an increase from 17% in 2006/07, when chronic pain first appeared in the New Zealand Health Surveys (Ministry of Health, 2007). One reason for this increase is that New Zealandersare living longer (Ministry of Health, 2018b), so the aging population is increasing, and with aging the prevalence of chronic pain increases (Ministry of Health, 2016). The most recent New Zealand Health Survey shows that 8.5% of adults aged 15–24 years reported chronic pain, increasing to 33.5% of adults aged 75 years and over (Ministry of Health, 2019). One significant contributor to chronic pain statistics is osteoarthritis, a chronic condition that can develop over many years. One in ten adults in New Zealand (10.2%) have osteoarthritis at any one time, and this figure only increases with age, with half of adults aged over 75 years (51%) being affected (Ministry of Health, 2019). Another large contributor to chronic pain statistics is chronic low back pain, with back disorders being the leading specific

cause of health loss in the middle-aged (Ministry of Health, 2016). Compared with other long-term conditions of similar prevalence, chronic pain and its impact on individual function and health related quality of life has received poor attention (Dominick et al., 2011).

While New Zealand statistics are similar to other Western countries, there is evidence of inequalities of the impact of chronic pain within the New Zealand population. Adults living in the most socioeconomically deprived areas of New Zealand are 1.7 times more likely to be affected with chronic pain compared to those who live in the highest socioeconomic regions (Ministry of Health, 2019). Chronic pain prevalence is highest in people of European descent (21.3%), followed by Māori (20.3%) Pacific (14.7%) and then Asian (10.7%) (Ministry of Health, 2019). Significant health disparities exist between European and non-European cultures in New Zealand (Reid & Robson, 2000; Kingi et al., 2018). These disparities can lead to discrimination and marginalisation of non-European groups within the health sector, which adds to the related mistrust and reluctance of many Māori to engage with the health care system and may delay their seeking help for pain (McGavock et al., 2012, Lewis & Upsdell, 2018). A lack of understanding and acceptance of Māori views on health and healing is thought to contribute to the reported unwillingness of many Māori to engage with the healthcare system (Cram et al., 2003; Kerr et al., 2010). Culture is fundamental in influencing how people experience and express pain (Richardson, 2012). For example, Māori views on health and healing are different to Western biomedical views and often there is more focus on spirituality, family and mental wellbeing (Magnusson & Fennell, 2011). Specifically, the experience of pain is understood as more than a physical symptom in Māori and incorporates all of these dimensions (McGavock et al., 2012). Sir Mason Durie, a well-known Māori psychiatrist, developed the Te Whare Tapa Whā model of health and describes Māori health

as the interaction between four major dimensions: te taha tinana (physical health), te taha hinengaro (mental health), te taha wairua (spirituality) and te taha whānau (family) (Durie, 1985).

2.4. **Pain and the nociceptive system**

Before discussing the management of chronic pain, it is important to discuss how the nociceptive system works, and how it can go wrong. From the many parts of the brain that are activated when a person experiences pain, there is no doubt that the processing of noxious stimuli is complex (Apkarian et al., 2011). The perception of pain can be classified into sensory-discriminative, affective-motivational, as well as autonomic components (Melzack & Casey, 1968). Under normal conditions, noxious stimuli give rise to a pain experience that diminishes as healing progresses. Acute pain can transition to chronic pain, however, when secondary mechanisms, both at the periphery and within the central nervous system, misfunction (Voscopoulos & Lema, 2010). Under normal circumstances, when nociceptors detect tissue damage, they release glutamate and substance P from their central terminals onto dorsal horn neurons within the spinal cord (Todd, 2009). From here, the signal is projected via ascending pathways to the supraspinal regions, where the emotional and sensory components of pain are experienced. The sensory–discriminative component of pain gives precise information on the presence, character, location and intensity of pain (McCance & Huether, 2019). The pain experience is then registered in the anterior cingulate cortex, prefrontal cortex and insula of the brain (Seifert et al 2009). These higher centres are also involved in the emotional component of pain and may contribute to the high psychosocial dysfunction that accompanies chronic pain and ongoing experiences (Apkarian et al, 2005).

Everywhere along the entire nociceptive pathway, from the periphery to the cortex, the nociceptive signal is subjected to constant modulation in the form of both inhibition and facilitation (McCance & Huether, 2019).

Following injury, nociceptive signals are normally facilitated, to ensure the signal is sufficient to capture the individual's attention, before being inhibited as the tissue recovers. Sensitisation of nociceptors (peripheral sensitisation) and dorsal horn neurons (central sensitisation) both occur following tissue injury to facilitate the nociceptive signal. Central sensitisation can occur through a process called wind up, where the bombardment of signals from nociceptors results in a sustained depolarisation of dorsal horn neurons (Voscopoulos & Lema, 2010). Windup is usually short-lived lasting seconds to minutes but can lead to sustained central sensitisation when these neural adaptations persist after the nociceptive input has ceased (Fong & Schug, 2014).

Once sensitisation occurs the person experiences a high state of reactivity and a lowering of the threshold of what causes pain, resulting in an increased response to noxious (hyperalgesia) and non-noxious (allodynia) input. The barrage of chemicals and the brain's on-going experience of pain can also lead to more sustained neural plasticity, driving further physiological and anatomical changes to the nociceptive system, and contributing to the development of chronic pain (Voscopoulos & Lema, 2010). This leads to a mis-match between a patient's presentation and what they report, with what appears to be a greater pain experience then the actual stimulus (Woolf, 2011).

In addition to the spinal and peripheral mechanisms just described, the cerebral cortex also plays a major role in pain perception and modulation (Ringkamp et al., 2018). Descending modulation of nociception from supraspinal sites can have both inhibitory and facilitatory

effects on dorsal horn neuronal activity. These modulatory experiences can depend on the environmental context of tissue damage, as well as the individual's sensory-discriminative and motivational-affective drive (Voscopoulos & Lema, 2010). The affective component does not only involve an individual's emotions, but also other factors such as anticipation or fear (Price, 2000), past experiences and beliefs (Holmes, 2013), and cultural and ethnic beliefs (Krupic et al., 2018). The availability of environmental resources that can assist patients to understand their pain and facilitate normal psychosocial function can also impact on a person's perception of pain (Turk et al., 2016).

It is therefore obvious that a person's psychological state has a major influence on nociceptive processing and the experience of pain. Anxiety and depression are more prevalent in chronic pain patients (Asmundson & Katz 2009; Bair et al., 2003; Dominick et al., 2012; Gambassi, 2009), and depression, fear, stress and catastrophising are psychosocial risk factors for developing chronic pain (Brosschot, 2002). These emotions have a complex influence on modulating pain (Asmundson & Katz 2009; Rhudy & Meagher, 2000; Butler & Finn, 2009). Pain catastrophising and fear aggravate pain (Turk & Okifuji, 2002; Visscher et al., 2001), and if events are perceived as stressful this too can aggravate the symptoms in those experiencing chronic pain (Zautra et al., 2007; Fishbain et al. 2006; Conrad et al., 2007). This cognitive emotional pathway emphasises the fact that negative emotions enhance pain, and positive emotions generally inhibit pain (de Wied & Verbaten, 2001; Meagher et al., 2001; Rhudy & Meagher, 2000). It is unclear why central sensitisation may persist in some people, but it may be related to abnormal function of descending inhibitory and facilitatory pathways (Voscopoulos and Lema, 2010). In other cases, such as those with arthritis or immune

disorders, the experience of persistent nociceptor activation can provide ongoing stimulus to drive persistent central sensitisation (Clauw & Witter, 2009).

2.5. **Management of chronic pain**

Chronic pain management has moved from a cartesian model, that is if you treat the disease, the pain will lessen (Goldberg, 2008), to a model of understanding that pain is a 'disease of the person'. Therefore, traditional biomedical treatment approaches cannot address all problems that this population experience (Schatman, 2011). It is now accepted, as is seen in the previous section, that chronic pain is complex and consists of multiple cognitive, physical and psychosocial components. Gatchel et al. (2014) describe the history of how chronic pain treatment morphed into a multidisciplinary model of care because of these components. With a need for chronic pain management to move from a reductionist approach of treating the symptom of pain with opioids, through to the acknowledgement that chronic pain is multifaceted, incorporating biopsychosocial elements. And how a wide multidisciplinary approach that encompasses different disciplines bringing multiple skills became accepted. Gatchel et al. (2014).

These changes in approach came about with new understanding in nociceptive pathways, such as the 'gate control theory' introduced by Melzack and Wall in 1965 (Melzack, 1967). Around the time of the development of the gate control theory, Wilbert Fordyce, a clinical psychologist, linked the importance of behavioural psychology principles to the physical elements of pain management (Fordyce, 1976). These observations lead to an understanding that more was needed to sufficiently treat those with chronic pain, and so began the emergence of the first multimodal treatments for chronic pain (Fordyce, 1976). Vlaeyen and

Morley (2005) credit Fordyce as the leader of the 'cognition revolution' in chronic pain management, and as the first person to study cognitive behavioural treatment and initiate multidisciplinary pain clinics. However, it took until the late 1980s for pain clinics to gain credibility and momentum. The slow growth over that time was partially due to issues such as funding, organising staff and lack of the development of care models (Runy, 2007; Wells & Miles, 1991). During this time, other psychological models were used alongside the core components of activity, exercise and pharmacology to help change perceptions and behaviours. For example, Mayer & Gatchel (1988) developed the functional restoration model of chronic pain management that was popular during the 1990s. Functional restoration empowers an individual to regain, or get to maximum independence in their activities of daily living with the goal being to return to vocational and recreational activities (Feinberg et al., 2015). The fear avoidance model is often used as a platform for understanding the association between fear and movement. When movement and pain are thought to be harmful, this results in the avoidance of movement for fear of re injury. Therefore, this model is used to coach people that movement will not contribute to damage (Vlaeyn & Linton, 2000). The acceptance model is also used to help patients with the fear of movement. This model has the philosophy that failure to accept pain results in fear of movement and therefore a decrease in functional capacity and subsequent increase in depression. With acceptance of pain people are more likely to work through their pain (McCraken & Eccestan, 2005). However, one of the most accepted models in relation to chronic pain is the biopsychosocial model developed by Turk & Okufuji (2002). This model comprehensively encompasses all elements of the previous models to make a holistic emphasis on a person's functioning rather than on their pain (Turk & Okufuji, 2002).

Some of the psychological techniques that are adopted within many of these models involve cognitive behavioural therapy (CBT). CBT was initially developed as a tool for addressing depressive disorders. CBT is based on the principle that an individual's assumptions and interpretations of the situation at hand play a significant role in psychological stress, rather than the situation itself (Beck, 1970). Depressive people perceive situations in an unhelpful way, and respond with low mood and withdrawal, creating a vicious cycle (Beck et al., 1979). CBT incorporates a wide variety of treatments, including relaxation, biofeedback, guided imagery, and acquisition of other adaptive coping mechanisms. CBT has shown success in chronic pain management positively impacting on pain, disability mood and catastrophising (Williams, 2013). There is also a third generation of behavioural and cognitive therapy called acceptance and commitment therapy (ACT) (Hayes et al., 2001). The focus of ACT is to accept feelings, sensations and thoughts, rather than control or avoid them (Hayes et al., 2011). It is felt that this treatment model gives the individual more flexibility when working towards living with their pain, rather than fighting and feeling frustrated with their pain (Deer et al., 2013).

The success of biopsychosocial practice and cognitive behavioural models for managing patients with chronic pain is endorsed with a proliferation of sentinel research demonstrating its efficacy (Turk et al., 2002; Okifuji, 2003; Becker et al., 2000; Guzman et al., 2001; Flor et al., 1992; Gatchel, 2007; Karjalainen, 1999).

2.5.1. *The multidisciplinary pain management programme*

The ethos behind MPMPs is that the clinicians from different specialties work together with frequent scheduled communication about therapies, procedures and the patients (IASP,2019a). Care is delivered in a programmed and coordinated manner, and is patient-

centred, up-to-date and evidence-based (IASP,2019a). Treatment emphasis is on a range of strategies aimed at maximising pain reduction, improving health-related quality of life, independence, and mobility (Pergolizzi, 2013). Systematic reviews and meta-analysis have determined that MPMP are the most effective treatment of chronic, non-malignant pain (Scascighini et al., 2008; Turk et al, 2002; Guzmán, et al., 2001).

Collaborative team treatment has been shown to have positive results, with patients reporting improved health status, acceptance of care and higher levels of satisfaction (Mickan & Rodger, 2005). Often these teams are referred to as either interdisciplinary or multidisciplinary and the two are used interchangeably. 'Multidisciplinary' refers to clinicians from different disciplines who see the same patient, but who set individual goals and may not work as an integrated team. 'Interdisciplinary' refers to teams that work together, often across disciplines, with a common goal for the patient. Interdisciplinary programmes have evolved from multidisciplinary programmes, incorporating medical, psychological, functional, and physical treatment methods in an intensive, integrated manner (Bosy et al., 2010). However, there is a lack of firm evidence confirming what is a mainly theoretical assumption that interdisciplinary teams are superior (Giusti et al., 2017).

According to the IASP, MPMP should have a health care staff with a diverse range of expertise and skills, who can assess and treat the four components of chronic pain: physical, medical, psychosocial and vocational. These health care professionals are not limited to but may consist of psychologists, occupational therapists, physicians, nurses, physical therapists, social workers and counsellors (ISAP, 2019b). The range of therapies delivered by these speciality disciplines may include physical and occupational therapy, counselling, education, vocational rehabilitation as well as aerobic conditioning and functional restoration (Stanos, 2007).

Multidisciplinary teams may focus on a range of principles to guide their practice. Three of these, self-management, goal setting and skills training apply to the patient's daily routines, while maladaptive pain behaviour adaptation and cognitive restructuring deal more with the mental aspect (McCracken and Turk, 2002). To achieve these goals, there are numerous physical approaches, such as pacing and physical fitness. Psychological approaches and models such as cognitive-behavioural approaches, operant behaviour therapy, time contingent medication and acceptance-based approaches may also be included. Mind and body techniques may be integrated into the treatments, which can include deep breathing, and relaxation, using meditation and guided imagery (Stanos, 2007). There are many variances frof what constitutes a health professional team and variances of the modalities offered throughout MPMP communities, however there is a minimal standard required (IASP,2019a, British Pain Society, 2014).

A recent mapping review (Lewis et al., 2019) explored different characteristics of inpatient MPMPs that had been published in the literature, including clinical staff and therapy components. In reference to the typology of staff involved in care, it was observed in this review that almost all programmes included a physiotherapist (96%) and a physician (94%), who were normally additionally an anaesthetist/pain medicine specialist, psychiatrist, or rehabilitation specialist. Most MPMP also included a psychologist (80%), nurse (69%), or an occupational therapist (65%). Other clinicians utilised were social workers (31%), exercise or recreational therapists (24%), dietitians or nutritionists (11%), pharmacists (6%), vocational rehabilitation specialists (6%), and massage therapists (6%). It was found that most programmes offered an exercise or physical therapy component, for example the majority of the studies offered aerobic exercise (61%) followed by aquatic exercise (34%), strengthening

(31%) and flexibility training (30%). Of all the programmes, 7% stated their programme had a graded or progressive approach to delivery (Lewis et al., 2019). Interestingly, physical exercise and therapy had not changed in the forty years covered by the review, although there was more Tai Chi and Qigong incorporated in recent years.

Virtually all programmes reviewed offered a psychological component (99%). The most common component was relaxation/biofeedback, which was offered by 78% of the MPMPs examined. Psychological skills training such as assertiveness, stress management and problem solving were apparent in 60% of the programmes reviewed. The next most common factor was cognitive therapy (46%). Counselling/psychotherapy was offered in 35% of the studies, operant therapy in 33% and behavioural activation (30%). Education was provided in 78% of the studies, predominantly to do with pain mechanisms or neuroscience (40%) and psychological influences on pain and pain management (40%). Just under half of the studies (45%) offered reduction or withdrawal from medication, and 38% included involvement of family members within the programme.

Approximately one quarter of the MPMPs included the utilisation of passive treatment in the programme, of which 15% mentioned using massage and 12% the use of transcutaneous electrical nerve stimulation (Lewis et al., 2019). Some evidence based guidelines have recommended that passive treatments are appropriate for the management of chronic, non-cancer pain and endorse the use of manual therapy, such as mobilisation and spinal manipulation techniques, along with acupuncture, yoga and massage (Canadian Agency for Drugs and Technologies in Health, 2016). However, there is much discussion about the value of passive treatment modalities and there is a strong movement towards active treatment approaches that have robust evidence of effectiveness (Zusman, 2018; Kerry, 2017).

Although some of the studies in Lewis et al.'s (2018) mapping review differed slightly in their delivery, they all appeared consistent in incorporating the basic standards both in terms of the team of professionals delivering the programmes, and the basic standards of the components delivered, all of which aligned with current best practice guidelines (British Pain Society, 2013; IASP, 2019a).

The exact formula for content and delivery is not so transparent. It remains unclear what content results in the most beneficial outcomes, and if content need varies on condition. For example, there are no specific recommendations on the types and amounts of physical activity or types of individual components to be delivered for success (Scascighini et al., 2008; Ehde et al., 2014).

A challenge that exists is heterogeneity in the content of treatment approaches delivered in MPMP, which makes it difficult to establish if a modality has a direct relationship with outcome success (Williams et al., 2013). For the development of new and more effective treatments, it is important to understand approaches and processes of pain treatments and their causal relationship with beneficial outcomes (Cederberg et al., 2016; Ehde et al., 2014).

2.5.2. *Group and individual management*

Treatment in most MPMPs and is delivered either in group or in individual settings. 'Therapy' gained traction and popularity from the end of the nineteenth century to the 1960s, thanks to psychoanalytical theorist Sigmund Freud (Neukrug et al, 2015). In the 1960s, Carl Rogers began steering therapy towards a person-centred approach, which was predominantly achieved through individual psychotherapy (Rogers, 1957). Counselling and psychotherapy delivered in a shorter time frame became popular around this time and became a solution for

effective delivery considering real-world service needs. Instead of attending individual therapy, these briefer forms of delivery were a way to meet the needs of low income and community groups, especially combined with a movement at the time to bring mental health treatments into the community (See & Kamenetz, 1998). It is now accepted that group therapy delivery meets the increasing service demands being placed upon public and private sectors (Hellider, 2009). Currently, working with peers and utilising peer-based change are widely accepted methods of influencing changes in behaviour (Chen & Rybak, 2004). The benefits of group learning may also provide support for catharsis, sharing of information, provision of giving feedback, promoting bonding, and for participants to develop inter- and intra-personal skills (Haynes, 2012). By thinking and feeling differently and then practicing new ways of thinking that are taught in group therapy, patients are provided with an opportunity to help positively change the neuroplasticity of the brain (Doidge, 2014, Makinson & Young, 2012).

Individual therapy delivery also has benefits, because it can offer an enhanced sense of confidentiality and provides the therapist with an opportunity to continually reassess how their patient is progressing (Cuijpers et al., 2008). With individual therapy there is a stronger alliance with the therapist, therefore the needs of the patient can be individually tailored (Cuijperset al., 2008). Individual therapy also provides an opportunity between the therapist and patient to address emotional and personal issues that the patient may not feel comfortable revealing in a group setting (Stunkard & Wadden, 1993). For example, individual delivery has been more promising for treatment of disorders such as trauma related disorders (Roberts et al., 2015). A meta-analysis of CBT techniques for distress and pain in cancer patients revealed that individual therapy delivery was more effective than group treatment for pain and most other outcome measures (Nevonen and Broberg's, 2006). A further meta-

analysis (Cuijperset al., 2008) found the drop-out rate was fewer in those participating in individual treatments compared to group treatments. It was suggested that the personal relationship between the patient and their therapist is stronger than the cohesion between group members and the group leader, promoting the individual participation to stay to the end of treatment duration.

However, individual therapy may be considered labour-intensive, expensive, time-consuming, and providing less opportunity to learn from or help others in the group (Maletzky, 1999; Schwartz & Brownell, 1995). Peer-based interventions improve three areas: access to health care services, self-efficacy, and involvement in self-care activities (Doull et al., 2017). When applied in context to chronic pain MPMPs, delivery in a group format means that the experience of pain is normalised, and there is an opportunity to learn from the experiences of others in the group. This is set in a natural social setting, making it optimal for behaviour change and for learning (Miller & Rollnick, 2002). Group participation allows people to realise they are not alone, and this can be an opportunity to learn new ways to deal with pain flare ups (Turk & Gatchel, 2018). Further, group therapy provides these additional benefits in a cost-effective manner, ensuring that more individuals are able to receive care within existing budgets and delivered at a lower cost per case (Corey, 2011; Turk & Gatchel, 2018). Studies have found that group delivered therapy has positive effects on pain intensity, functional impairment, depression and anxiety in populations such as chronic myofascial pain (Bogart et al., 2007), low-back pain (Lamb et al., 2010) and in people with heterogeneous chronic pain symptoms (White, Beecham, &Kirkwood, 2008).

Meta-analyses and systematic reviews have found that there is little difference in outcomes between individual or group delivery styles, when looking at comparison studies across

physiotherapy, psychotherapy for multiple pain, and counselling populations. In a meta-analysis that explored individual and group delivery in psychotherapy practice, it was found that when identical doses and treatments were compared, there was no difference between the two formats (Burlingame et al., 2016). This is supported by numerous other studies in chronic pain cohorts. Toomey's (2015) systematic review examined 22 studies involving people with osteoarthritis or chronic low back pain and found no significant difference between the effectiveness of group-based physiotherapy-led self-management interventions and individual physiotherapy for any outcome. A randomised control trial (Turner-Stokes et al. 2003) compared cognitive behavioural therapy delivered with either a group or individual delivery in a MPMP setting found no significant differences between the two modes of treatment delivery.

Some studies, however, found group therapy had better outcomes; for instance a systematic review of 46 random controlled trials found that group-delivered courses that had healthcare input, resulted in more beneficial effects than individual, mixed or remote delivery for chronic musculoskeletal pain (Carnes et al, 2012). Dufour et al. (2010) compared an intensive individual therapist-assisted back muscle strengthening exercise programme to a group delivered back muscle programme in a MPMP for chronic lumber back pain patients. The results showed that it was slightly favourable for the group-based approach, however, it was not clinically significant.

Although MPMPs can offer the benefits of both individual and group delivery approaches to treatment, group delivery as an approach is gaining wider application. Lewis et al.'s (2019) mapping review found there has been a definite shift to a more group-based format over time. It was found that use of a group delivery format increased from 4% of MPMPs in the 1970-80s

to 43% in the 2010s. The evidence from the meta-analyses and systematic reviews, suggests that a group approach to treatment should be considered as an effective and cost-effective means to treatment delivery.

2.6. Predictors of success

Although MPMPs are largely successful, not everyone experiences beneficial outcomes. Much research in the field of chronic pain management has been devoted to prediction of who is predisposed to developing chronic pain in the first place, and which patient characteristics respond best to multidisciplinary treatment. The seeking of a 'pain personality' was of interest to early psychologists in order to predict who may be predisposed to chronic pain (Hathaway & McKinley, 1943, Blumer and Heilbrom, 1882). However, identifying a specific pain personality has been unsuccessful, and it is accepted that the perceived responses to pain can be due to the pain itself, and not a personality type (Sullivan and Braden, 1982). This has led researchers to focus more on specific personality traits such as anxiety or depression (Lumley et al., 2007) and further to evaluate the predictive power of these different individuals' traits and their response to pain (Turk and Melzack, 2011). It is important to understand the variables and processes that account for the positive effects of pain treatments (Cederberg et al., 2016; Ehde et al., 2014). Identifying who is at risk for better or poorer outcomes in MPMP can inform the development of new and more effective treatments and would mean delivery of personalised care for patients with chronic pain.

A detailed review of the literature was undertaken on studies that had examined the relationship between patient characteristics at baseline (predicter variables) and outcomes from inpatient MPMPs (outcome variables). All study types were included, including

retrospective and prospective studies. In total, 47 studies were identified and reviewed. The following key words were used "chronic pain" or "long-lasting pain" or "long-term pain" or "persistent pain" or "intractable pain" or "musculoskeletal pain" or "musculoskeletal disorder*" or "chronic muscular pain" or "shoulder pain" or "neck pain" or whiplash or "back pain" or "widespread pain" or fibromyalgia or FMA or "myofascial pain syndrome" or myalgia or "idiopathic pain" or "diffuse pain" or "aspecific pain" or "non-specific pain" or "non-cancer pain" or "non-malignant pain" or "benign pain" or arthriti* or osteoarthritis or "neuralgia" or "CRPS" OR "complex regional pain" OR "irritable bowel" OR "IBS" OR "temporomandibular disorder" or neuropathic or "spinal cord injury" or "spinal pain" or (chronic N4 pain) AND multidisciplinary or multiprofessional or multimodal or interprofessional or inter-professional or interdisciplinary or inter-disciplinary or biopsychosocial or "functional restoration" or "self management" or (pain N2 program*) or "pain school" or "back school" or "pain management" or collaborat* or integrat* or combin* or "pain clinic" or "pain cent??" or "pain program*" AND predict* or efficacy or outcome* or effect* or prognos* or influence* or "clinical trial" or random* "control* trial" or RCT or "observational" or "longitudinal or prospective or retrospective or "cohort" or "follow up" or "follow-up" or associate* or benefit AND inpatient or residential or inhouse.

The main findings are summarised in the following paragraphs under the predictor variable categories of demographic (e.g., gender, age, education and compensation/litigation), biomedical (e.g., pain duration, physical function) and psychosocial (e.g., depression, anxiety, catastrophising).

2.6.1. *Demographic predictor variables*

Age and gender were the most common demographic variables to be examined, and overall, they were poor indicators of treatment success. Twenty-four studies examined the relationship between age and six major outcome variables: pain, employment, quality of life, treatment success, psychosocial function and drop out. Eight studies (33%) reported a significant relationship between age and an outcome, however, the remainder (77%) of the studies showed no relationship with age. When there was a significant relationship, in most cases it was found that those who were younger had better outcomes. Aronoff and Evans (1982) found younger patients had greater change in pain, but the majority of other studies showed no significant relationship between age and pain outcomes (Tota-Faucette, et al., 1993; Moore et al., 1984; Goldberg & Maciewicz, 1994; Guck et al., 1988; King et al, 1994). Two studies examined the relationship between age and return to work, with both finding younger patients had better outcomes (Cairns et al., 1984; Kool et al., 2007). Couppe et al. (2017) also reported better outcomes for younger aged women in terms of quality of life. However, three other studies that looked at quality of life and age found no relationship (Bjornsdottir et al., Gough & Frost, 1996; Bremander et al., 2011). A number of studies used treatment success as an outcome. Two studies (Guck et al., 1986; Keel et al., 1998) found younger patients had more treatment success. However, Maruta et al. (1979) found no relationship in terms of treatment success. In terms of psychosocial outcomes, most studies showed no relationship with age (Tota-Faucett et al., 1993; Kleinke & Spangler, 1988). Schweikert et al. (2006) used programme dropout as an outcome measure and found that those who were younger were more likely to drop out of the programme, but other studies showed no relationship between age and dropout (Cassisi, 1989; King & Snow, 1989).

Twenty-five studies examined gender and its relationship with MPMP outcomes. Six studies (24%) found gender was significantly associated with an outcome, with the remainder (76%) showing no significant relationships. Most of the studies indicated that females had better outcomes than males, with the main outcome measures used being quality of life, overall programme success, psychosocial function, pain, physical function and programme dropout. Couppe et al. (2017) found women had greater treatment success in quality of life measures. However, this was contraindicated in other studies (Bremander et al., 2011; Gough & Frost, 1996; Hampel, 2009) that reported men had better outcomes, or that there was no difference between men and women. Multiple studies used pain as an outcome measure. Gough and Frost (1996) found that women benefited more in reduction of reported pain. However, all other studies that assessed this measure showed no relationship between pain and gender (Aronoff & Evans, 1982; King & Snow, 1989; Kleinke & Spangler, 1988; Kool et al., 2007; Lipchik et al., 1993; Tota-Faucette et al., 1993). Of the studies that looked at psychosocial outcome measures and pain, one showed that females had greater improvement (Hampel et al., 2009; Murphy et al., 2016). However, four studies showed no significant relationship between gender and psychosocial outcome measures (Kleinke & Spangler, 1988; Kool, et al., 2007; Tota-Faucette et al., 1993; Williams et al., 1988). King (1994) assessed overall programme success and found women had more positive outcomes, but other studies showed no significant relationships between gender and this variable (Guck et al., 1986; Keel et al., 1998; Maruta et al., 1979). Meng et al.'s (2011) study showed men had significant improvement compared to women in physical activity. Other studies had no significant associations between gender and physical improvement (Meng et al., 2011; Hampel et al., 2009, Williams et al., 1996). Finally, Schweikert et al. (2006), showed that males were more likely to drop out of

the programme. However, other studies assessing dropout showed no relationship with gender (King & Snow, 1989; Cassissi, 1989; Coughlan, 1995).

Ten of the studies evaluated whether education status predicted success. Three studies (33%) found that education impacted on outcomes, with the remainder (77%) showing no relationship between education status and outcomes. Guck el al. (1986), found that those with higher educational levels were involved in the least litigation following the programme. Keel et al. (1998) found the higher the participants' education level, the greater the number of days worked in the follow up year. One study showed that lower education resulted in a higher risk of dropout (King & Snow, 1989) however two studies showed no significant relationship between education and dropout (Cassisi, 1989; Kleinke & Spangler, 1988).

Fifteen studies assessed whether receiving workers' compensation was a predictor for outcome success. Of these, only five (20%) showed a significant relationship with at least one outcome measure. The studies with a significant relationship mostly indicated that receiving a form of compensation or being involved in litigation was an indicator for poorer outcomes. Cairns et al (1984) demonstrated that the best predictor of ability to work was not being on any disability, income or workers' compensation. This result was similar to Kool et al. (2007), who showed litigation and longer sick leave had a negative effect on the amount of days worked, and Guck et al. (1986), who found that those workers not on compensation had better treatment success. However, Keel et al. (1998) and Maruta et al. (1979) in their studies showed no significant relationship between treatment success and receiving compensation. Two studies (Kleinke and Spangler, 1988; Kores et al., 1990) found patients who were receiving worker's compensation engaged in more pain behaviour and rated their pain as more severe.

2.6.2. *Biomedical predictor factors*

Most studies used the outcome measure of pain intensity, change in pain, or physical functioning, and thirteen studies examined if pain predicted outcome. Of these, six studies (46%) showed significant outcomes. Overall, baseline pain predicted pain intensity after the programme. Those with high pain at baseline had a greater change in pain, however, their pain remained high (Angst et al., 2014; Aronoff & Evans, 1982; Moore et al., 1984; Keefe et al., 1981). Those with low pain at the beginning had lower pain at the end (Borys et al. 2015), and Neumer et al. (2013) found there was a decreased chance of being on a disability pension for those with lower baseline pain. The remaining six studies showed no significant relationship between baseline pain and outcome (Bremander et al. 2011; King et al, 1994; King & Snow 1989; Richardson et al., 1994; Keefe, 1981; Cassisi, 1989; Chapman & Pemberton, 1994; Goldberg & Maciewicz, 1994).

Function as an outcome predictor was also examined in seven studies. Four studies (57%) found that poorer physical baseline function predicted poorer outcomes. Lower baseline function was associated with being on a disability benefit at the end (Neuner et al. 2013), having a general negative effect (Verra et al., 2009), poorer function (Angst et al. 2014), and poor over all treatment success (Bremander et al. 2011). Three studies showed no relationship between baseline function and outcome (Moore et al., 1984; Schweikert et al., 2006; Angst et al., 2014).

Thirteen studies used pain duration as a predictor of success. Four studies (31%) showed that a shorter pain duration was a predictor of a better outcome, while the remaining (69%) did not show any significant relationships. Cairns et al. (1979) showed that a shorter pain duration was associated with decreased work time loss, while Roberts & Reinhardt (1980) found that

shorter pain duration resulted in a reduced number of hours spent in pain post treatment. Two studies (Keefe. (1981) and Maruta et al. (1979), showed a shorter duration of pain was associated with the best overall treatment success. However, a further three studies did not show any relationship between outcome success and pain duration (Keel et al., 1998; King, et al., 1994; Guck et al., 1986).

2.6.3. *Psychosocial predictor variables*

Psychosocial variables were more consistent predictors of outcome than the other predictor categories. Twelve studies assessed psychosocial variables, of which nine (75%) found a significant relationship. Of those with significant findings, Bremander et al. (2011) and Hampel et al. (2009) found quality of life was better at the end of the programme for those who were more depressed or who had more anxiety at baseline. Multiple studies showed a direct correlation between baseline and post-treatment values, with higher predicting a larger decrease in depression and anxiety respectively (Borys et al., 2015; Kleinke & Spangler, 1988; Keel et al., 1998). Angst et al. (2014) also showed that low depression was associated with lower discharge physical function.

King and Snow (1989) found people with high anxiety were more likely to drop out. However, anxiety was not a predictor of dropout in other studies (Coughlan, 1995; Schweikert et al., 2006). Tota-Faucette et al. (1993) found higher pain control and rational thinking predicted lower anxiety and depression. Neuner et al. (2013), found that poorer overall mental health predicted early retirement.

Three studies examined catastrophising as a predictor. Two (67%) found low baseline catastrophising was associated with treatment success (Angst et al., 2014) regarding anxiety,

depression and catastrophising outcomes (Farin, 2015), while the third study showed no significant relationships (Murphy, 2016).

2.6.4. *Quality of predictor studies*

A quality review was performed on the studies used in the above predictor review. Each study was reviewed according to 4 main criteria:

1) If the study was prospective or retrospective.

2) If the study was representative of the population.

3) If the outcome measures were measured accurately and objectively.

4) If the researchers had noted if there were losses to follow up.

This analysis demonstarted that of all the studies used in this review, 95% of the studies were prospective, all of the studies were representative of the population, and the majority of the studies (82%) used outcome measures accurately and objectively. However, almost half of the studies (48%) had noted losses to follow up. Over all the majority (93%) of the studies met two or more of the above criteria, demonstrating low risk of bias.

2.6.5. *Summary*

Although the studies that were included in this review often had mixed findings, and there were mixed results on the analysis of their quality, there are some noteworthy trends. The most consistent predictor variables were the psychosocial variables of anxiety and depression, followed by catastrophising, physical function and pain intensity. Variables that were not predominantly related to outcome were education levels, gender, age and litigation. These findings are consistent with Van der Hulst et al. ’s (2005) systematic review of back school and

multidisciplinary treatment outcomes in patients with chronic low back pain. This review established that neither age nor gender were predictive of outcome.

Also, confirming the biomedical predictor findings from the above review, Van der Hulst et al. (2005) found that pain duration consistently lacked predictive value. However, those patients experiencing high pain intensity and pain interference associated with physical function was predictive of reduced treatment success (Van der Hulst et al. 2005). De Rooij et al.'s (2013) systematic review of predictors of MPMP outcome for fibromyalgia, found depression and its associated problems were a barrier to effective MPMP treatment. Van der Hulst's systematic review on the contrary showed that depression was an inconsistent predictor of outcome (Van der Hulst et al., 2005).

Aligned with other predictor reviews on MPMP, Van der Hulst et al. (2005) also showed low levels of active coping skills at baseline were predictive of better outcome in pain, physical, and emotional functioning and global treatment effect. Yet other studies found the opposite, with more active self-management and positive cognitions and emotional characteristics such as a higher self-efficacy were associated with better treatment outcomes (Van der Hulst et al. 2005).

To date, there appears to be no exact answer as to what characteristics at baseline benefit most from MPMP. Broadly however, the three patient characteristics on baseline presentation that appear to be consistent predictors of outcome in MPMP are psychosocial factors, pain intensity, and function.

2.7. **QE Health**

QE Health is one of only three providers of intensive, multidisciplinary pain management programmes in New Zealand. The two District Health Board (DHB) funded services are the Auckland Regional Pain Service (TARPs) and Burwood Hospital Pain Management Centre in Christchurch, Canterbury. QE Health is a private provider based in Rotorua.

QE Health was established in 1942 as a rehabilitative hospital for soldiers returning from World War 2. At this time, daily programmes included exercise, counselling, recreation, physiotherapy, occupational therapy and spa treatments (QE Health, 2016). Currently, QE Health offers a three-week holistic intensive MPMP, as well as outpatient services, for people with chronic pain conditions. The MPMP is an inpatient three-week treatment programme (120 hours) run Monday to Friday, 8 hours a day. Patients are boarded in the facility during the week, leaving in the weekends. The predominant conditions experienced by those attending include fibromyalgia, osteo arthritis (OA), rheumatoid arthritis (RA), autoimmune disorders, ankylosing spondylitis, however there are also other musculoskeletal conditions. Treatment modalities offered on the three-week MPMP are sleep hygiene, pain education, medication review, goal setting, nutrition, relaxation, abdominal breathing, exercising, leisure groups, vocational training, graded exposure, massage, posture stabilisation, problem solving and mindfulness (Table 1)Due to Rotorua's geographical location, its point of difference is its access to thermal springs and hot pools for patient use, and therefore it is a facility with a specific focus on rheumatological conditions (Butterworth, 2012). It is believed that immersion in mineral water and the application of mud causes neuroendocrine and immunological responses, providing an anti-inflammatory, antioxidant, and chondroprotective effect (Gálvez et al., 2018). Studies provide evidence for a therapeutic

effect of spa therapy and balneotherapy in patients with RA, however little knowledge is available about the mechanism of action by which spa therapy improves symptoms (Fioravanti et al., 2011, Kloesch et al., 2012).

QE Health's MPMP content is delivered via individual and group discussions and involves a team of clinicians, including rheumatological specialists, nurses, physiotherapists, occupational therapists, personal trainers and massage therapists. The overarching delivery approach at QE Health is based on a biopsychosocial model, which incorporates teaching physiology, psychology and skills. This is delivered in sessions that use the EDUCATE philosophy of delivery which emhasises that the educater includes seven requirements for effective facilitation - enhancing understanding and retention, delivery of patient centred education, understanding the learner, communicating clearly and effectively, addressing health literacy and cultural competence and having teaching and education goals (Marcus, 2014). A typical week consists of approximately 33 hours of delivery with a breakdown of content and hours shown in Table 1. (A. Randell, personal communication, July 2017).

Table 1: Standard content and hours of the inpatient multidisciplinary pain management programme (MPMP) at QE Health.

Component	Content
Group education 10-12 hours	living healthily with chronic pain, communication and thinking, energy management, anatomy pathophysiology, pacing, posture and positioning, core stabilisation, muscle tension release, scheduling exercise, problem solving, goal setting, set back planning, sleep management, nutrition, lifestyle balance, pacing, barriers to rehabilitation, what is health, coping when pain flares, transition home, pain medication forum, orthotic foot care, stress and anxiety, explain pain, general health and wellbeing, specialist classes for rheumatology conditions, pain medication forum, communication and thinking, where after QE.
Practical 5-8 hours	leisure, relaxation abdominal breathing, mindfulness, community outing/group meal, graded exposure to activity, tai chi, back health, hip and knees care, foot health, self-massage, general health check
Physical 10-12hours	gym, circuit exercise class, pool exercises, recreational activities, hot pool, massage, posture stabilisation sessions.
Vocational 3 hours	vocational counselling, identifying transferrable skills, goal setting, working from core values
Individual 2 hours	physiotherapy, occupational therapy, psychology sessions when additional needs are identified

While initially DHB owned, QE Health is a now a private facility. It meets the requirements of a tertiary pain management service and accepts referrals from numerous DHB regions in central New Zealand, including Lakes, Hawkes Bay, Wairarapa, Capital & Coast, Hutt Valley, Mid Central, Whanganui, Marlborough, Taranaki and Waikato. General practitioners and specialists in these areas have referral rights to send patients to QE Health; however, most referrals are rheumatologist lead. The criteria for referral from these specialists are for people who have had pain for more than three months and are not responding to other treatments (QE Health, 2016). Currently, four to five people attend the programme weekly, with approximately 300 people completing the inpatient three-week MPMP annually (Queen Elizabeth Health, 2016).

2.7.1. *QE Health programme*

Historically, QE Health's MPMP interventions were delivered to the patient by the clinician in a one-on-one setting, with some group activities. In 2015, an independent audit recommended that many of the one-on-one treatments be replaced with group and self-management focused education. It was rationalised that rather than a group being just for the purpose of information sharing, it would provide structured therapy with benefits such as instillation of hope, optimism and supporting self-efficacy. The group provides a social experience to practice new behaviours, attitudes and thoughts, and assists learning via imitative behaviour and interpersonal processes (Chen & Rybak 2004; Queen Elizabeth Health facilitator's manual, 2019). It was also felt that the intense input that individual one-on-one treatments provided would not be sustainable upon discharge. Therefore, it would be more beneficial to get patients to take on a self-management style, which is emphasised in group classes, finding ways to adapt and cope with their pain throughout the pain management programme so that they could independently maintain their own pain-related goals upon discharge (Randell, 2017).

QE Health accepted the recommendation to move to a more group-based focus (SeeTable 2). Prior to 2015, massage therapy was available 4-5 times a week. This modality is still part of the programme at QE Health but currently is available only once a week. In the old schedule, patients received individual physiotherapy treatments of up to 5 sessions per week. In the new programme, this has been reduced to twice a week. Additional physical therapy, psychology and OT are available as a 1:1 session for clients in the new programme whenever specified as necessary by the MPMP team.

It is currently unknown if the changes in programme structure at QE Health were beneficial in terms of patient outcomes. This is the focus of the first experimental study in this thesis. There is also a need for patient characteristics to be explored in more detail as to the affect these have on treatment outcomes (Scascighini et al., 2008). This was the focus of the second experimental study. Given the financial constraints, demand for appropriate healthcare, and rising numbers of patients experiencing chronic pain it would be beneficial to determine what patient types QE Health currently serves best.

Table 2. Example of the QE Health programme before (Individual delivery/timetable A) and after (Group delivery/timetable B) the change in programme structure

Individual Delivery					
Time	**Mon**	**Tuesday**	**Wed**	**Thursday**	**Friday**
0730	Pool/spa	Pool/spa	Pool/spa	Pool/spa	Pool/spa
0800	Intro	Meeting morning review	Meeting morning review	Meeting morning review	Meeting morning review
0830	gym	recreational activities	circuit exercise class	Individual review	pool exercises
0930	wax	vocational counselling	1.1 massage	Goal setting	1.1 massage
1030	1.1 massage	nutrition	leisure group	core values	Lifestyle balance
1130	Exercise pool	stress and anxiety	anatomy	pacing	Vocational follow up
1230	lunch	lunch	lunch	lunch	lunch
1300	Education medications	1.1 Physio	Education communication	1.1 Physio	coping when pain flares
1400	energy management	Posture stabilisation	Problem solving	transferrable skills	Explain pain
1500	1.1 Physio	health and wellbeing	1.1 psychology	graded exposure to activity	self-massage
1600	mindfulness relaxation	abdominal breathing	mindfulness relaxation	tai chi	mindfulness relaxation

Group Delivery					
Time	**Mon**	**Tuesday**	**Wed**	**Thursday**	**Friday**
0730	Pool/spa	Pool/spa	Pool/spa	Pool/spa	Pool/spa
0800	Meeting morning review	Meeting morning review	Meeting morning review	Meeting morning review	Meeting morning review
0830	gym	recreational activities	circuit exercise class	Individual review	pool exercises
0930	wax	1.1 massage	Graded exposure	communication and thinking	pacing
1030	sleep hygiene	barriers to setbacks	Lifestyle balance	Goal setting	community outing/group
1130	graded exposure	Exercise pool	Vocational follow up	Problem solving	Spa massage
1230	lunch	lunch	lunch	lunch	lunch
1300	Aquatics pool	anatomy	Posture stabilisation	What is health	stress and anxiety
1400	1.1 Physio	Education communication	Education	1.1 Physio	vocational counselling
1500	leisure group	Energy management	Explain pain	Problem solving	Weekly planner
1600	mindfulness relaxation	abdominal breathing	mindfulness relaxation	tai chi	mindfulness relaxation

2.7.2. *Measuring outcomes at QE Health*

Before discussing the outcome measures used at QE Health, a brief history of outcome measure assessments at chronic pain clinics follows. The IASP recommend that MPMPs should routinely collect and summarise data on the characteristics and outcomes (including pain intensity, psychological distress, function, and quality of life) of the patients evaluated and treated (ISAP, 2019b). There has been a push to establish and standardise core outcome domains across MPMPs to provide a consistent and holistic evaluation of treatment effects and facilitate comparison across programmes (Turk& Swanson, 2007). Historically, there has been a lot of variability in the outcome measures used in clinical trials evaluating MPMPs. In turn, this has hindered evaluations of the efficacy and effectiveness of treatments. In recognition of this, the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) has recommended core outcome domains and specific outcome measures for chronic pain trials to allow a standardised approach thus providing the ability to allow comparison between studies. The four domains recommended to be included in assessment are: pain intensity, physical functioning, emotional functioning, and a patient rating of improvement (Dworkin et al., 2008).

The mapping review from Lewis et al. (2019) showed that the most common domains measured in studies of MPMPs were pain intensity, anxiety, depression, coping, or self-efficacy. 80% of studies assessed pain intensity, and psychosocial function. 75% of studies assessed anxiety, depression, coping, or self-efficacy. Self-reported physical function was assessed in 67% of studies and a physical function test was undertaken in 27% of studies. This shows that most studies, and clinics, followed IMMPACTs domain guidelines, however this is

not the case in all clinics, and there is a lack of consistency of studies assessing patient-reported outcomes.

There has also been a drive for consolidated reporting of outcomes across practices, bringing together information from multiple pain services. Established registries currently participating in formalised databases in Canada, the United States of America, and the United Kingdom. These are the Quebec Pain Registry (Choinière et al., 2017), the Collaborative Health Outcomes Information Registry (Collaborative Health Outcomes Information Registry, 2015) in the United States of America, and the Pain Audit Collection System (Griffiths et al., 2003) in the United Kingdom. The Electronic Persistent Pain Outcomes Collaboration (ePPOC) was established in 2013 to assist in evaluating specialist pain management services for people with chronic pain in Australasia. The information obtained is used within each pain service to assess and monitor patients and is also submitted to a central coordinating site for analysis, reporting, and benchmarking purposes. Most of the specialist pain management services in Australia are now participating in this electronic outcome programme, with twenty-four services in New Zealand also joining the collaboration (ePPOC Clinical Reference Manual, 2019). Based on the IMMPACT guidelines, the standardised assessment tools used under the ePPOC are the Brief Pain Inventory (BPI), Depression Anxiety and Stress Scales (DASS-21), Pain Self-Efficacy Questionnaire (PSEQ), and the Pain Catastrophising Scale (PCS) (ePPOC Clinical Reference Manual, 2019).

Although IMMPACT have made recommendations on domains to be assessed, they don't say when they should be assessed. The ePOCC clinical reference manual recommends that follow up is done at three months and provides a follow up questionnaire, it is unclear how effective

follow up reporting is, and often is only reflecting outpatient programmes (ePOCC Clinical Reference Manual, 2019).

QE Health's outcome measures have changed numerous times over the past six years. The assessment tools used prior to November 2015 were the McGill Pain Questionnaire (MPQ), Stanford Health Assessment Questionnaire (HAQ), Hospital Anxiety and Depression Scale (HADS), the EuroQuol-5D (EQ-5D) and the QE Health Questionnaire. These outcome measures were then changed in November 2015. At this time, QE Health had two separate MPMPs running, a District Health Board (DHB)funded programme and an Accident Compensation Corporation (ACC)funded programme. The changes in outcome measures were made to align with the outcome measures required by the ACC programme funders (Table 2)The tools used at this time were the Pain Self-Efficacy Questionnaire (PSEQ), the Recreational Activities of Daily Living (RADLs), the Hospital Anxiety and Depression Scale (HADS) and the QE Health Scale. On review of these measures and comparing them to the IMMPACT recommendations, the self-reported domain is missing.

The outcome measures were reviewed again in November 2017, and it was suggested that QE Health would benefit by changing the outcome assessments to those used by the ePOCC. After consultation with senior management and staff at QE Health and Auckland University of Technology researchers, it was decided that adopting these new outcome measures will enable dataset collection that includes a broad range of assessment tools which encompass the multidimensional nature of chronic pain. At the same time the new outcome measures are standardised to other MPMPs in Australasia. In January 2018, QE Health implemented a change to the assessment tools utilised by ePPOC.

The outcome forms are filled out by the patients at two time points, prior to commencement of the three-week programme and on completion of the programme. Two weeks before commencement of the programme QE Health send the admission questionnaires out to patients to fill out and bring in with them when they arrive, if this is not completed prior then on the first day of the programme time is set aside for completion, this is done in hard copy at the facility. This process is repeated on completion of the programme.

Table 3. Outcome measures used by QE Health from prior to 2015 through to the present

Assessment tools prior to November 2015	Assessment tools established November 2015	Assessment tools established January 2018
McGill Pain Questionnaire (MPQ)	Pain Self-Efficacy Questionnaire (PSEQ)	Brief Pain Inventory (BPI)
Stanford Health Assessment Questionnaire (HAQ)	Recreational Activities of Daily Living (RADLs)	Depression, Anxiety Stress Scale (DASS21)
Hospital Anxiety and Depression Scale (HADS)	Hospital Anxiety and Depression Scale (HADS)	Pain Catastrophising Scale (PCS)
EuroQuol-5D(EQ-5D)		Pain Self-Efficacy Questionnaire (PSEQ)
QE Health Scale	QE Health Scale	

2.7.3. *QE Health Scale*

QE Health developed its own 28-item holistic assessment tool, the "QE Health Scale" (see Appendix A). The scale is based on a concept called "health change process therapy", which identifies the process of how health is achieved by people with physical disabilities (Faull and Hills, 2006). It is designed to predict where a patient is on their health change pathway. The health change theory has the underlying conviction that those who experience ill health can be in identity shock and are often emotionally and spiritually challenged as they come to terms with their condition (Faull & Hills, 2007). It is a further thought that physical, social and psychological wellbeing is a reflection of spiritual health and is achieved by successfully confronting change and using creative problem-solving. The QE Health questionnaire consists

of 28 items that each have a 5-point Likert response, ranging from 1 (“all the time”) to 5 (“never”). Example questions include:

In the past week, how frequently did you understand, accept and value yourself, warts and all?

In the past week how frequently did you have an ultimate goal, and set small, achievable steps to achieve it?

The total score achievable for the QE Health scale is between 28 and 140, with higher scores indicating better holistic health status. The QE Health Scale is designed to predict where a person is in terms of his/her anxiety, motivation and perceived obstacles, across physical, social and psychological domains. The score provides a framework for the development of a quantitatively based assessment, triage and treatment approach. The QE Health scale has satisfactory reliability, a face content criterion, discriminate and construct validity (Faull & Hills, 2007).

2.7.4. *Brief Pain Inventory*

The Brief Pain Inventory (Dworkin et al., 2008; Appendix B) is broken into two separate measures: pain intensity and pain interference. Intensity is assessed by the patient rating the intensity of their pain based on four questions: what is the worst, average and least pain they have had over the last week, and how their pain is right now. For each of these four questions, the patient rates their pain from 0-10, with 10 being the worst possible pain imaginable. An average score is generated by summing the scores and dividing by the number of questions completed. Severe pain is considered when a score is between 7-10, moderate pain between 5-6 and mild pain with a score between 1-4. According to the IMMPACT recommendations, an

improvement of 10% or more indicates a minimally important change, 30% or more moderately important change, and 50% or more substantial clinically important change (Dworkin et al., 2008).

The pain interference score is obtained from patients rating how much their pain has interfered with their everyday function. Seven questions are asked covering the patient's general activity, mood, ability to walk and to work (either outside the home or during housework), how they are relating to others, as well as their sleep and enjoyment of life. For each of the seven questions, the patient must rate their pain interference on a scale of 0 to 10, where 0 = 'Does not interfere' and 10 = 'Completely interferes'. An interference score is calculated by the summing of the seven scores and then dividing the sum by the number of questions the patient completed. According to the IMMPACT recommendations, a clinically significant change is a change of one point or more over the average of the seven interference items points (Dworkin et al., 2008). The Brief Pain Inventory has shown to be a valid and reliable tool (Pelayo-Alvarez et al., 2013).

2.7.5. *Hospital Anxiety and Depression Scale (HADS)*

The HADS assesses psychological wellbeing in those who do not have a mental health diagnosis (Zigmond and Snaith, 1983). The patient is asked to rate their experiences over the last week. There are a total of 14 questions, seven of which pertain to anxiety and seven pertain to depression. Each category can have a total score of 21, a normal score is 0-7, borderline abnormal is 8-10, and finally abnormal is 11-21. The HADS has an acceptable level of diagnostic accuracy (Norton et al., 2013) and has been shown to be a valid and responsive measure in people with chronic pain conditions (Turk et al., 2015). A cut-off score of eight is

may indicate possible anxiety or depression, therefore scoring below the clinical cut-off post-treatment defines clinical significant change (Herrmann, 1997; Jacobson and Truax, 1991). (Appendix C)

2.7.6. *Pain Catastrophising Scale (PCS)*

The PCS measures a patient's thoughts and feelings of catastrophising related to their pain. Catastrophising is described as "an exaggerated negative mental set brought to bear during actual or anticipated painful experience" (Sullivan et al., 2001). Three subscales are tested, including helplessness ("There is nothing I can do to reduce the intensity of the pain"), rumination ("I can't stop thinking about how much it hurts") and magnification ("I worry that something serious may happen") (Osman, 2000; Sullivan & Bishop 1995). Each question has a Likert scale ranging from 0 (not at all) to 4 (all the time). The participant is asked to reflect on past painful experiences, and to indicate the degree to which they experienced each of 13 thoughts or feelings when experiencing pain. (Appendix D)

The PCS has been shown to have adequate to excellent internal consistency (Sullivan & Bishop 1995). The PCS has proved to provide reliable and valid reports when used in different chronic pain samples (Miró et al., 2008). Clinically significant scores for each of the subscales are a score of 11 for Rumination, a score of 5 for Magnification, and a score of 13 for Helplessness. With the scores combined, a score <20 is considered mild, a score of 20-30 is considered high, and > 30 is severe catastrophising. Clinically significant change requires a change in score of six or more points, combined with movement to a different severity category (Nicholas, 2014).

2.7.7. *Pain Self-Efficacy Questionnaire (PSEQ)*

The Pain Self-Efficacy Questionnaire (PSEQ) is a 10-item questionnaire developed to assess the confidence people with ongoing pain have in performing activities while in pain. The PSEQ total is a sum of scores from 10 questions (Nicolas 1989, 2007). Each question has a Likert scale ranging from 0 (not at all confident) to 6 (completely confident). Total scores range from 0 to 60, with higher scores equating to greater confidence (Turk et al., 2016). High PSEQ scores provide a useful tool for evaluating outcomes in chronic pain populations, and high PSEQ scores are associated with clinically significant functional levels. The PSEQ covers a range of functions, including household chores, socialising, work, as well as coping with pain without medication (Nicholas, 2007).

Internal consistency of the PSEQ is high and test-retest reliability is high over a 3-month period (Nicholas, 2007). Scores of around 40 and above (Cohen et al, 2000; Adams & Williams, 2003) are associated with a return to work and maintenance of functional gains (Couglan et al., 1995; Nicholas, 1989). (Appendix E)

2.7.8. *Depression Anxiety Stress Scale-21 (DASS-21):*

The DASS-21 measures the negative emotional states of depression, anxiety and stress over the previous week. It comprises 21 questions separated into the three components. Each of the three DASS-21 scales contains 7 items. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The stress scale is sensitive to levels of chronic non-specific arousal. It assesses difficulty relaxing, nervous arousal, and being easily

upset/agitated, irritable/over-reactive and impatient. People are asked to use 4-point frequency scales to rate the extent to which they have experienced each state over the past week. To enable comparison with the full-scale DASS-42 scores are multiplied by 2

(Lovibond & Lovibond,1995). The three scales range from normal to severe for each category. Depression ranges between (0-9) for normal to the highest score of (28+) which is extremely severe. Anxiety ranges from normal being between (0-7) to extremely severe at (20+). Stress scores range from normal (0-14) to extremely severe (34+). Clinically significant change is indicated when the difference between the scores at Time 1 and Time 2 is a five or more-point change on the full scale DASS-21, combined with a move to a different severity level (Johnson, 2014). The DASS-21 scale has proven validity and reliability (Antony et al., 1998). (Appendix F).

2.7.9. *Summary*

This literature review has explored the social, physiological and psychological impact of chronic pain globally and within a New Zealand context. The philosophy of, and evidence for, MPMPs for managing chronic pain has also been addressed. Components of MPMP practice have been identified, however there is a need to establish what components are needed for best practice management. Although this review has highlighted the demographic, psychosocial and biomedical factors that tend to be associated with who does well in MPMPs, there is a need to understand in more detail the patient and programme characteristics predictive of outcome, particularly in a New Zealand context. Therefore, Chapter 3 will explore whether QE Health's MPMP was more effective when delivered with a more group-based approach compared to a predominantly individual-based approach, while Chapter 4 will

explore whether patients' baseline characteristics at admission can predict the three-month outcome.

Chapter 3. STUDY 1: DOES THE MODIFIED THREE-WEEK MULTIDISCIPLINARY CHRONIC PAIN PROGRAMME AT QE HEALTH IMPROVE PATIENT OUTCOMES?

3.1. **Introduction**

There is a necessity to determine optimal delivery formats within MPMPs, and to evaluate changes made to existing services to inform and improve future programmes. Therefore, this study sought to analyse whether a change in a 3-week MPMP at QE Health that went from an emphasis of working one-on-one (one clinical team member to one patient) to a group delivery focus (one clinical team member to four to six patients) resulted in different patient outcomes at the end of the programme. The IASP advocates collecting ongoing data about the characteristics and outcomes of patients attending MPMPs to facilitate quality pain management, and to contribute to evidenced based treatment and management of pain through research (IASP, 2009b). Understanding the treatment modalities that contribute to positive effects in pain treatment programmes is vital to provide the best options available for patients with chronic pain (Cederberg et al 2016; Ehde et al. 2014). This research will specifically ask whether the group delivery approach was any more successful than the individual delivery of the QE Health programme, when evaluating the outcome measures; Hospital anxiety, Hospital depression and the QE Health scale.

3.2. **Methodology**

This study was a retrospective cohort study using prospectively collected data. This study design meant that there could be comparison of outcomes between two groups, a group that received Individual delivery and a group that received Group delivery. With a retrospective

cohort design, the participants were identified at the beginning of a study from past records and their outcome, and risk was assessed (Celentano & Moyses, 2019).

This researcher's guiding philosophical world view is post-positivism. Research under this paradigm makes claims that are either refined or abandoned if other claims are more warranted. When looking at the knowledge gained by using a post-positivist lens, the researcher focuses on objectivism that exists in the world; this is done by aligning the behaviour of individuals with numeric observations and measures (Creswell, 2014).

3.2.1. *Study protocol*

Clinical data was obtained from all patients who attended the QE Health MPMP from January 2014 to November 2015 (Individual delivery) and from a separate cohort who attended from February 2016 to March 2017 (Group delivery). The same clinicians delivered the two programmes over this time frame. To ensure that the MPMP was fully implemented from the changes introduced in December 2015, a 2-month change-over period was factored into this study. Therefore, no data were included from patients who attended during December 2015 and January 2016 to allow for a period of transition and to give clinicians delivering the new intervention time to adjust to the new structure. All patients that had attended QE Health more than once were also eliminated from the study.

Data had been collected by QE Health as part of routine clinical practice. The inclusion criteria were patients who attended either two or three weeks of the MPMP in the specified date ranges, were 18 years of age or older, and had full sets of HADS and QE Health Scale scores at entry to the programme and at completion of the programme. People with major psychiatric conditions were excluded as they may respond differently to the pain management

programme compared to others. People under 18 years of age were excluded as the programme is directed at adult populations (e.g. group activities, education content). Because this was a cohort study, the patients were not recruited for a trial intervention, therefore no formal sample size/number was needed for the analyses to be formally carried out. The discussion's strengths and limitations sections elaborate on the relative strengths and limitations of the study's sample size.

3.2.2. *Ethical considerations*

Ethical approval was granted from the Auckland University of Technology Ethics Committee (AUTEC) (Application: 18/66 see Acknowledgements). De-identified data were provided to the primary researcher by QE Health staff. The researcher then entered the de-identified participant data into a computer while on the premises at QE Heath. All information was stored securely on a QE Health computer with codes used to identify participants in the research database. The codes could only be accessed by the researcher and the CEO of QE Health.

3.2.3. *Outcome measures*

The QE Health Scale and the Hospital Anxiety and Depression Scale (HADS) were used to evaluate outcomes, as it was only these questionnaires that were consistently applied throughout the study period. The HADS scale was separated into anxiety and depression components to provide separate outcome measures for analysis. The outcome measures were obtained at entry to the programme (baseline) and at completion of the programme (discharge). Patient demographic data collected at the commencement of the programme included age, gender, ethnicity (NZ European, Māori, Pacific Island, Asian and Other) as well

as the patient's presenting condition on admission to the programme. When identifying what condition patients had for this study, the condition that was used was what had been recorded on the patient's admission notes. These conditions had been categorised previously by referring physicians, or if there was no diagnosis, the QE Health rheumatologist would review and then ascribe a diagnosis. Often conditions are overlapping so the primary diagnosis was taken from the patient's chart. The conditions the patient presented with were divided into three main categories; 1. Fibromyalgia, 2. Arthritis (including both RA and OA), 3. Other chronic pain which included all other conditions.

3.2.4. *Data analysis*

Descriptive statistics were utilised to summarise the age, gender, ethnicity and diagnosis of participants in the study, as well as the HADS and QE Health outcome measures. To establish if the two cohorts were similar at baseline, an independent sample T-test was used to compare the baseline demographic data for the continuous variables (age and the clinical outcome measures) between the Individual delivery and Group delivery approaches. Chi square analysis was used to compare the categorical variables (gender, presenting condition, and ethnicity) between the two groups. For the variables with a small cell count, a Fischer's exact test was utilised.

Paired T-tests were used to compare baseline and discharge data (QE Health Scale, HADS depression, HADS anxiety) within each group to determine if there were any differences between the individual and group delivery. Regression analysis then compared the difference between Individual and group delivery in relation to the outcome measures of anxiety, depression and QE Health, controlling for base line values.

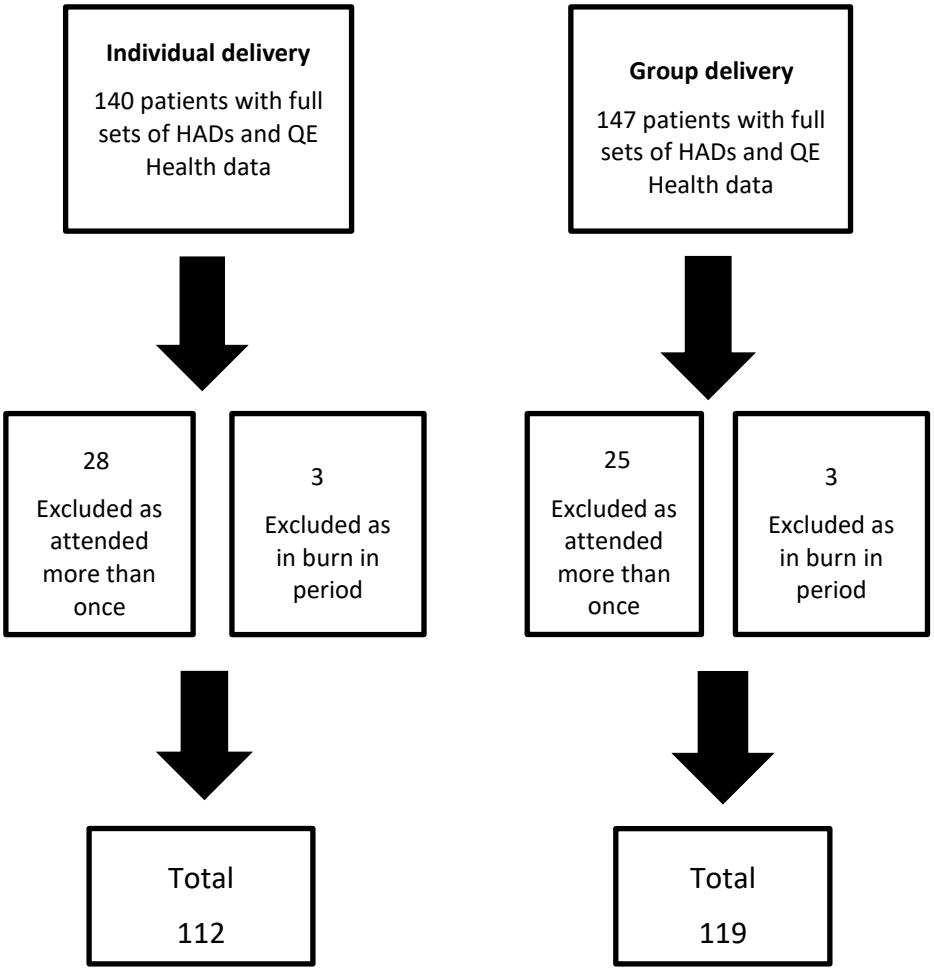
Regression analysis was also used to compare the differences between the Individual and Group delivery in relation to condition, age, gender, and the outcome measures anxiety, depression and QE Health Scale. Stratified analysis was additionally carried out for ethnicity, condition and gender. In all regressions Individual delivery was the reference and all regressions controlled for baseline values.

Due to the time proximity of the two groups, no appraisal of cohort effect was carried out. Statistical significance was considered with a p-value (< 0.05). SPSS version 25 (IBM, USA) was used for all statistical analyses.

3.3. *Results*

A total of 140 patients who had full sets of HADS and QE Health data in the period between July 2014 and December 2016, represented those who received the more individual delivery of treatment. Of these 28 were not included as they had attended the programme more than once, and three patients were not included due to the burn in period. A total of 147 patients with full sets of HADs and QE Health data were available from January 2016 to June 2017 and represent those who participated in the more group delivery approach. Of these 25 were not included as they had participated in QE Health's programme more than once, and three were not included as they were part of the burn in period (Figure 2).

Figure 1. Recruiting process



A summary of the demographic data is shown in Table 4.

Table 4. Demographic and baseline clinical characteristics of participants. Data are presented as N (%) unless otherwise indicated.

	Individual delivery (N=112)	**Group delivery (N=119)**	**Between group P-value**
Age (years)	56 (±17)	56 (±18)	0.88
Gender - Female	99 (88%)	98 (82%)	0.21
Ethnicity			
European	92 (82%)	79 (66%)	0.01
Māori	11 (10%)	19 (16%)	0.17 ▪
Pacific	1 (<1%)	2 (2%)	0.10 ▪
Asian	4 (3.6%)	1 (<1%)	0.20 ▪
Other	4 (3.6%)	18 (15%)	0.03 ▪
Condition			
Fibromyalgia	37 (33%)	33 (28%)	0.383
Arthritis (RA and OA)	40 (36%)	38 (31%)	0.546
Other chronic pain (musculoskeletal pain, chronic pain)	35 (31%)	29 (24%)	0.152
Clinical Outcomes			
QE Health	89.5 (±26)	92 (±34)	0.54
HADS Anxiety	9.3 (± 4.2)	10.3 (± 4.7)	0.09
HADS Depression	8.5 (± 4.5)	8.7 (± 4.2)	0.71

Note: QE Health = QE Health Scale HADS = Hospital Anxiety and Depression Scale.
RA=Rheumatoid arthritis, OA= Osteoarthritis
Fischer's exact test ▪

Paired T tests showed improved outcome scores across all outcome measures between admission and discharge (all P<0.001; Table 5).

Table 5. Pre- and post-treatment scores of the Individual and Group delivery

	Mean	SD	*t value*	P value
Individual delivery				
Pre QE-Health	89.5	26.1		
Post QE-Health	111	25.8	8.9	<0.001
Pre HADS-Anxiety	9.3	4.2		
Post HADS-Anxiety	6.2	3.7	-9.2	<0.001
Pre HADS-Depression	8.5	4.5		
Post HADS-Depression	4.7	3.0	-8.4	<0.001
Group delivery				
Pre QE-Health	92	34.5		
Post QE-Health	118	42.2	11	<0.001
Pre HADS-Anxiety	10.3	4.7		
Post HADS-Anxiety	6.7	4.2	-9.2	<0.001
Pre HADS-Depression	8.7	4.2		
Post HADS-Depression	4.6	3.6	-11.2	<0.001

Note: QE Health = QE Health measure; HADS = Hospital Anxiety and Depression Scores

To determine the number of individuals who had clinical anxiety and depression published cut-off values were used. There were notable decreases in the proportion of participants who had clinical anxiety and depression according to these cut-offs in both those who were in the individual delivery group and those in the group delivery approach (Table 6).

Table 6. Pre and post HADS Anxiety and Depression scores of individual and group participants showing the number of patients who had clinically relevant results pre- and post-programme.

Individual delivery (N=112)				
Number of participants with clinical Anxiety and Depression Pre- treatment		**Number of participants with clinical Anxiety and Depression post-treatment**		**Overall decrease**
Anxiety	N=71 (64%)	Anxiety	N=38 (34%)	30%
Depression	N=64 (57%)	Depression	N=22 (20%)	37%
Group delivery (N=119)				
Number of participants with clinical Anxiety and Depression Pre treatment		**Number of participants with clinical anxiety and depression Post treatment**		
Pre HADS-Anxiety	N=74 (62%)	Post HADS-Anxiety	N=45 (38%)	24%
Pre HADS-Depression	N=71 (60%)	Post HADS-Depression	N=24 (20%)	40%

Regression analyses showed no significant differences between the two groups in relation to the outcome measures of HADS anxiety, HADS depression and QE Health scale. Therefore, there was no difference between the two delivery methods ($P > 0.05$; Table 7).

Table 7. Results of the regression analysis for determining change between group and individual delivery. Each variable HADS Anxiety, HADS Depression and QE Health controlled for the baseline of each variable.

Variable	**β**	**SE**	***t value***	**P value**	**CI**	
HADS Anxiety	-0.07	0.44	-0.17	0.87	-0.99	0.78
HADS Depression	-0.17	0.41	-0.42	0.67	-0.97	0.63
QE Health	4.62	3.32	1.39	0.17	-1.93	11.18

Note: QE Health = QE Health measure; HADS = Hospital Anxiety and Depression Scores
SE=Standard Error; CI =Confidence Interval

Further regression analyses explored whether demographic variables, including condition, ethnicity, age and gender, impacted on the outcome measures between the two forms (Individual and Group) of delivery. The analyses showed no significant findings for age, ethnicity and gender but there were significant findings for condition. Those with arthritis (RA and OA) in the group delivery had statistically significant scores in both the QE Health score ($P<0.001$) and HADs depression ($P< 0.05$; 8).

Table 8. Regression analysis of sub-groups (demographic characteristics) influenced change in outcome measures between Individual and Group delivery. Controlling for baseline values.

Variables	β	SE	*t-value*	p-value	CI	
Ethnicity:						
NZ European (Individual N = 92, Group N=79)						
Depression	- 0.04	0.46	-0.09	0.93	-0.95	0.87
Anxiety	- 0.00	0.48	-0.01	0.99	-0.95	0.95
QE Health	4.20	3.90	1.00	0.29	-3.70	12.00
Māori (Individual N=11, Group N= 19)						
Depression	- 0.88	1.15	-0.77	0.45	-3.20	1.50
Anxiety	- 0.65	1.34	-0.48	0.64	-3.50	2.20
QE Health	1.85	4.74	0.39	0.67	-7.90	11.60
Age:						
Depression	0.00	0.01	0.36	0.72	-0.02	0.03
Anxiety	-0.04	0.44	-0.10	0.92	-0.04	0.01
QE Health	4.64	3.28	1.42	0.16	-0.46	0.08
Female: (Individual N=99, Group N= 98)						
Depression	0.07	0.44	0.04	0.97	-11.50	11.30
Anxiety	-0.34	0.48	-0.71	0.48	-1.30	0.61
QE Health	6.09	3.74	1.63	0.11	-1.30	13.50
Male: Depression	-1.26	1.19	-1.06	0.30	-3.70	1.20
Anxiety	1.17	0.95	1.24	0.23	-0.76	3.10
QE Health	0.44	0.13	-0.02	0.99	-11.50	11.30
Condition:						
Sub-group: Fibromyalgia (Individual N=37, Group N=33)						
Depression	0.22	0.71	0.31	0.76	-1.20	1.64
Anxiety	-0.19	0.96	-0.21	0.84	-2.00	1.70
QE Health	-0.01	5.50	-0.00	0.99	-11.0	11.00
Sub-group: Arthritis (Individual N=40, Group N=38)						
Depression	-1.32	0.62	-2.13	0.04*	-2.60	-0.08
Anxiety	-0.55	0.75	-0.74	0.46	-2.00	0.94
QE Health	18.45	6.07	3.04	<0.01*	6.40	30.50
Sub-group: Other Chronic Pain (Individual N=35, Group N=29)						
Depression	0.38	0.78	0.48	0.63	-1.18	1.93
Anxiety	0.56	0.65	0.87	0.39	-0.73	1.86
QE Health	0.21	3.59	0.06	0.95	-6.92	7.36

3.4. **Discussion**

This research sought to answer whether there was any significant change in patient outcomes at QE Health when the MPMP went from delivering more one-on-one components (Individual delivery) to delivering more group components (Group delivery). The findings showed that there was no statistically significant difference in outcomes between the two groups. This finding helps to inform QE Health that a group delivery approach is just as beneficial as one-on-one treatment. This research also agrees with meta-analyses and systematic reviews that found there is little difference between individual or group delivery styles, when looking at comparison studies across physiotherapy, psychotherapy and multiple pain and counselling populations (Burlingame et al., 2016; Toomey 2015). Thus, the study provides support for maintaining the change in programme structure, alongside consideration of cost, patient volume, and practical aspects of programme delivery.

The study findings showed considerable improvement in statistical significance in the outcome measures from baseline to discharge. To assess whether there were any clinically significant differences between the two groups, the HADS Anxiety and HADS Depression outcome measurements were evaluated. A HADS score >8 indicates significant depression or anxiety (Herrmann, 1997; Jacobson and Truax, 1991). This study showed that for the patients who received more individual delivery components, there was a 30% reduction in those with significant anxiety and a 37% reduction in those with significant depression from admission to discharge. For the patients with a more group delivery approach, there was a 24% decrease in those with significant anxiety and a 40% decrease in those with significant depression from admission to discharge (Table 6). This adds to the body of evidence that demonstrates MPMP

are an effective and well-accepted method to manage and treat multiple types of chronic pain (Gatchel, 2007; Karjalainen, 1999; Turk & Swanson, 2007).

Regression analysis explored whether demographic variables such as condition, ethnicity, age and gender, impacted on the findings for HADS depression, HADS anxiety and QE Health. In terms of conditions, it was found that those with OA and RA who were in the group treatment approach had greater improvements in their QE Health score and depression than those who received individual delivery. There were numerous reasons hypothesised as to why this occurred. The environmental milieu of spa settings has shown benefits for behavioural management of knee OA (Bender et al., 2014). It was hypothesised that the opportunity to meet and interact with others for sharing and socialising in such settings added to the benefit of multidisciplinary support for improving pain and disability (Bender et al. 2014). Research has also shown that delivery of physical activity in community group-based exercise programmes has a positive impact on supporting behavioural engagement in older adults (Farrance et al. 2016), while a meta-synthesis advocates that older adults who participate in group based physical activity experience positive effects of forming social bonds and connection (Devereux-Fitzgerald et al. 2016). These factors may explain why the group-based format is more efficacious for some outcomes in those with OA and RA.

QE Health had a higher female attendance when compared to national and global literature. The proportion of females entering the programme at QE Health was 84.5%. A retrospective study (Nicholas et al., 2019) of 13,343 patients who had attended 36 outpatient MPMP pain clinics in Australasia found that 59% were female, while a global review of inpatient MPMPs reported 55% were female (Lewis et al., 2019). Two NZ studies from Canterbury (Shipton et al. 2013) and Waitemata (Burri et al. 2018) reported female representation at their DHB pain

MPMP to be at 59.1% and 67.7%, respectively. High female attendance at QE Health could be explained by several factors. Chronic pain and musculoskeletal conditions affect females in greater numbers than men (Berkley, 1997; Fillingim, 2017). It is also indicated from chronic pain studies that women experience physical effects such as having higher intensities of pain and more frequent pain, in addition to psychosocial effects such as higher levels of pain-related negative outcomes, as well as higher pain-related levels of disability than men (Filligim, 2017). And it is believed that gender role expectations mean that women more than men are willing to seek healthcare and to report pain (Robinson et al., 2001). Many of the patients who attended QE Health in this study have fibromyalgia, and up to 90% of people with fibromyalgia are women (Wolfe et al., 2018). Although research is scarce on gender preference and attendance at spa environments, it has been suggested that the spa environment is associated with wellbeing and pampering and plays a role in women's overall health (Little, 2013). With spas historically being linked to a place of having social, therapeutic and spiritual meaning (Cayleff 1988; Gesler 1998; Williams 2007), they may be more attractive as a treatment option to females.

Of the 231 participants across the two cohorts, 13% identified as Māori and 74% as NZ European. There were smaller numbers of Asian and Pasifika patients that did not permit further analysis. The proportion of Māori and NZ European who participated align with New Zealand statistics that show that New Zealand's general population consists of 74% European and 15% Māori (Statistics NZ, 2019). However, within the Rotorua district, Māori make up 37.5% of the community, compared with 14.9% for all other districts (Statistics NZ, 2019). In view that Māori experience just as significant pain prevalence than non-Māori (Ministry of Health, 2019) and that Rotorua has a proportionately higher Māori population then the rest

of New Zealand, this may highlight a disparity in Māori accessing and attending the healthcare services at QE Health. Lewis and Upsdell (2018) also identified ethnic disparities in access to DHB chronic pain services across New Zealand, with the European ethnicity being over-represented. Culture plays an important role in the perception, experience and diagnosis of pain (Magnusson & Fennell, 2011). This may explain why this service is underutilised by Māori. Cultural influences may make Māori, Pasifika and Asian people less likely to reveal pain to others, and potentially they will ignore or endure pain for longer before seeking treatment (Hastie, Riley & Fillingim, 2005; Lewis & Upsdell, 2018). Promoting local Māori attendance at QE Health in the future would be beneficial.

Neither age nor gender in the group delivery approach were significant determinants of treatment success in this study when looking at outcome measures QE Health scale or HADS depression or anxiety. This is consistent with findings from previous predictor studies which found no significant relationship between age and pain outcomes (Tota-Faucette, et al., 1993; Moore et al., 1984; Gough & Frost, 1996; Bremander et al., 2011; Maruta et al., 1979), nor with gender in predictor studies (Aronoff & Evans, 1982; King & Snow, 1989; Kleinke & Spangler, 1988).

The benefit of not having so many individual treatments and more group-based sessions means that patients adapt to becoming active participants in learning to self-manage their condition. There is much debate as to the effectiveness of hands-on passive approaches as a delivery method in manual therapy, with claims these treatments are not beneficial for chronic pain patients. The Institute for Clinical Systems Improvement (2016) guidelines for chronic pain stipulate that passive physical treatments are only recommended as part of a treatment strategy, in conjunction with active physical therapy or an exercise program.

Although passive treatments may provide short-term pain relief, they only have potential medium-term benefit (Elibol, & Cavlak, 2019). For example, a recent scoping review concluded that there are few evidence-based studies advocating the effectiveness of massage for therapy, with massage being low in physical therapy evidence databases (Elibol, & Cavlak, 2019).

3.5. **Strengths and limitations**

This study design meant that the research was carried out in a clinical setting, using a retrospective cohort study of prospectively collected data. The research was carried out using the same clinicians delivering the two programmes, and the baseline clinical and demographic measures were equal between the two groups, so the method of treatment delivery was the only difference. Another strength is that this study examined a relatively heterogeneous group of chronic pain patients attending a MPMP, therefore the findings can be generalised to a relatively wide population of people attending an MPMP.

There were also several limitations to the study. There were reasonable sample sizes for the two cohorts; data was obtained from 112 patients receiving individual delivery and 119 patients receiving group delivery. However, there were not enough participants to complete all the subgroup analyses. Sample size is important to consider in clinical research as it is imperative to collect enough data to give statistically valid and clinically useful results, and for this to be balanced with efficient use of resources and to be completed in a realistic time frame (Jinks, 2012). Problems arise when there are insufficient patients in a study, as this means that the analysis will have wide confidence intervals and low statistical power and precision. And the opposite is the case with having too many patients, as there will be an increase in precision and power but is resource-costly and may not be feasible (Jinks, 2012). Sample size is dependent on the purpose of the study and how the outcome measure is summarised. Sample size calculation also relies on the test statistic that will allow a reasonable chance (power) of detecting a predetermined difference (effect size) in the outcome variable, at a given level of statistical significance (Machin et al, 2018). Consideration of loss to follow up is also needed

when considering sample size in cohort studies (Conato et al, 2000). Therefore, any sample size calculated should be inflated to account for the expected dropouts.

For retrospective studies, formal sample size calculations are available but are not performed (Jinks, 2012). In a systematic review of 47 published articles aiming to develop prognostic models in time-to-event data, all but one of the studies performed on retrospective data (n=32) did not provide any justification at all for the sample size used (Mallett et al. 2010). Similarly, in a review of publications developing and / or validating models in operable breast cancer, none of the 61 papers found justified the sample size (Altman, 2009). Further, a more recent non- systematic review of ten recently published chart reviews focusing on assessing treatment patterns and costs revealed that no studies presented a rationale for their chosen sample size (Johnston et al, 2019).

Existing formulae can be used in some particular situations, but for most analyses of prognostic data, particularly time-to-event data, little guidance is available to researchers, and sample sizes are frequently determined using ad-hoc approaches and/or based only on feasibility considerations in retrospective data collection (Jinks et al, 2015). Therefore, retrospective studies are often based on whatever suitable existing data can be easily obtained. This was the case with the collection of data for this research which was based on the number of participants that were able to have full sets of data collected in the time frame. A risk of this approach is that sample sizes are haphazard and may be too low and there is a risk that these studies may often be underpowered (Jinks, 2012). Guidelines from the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) acknowledge that few epidemiological studies explain or report deliberations about sample size (Pocock et al., 2004). Although STROBE encourage investigators to report pertinent formal sample size

calculations if they were done, they stress that researchers should indicate considerations that determined the study size, e.g, a fixed available sample (Vandenbroucke et al., 2009).

It is also recommended by STROBE to present regression estimates in both adjusted and unadjusted format (STROBE, 2009). A limitation of this study is that only the unadjusted format was presented in Table 7, this is the crude estimate and is the presentation of a variable without any of the covariates In this case, each outcome variable (HADS Anxiety, HADS Depression, QE Health) was controlled for by the baseline value of the same variable. This estimate considers the effect of only one independent (predictor) variable.

When you include more independent variables in the analysis (confounder variables), you have an adjusted estimate, which considers the effect due to all the additional independent variables included in the analysis (Pourhoseingholi, 2012). Confounders are observed or unobserved variables that are related to both the independent variable of interest and the outcome variable and, as such, can influence the magnitude of the relationship between the independent variable and outcome (Voils et al,2011). This could have been achieved by placing confounders such as anxiety, age or gender into the regression and making it a multiple regression rather than a linear regression. The advantage with providing both adjusted and unadjusted results is that there is a better understanding of how much the variables affect each other and a gives a sense of how much confounding is present in the model (Gordon, 2020).

Over the time period in which data were obtained, the outcome measures used by QE Health changed. The outcome measures available to analyse were restricted to the HADS and the QE Health Scale. Although the QE Health Scale has been tested and has demonstrated satisfactory reliability, face content criterion, discriminate and construct validity (Faull & Hills, 2007), it is

only used at QE Health and is not used in any other facility and therefore a comparison with findings of other programmes has not been possible. This limitation in outcome measures meant there were no pain or physical function outcome measures available for analysis. Another weakness of this study is that data were obtained at baseline and discharge and not at follow up, therefore it cannot be seen if there are differences between the programmes that emerge in the longer term. The programmes also were not run concurrently, which means there is opportunity for bias, as there is a possibility that some influences cannot be controlled over time such as staff changes, physician referral patterns and public holidays.

3.5.1. *Conclusion*

There is no evidence that the new programme at QE Health involving group therapy is any less effective than the previous programme involving more individual sessions. This finding, when considered alongside costs, patient volume, and practical aspects, supports the maintenance of a more group-based structure for programme delivery. Overall, those participating in the three-week QE Health programme showed improvement in all outcome measures analysed. Māori attendance was low when compared with the local regional Māori population, and male attendance was also low when compared with national and global statistics. Regression analysis showed that those with rheumatoid arthritis and osteoarthritis in the group delivery approach benefited the most.

3.6. **Clinical recommendations**

Based on the study findings there are numerous clinical recommendations that can be made.

The findings show there was no difference between the groups, so, in terms of outcomes, QE Health could go back to individual delivery or stay with group format delivery. Research

supports that group delivery has many merits; therefore, it would be beneficial for QE Health to consider costs, and practicality such as staffing to determine what format they use in the long term as patient outcomes did not appear to differ.

Another clinical recommendation would be that QE Health aligns its clinical outcome measures with the domains in the IMMPACT recommendations and the standardised Australasian measures. These measures incorporate the domains of pain intensity, physical functioning, emotional functioning, and a patient rating of improvement which give a more holistic assessment. These measures can easily be compared to similar practices across New Zealand and Australia. This point was raised by the researcher and supervisor and with QE Health, emphasising the benefits of using the ePPOC outcomes. After further discussions with management and clinicians at QE Health, these recommendations were accepted and altered outcome measures put in place. This happened prior to the commencement of study two.

It would also be valuable for QE Health to collect follow up data, after patients leave the facility. For example, the clinical outcomes could be assessed at 3, 6- and 12-months following completion of the programme (note 3 months follow up occurs prior to the start of Study two). Collecting follow up data is clinically useful to assess if long term effects of MPMP are maintained after discharge. A reason for advocating for a group format is to encourage less reliance of patients receiving one on one treatments, which are often unaffordable. Therefore, having follow up data would enable clinicians to know if they needed more emphasis on long-term behaviour change strategies to improve transition to home, and maintenance of programme gains.

Although the attendance of Māori at QE Health was in alliance with the general New Zealand population, this representation was not reflective of the demographic of Māori in Rotorua.

Therefore, investigating ways to increase the representation of Māori at the facility would be beneficial. This may include increased partnership and education about the facility to local iwi and health providers in the area. It may also be beneficial to consider how to improve the attendance of males at QE Health, as there is currently a high population of females in attendance. Finally, this study suggested that those with RA and OA who were in the group delivery benefited more. If this result was understood, it could be beneficial in the future to tailor programmes to those with different conditions, alongside the normal content delivery.

3.7. **Recommendations for future research**

There are several suggestions for further research based on these study findings. For example, exploring if there is any cost benefit for promoting group delivery rather than individual delivery given equivalence of clinical outcomes; an economic analysis would help determine whether group or individual-based programmes were more cost efficient. A qualitative study on patient and clinician perspectives of modes of delivery would provide insight into what patients and clinicians see as the benefits/limitations of the individual and group components.

Although QE Health has a philosophy of teaching patients to manage their pain regardless of their presenting condition, this research has shown that there may be some benefit in examining the effectiveness of the programme in delivering a more group based focus for patients with certain conditions like RA and OA. Therefore, designing a prospective study where patients with different conditions are given extra interventions specific to their needs and after delivery retesting to see if there would be a difference for the different conditions could be beneficial for enhancing future delivery.

As the ratio of those attending could not be accurately quantified in this study, a quantitative study evaluating the number of men/Māori could be beneficial to determine if these numbers are lower than expected. This could be followed by a qualitative study, to determine why men/ Māori do not attend. Based on these findings promotional strategies regarding the programme to the local Māori population and to the male chronic pain population and testing if the numbers of these groups increase as a consequence, could help to make attendance at the programme more representative of the local and global population.

Chapter 4. STUDY 2. CAN THE OUTCOMES FROM THE CHRONIC PAIN PROGRAMME AT QE HEALTH BE PREDICTED THREE MONTHS AFTER DISCHARGE BASED ON PATIENT CHARACTERISTICS AT BASELINE?

4.1. **Introduction**

There is clear evidence through systematic reviews and meta-analyses that MPMPs are successful in providing relief to those with chronic pain (Scascighini, et al, 2008; Gatchel & Okifuji, 2006). However, not everyone benefits to the same extent. Previous predictor studies examining outcomes from MPMPs have mostly agreed that age (Tota-Faucette, et al., 1993; Moore et al., 1984; Goldberg & Maciewicz, 1994; Guck et al., 1988; King et al, 1994), gender (Aronoff & Evans, 1982; King & Snow, 1989; Kleinke & Spangler, 1988; Kool et al., 2007; Lipchik et al., 1993; Tota-Faucette et al., 1993), and pain duration (Keel et al., 1998; King, et al., 1994; Guck et al., 1986) are not predictive of outcome, whereas psychosocial variables, pain intensity and physical function are more consistent predictors of pain outcomes (Angst et al, 2014; Aronoff & Evans, 1982; Keefe et al.,1981; Neuner et al.,2013; Borys et al.,2015; Angst et al.,2014; Farin.,2015; Angst et al., 2014). Prediction of outcome from a MPMP based on validated baseline variables has not been evaluated in a New Zealand. Predicting accurately who does best is beneficial for all involved - patients, clinicians and stakeholders - and adds to local, national and global priorities of personalised health care.

This study builds on the previous study in Chapter 3 and explores whether the characteristics of patients at the beginning of the QE Health programme can predict treatment outcome at three months post-programme. If the multidisciplinary team can identify baseline factors

associated with patient outcomes, this in turn could help identify groups of patients who on average will show the greatest or poorest improvement and need prioritising. It could allow the team to suggest ways to alter the QE Health programme for those who are currently not receiving as much benefit, and therefore deliver more individualised treatment programmes.

4.2. **Methodology**

This study was a prospective cohort study. The object of prospective cohort studies is to study the effect of treatment as it occurs during the study (Celentano & Moyses, 2019). Therefore, this research examined the relationship between outcome variables obtained at three months following the MPMP and independent variables obtained at admission, to ascertain who had better outcomes based on baseline presentation. Quantitative methodology was used to deductively examine cause and effect (Borbasi & Jackson, 2012). A post-positivist view was taken to establish the research question. Phillips and Burbules (2000) state that knowledge is anti-foundational, imperfect and fallible. Therefore, it is important to test and reject, or fail to reject the hypothesis.

4.2.1. *Methods*

Patients were recruited within the first three days of entry to the three-week inpatient MPMP programme at QE Health. Clinical outcome data were collected at three time points using questionnaires: at admission, discharge and three months post-discharge (follow-up). This information, along with baseline demographic data (ethnicity, condition, gender and age), was recorded and stored at the facility on a secured computer. The admission and discharge questionnaires were completed by patients onsite at QE Health or at the patient's home (admission only). Three months following discharge, a follow-up questionnaire was sent out

by mail, along with a self-addressed return envelope. Once returned, the administrator attached the questionnaire to the patient's admission and discharge questionnaires. If the follow-up questionnaires were not returned, the participant was followed up with a text message sent by the administrator. After two weeks, if the questionnaires were not returned, this was followed up with a phone call. If the patient was unable to be reached or there was no response from these forms of communication, another set of questionnaires were sent out with a return envelope.

4.2.2. *Participants*

Participants in the study were patients who had been accepted into the three-week programme of the MPMP. Participants had to be at least 18 years old and able to communicate in English. Patients were excluded if they had a psychiatric condition or were taking psychiatric medication. Flyers were posted around the QE Health facility informing patients about the study (See appendix G). On the first day of attendance to the programme, the recruiter (a senior occupational therapist) introduced the research study to the participants via a pre-recorded presentation from the study researchers. The recruiter then provided an Information Sheet for the patients to read and consider (Appendix H). The next day, the recruiter asked the patients if they had any questions and then provided a consent form to complete if the patient wanted to participate (Appendix I).

Demographic data were collected as part of routine clinical practice at the beginning of the programme. This included age, gender, ethnicity and condition. Condition was categorised by the referring physician or QE Health Rheumatologist into four categories, 'rheumatoid arthritis', 'osteoarthritis', 'fibromyalgia', and 'other chronic pain'. Data collection commenced

in February 2018; this process went on until there were sufficient 3-month follow up questionnaires obtained, defined as 100 complete records. This was a pragmatic requirement, so that the study could be completed in the necessary timeframe. As this was a cohort study where patients were not recruited for a trial intervention, no formal sample size number was needed for recruitment analyses to be formally carried out.

4.2.3. *Ethical considerations*

Ethical approval was obtained from AUTEC (AUT Ethics 18/123, see Acknowledgements). As patient data were being utilised, all patient information was de-identified by the administrator at QE Health and replaced with a coded number. All original data remained on the premises at QE Health within their computer system. Access to study data was accessible only by the primary researcher and the chief executive officer of QE Health.

4.2.4. *Outcome measures*

The questionnaires completed at follow up were used to assess outcome. The outcome measures in this study were the clinical assessments implemented by QE Health in 2018 (BPI, DASS-21, PCS, PSEQ). The BPI has two components that measure the severity of pain (BPI intensity) and the degree to which the pain interferes with common activities of daily living (BPI interference, Cleeland, 1991). Outcome measures that were used to assess psychosocial function were the DASS-21, which provides separate measures of the negative emotional states of depression, anxiety and stress over the previous week (Lovibond & Lovibond, 1995) and the PCS, which measures a patient's thoughts and feelings of catastrophising related to their pain and includes three components of magnification, rumination and helplessness (Osman, 2000; Sullivan & Bishop, 1995). The PSEQ measures how confident a patient is that

he or she can do a range of activities despite their pain (Nicolas 1989, 2007). For further information on each outcome measure, please refer to Chapter 2.7.

4.2.5. *Predictor variables*

The predictor variables used in this study consisted of demographic information (age, gender, ethnicity, condition, work status) and the clinical data consisting of BPI intensity and interference, DASS-21 depression, anxiety and stress, PCS rumination, magnification and helplessness. Ethnicity categories were defined by Statistics New Zealand level 1 categories of European, Maori, Pacific, Asian, and Other. Work status was divided into five main categories; fulltime, part time, retired, unemployed and other.

4.2.6. *Data analysis*

Descriptive statistics were applied, summarising age, gender, ethnicity, diagnosis, and the clinical outcome measures. The mean and standard deviation of the participants' age and pain (BPI) measures were reported, while the psychosocial variables (PCS, PSEQ, and DASS-21) were described with median and Inter Quartile Range (IQR) due to their skewed properties. Did you do normality checking of all your data?

To compare the clinical outcome measures over the three time periods (admission, discharge, follow-up), repeated measures ANOVAs were used for the BPI data and a Freidman's test for the DASS-21, PCS and PSEQ. Significant findings were followed up using paired T tests and Wilcoxon signed rank tests, respectively.

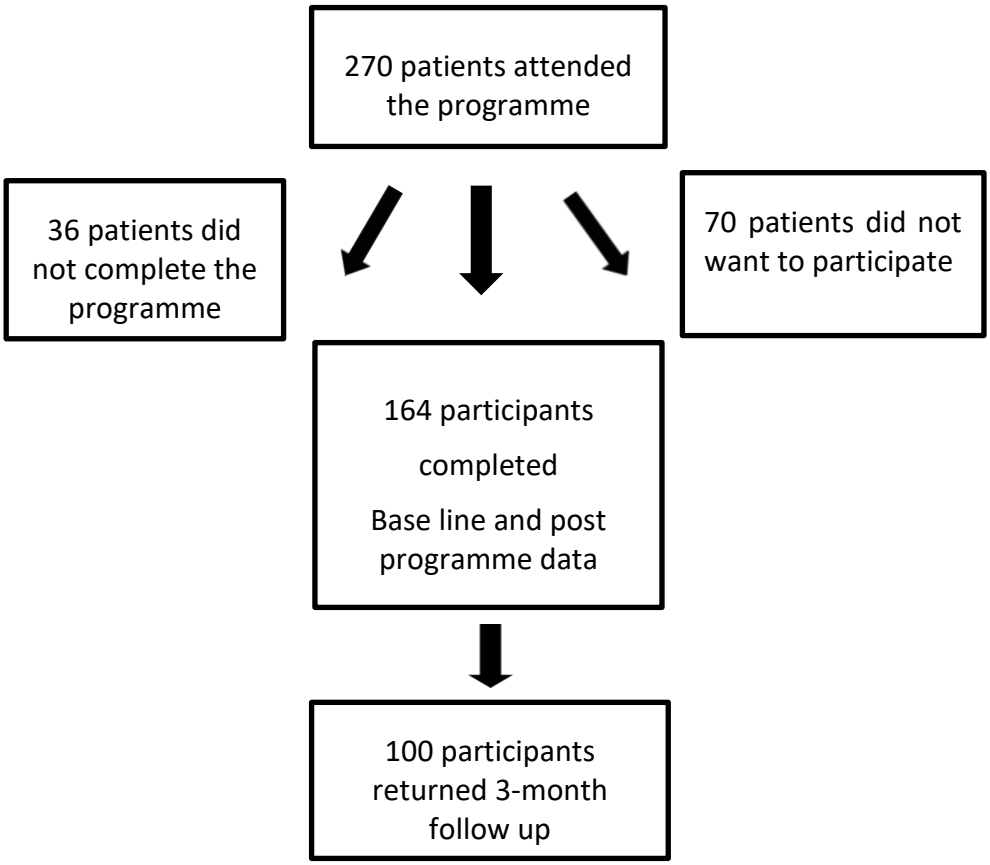
To investigate the relationship between the predictor variables and outcome measures, regression analyses were performed. Predictor variables consisted of the baseline

demographic data (ethnicity, age, gender, work status and condition) and baseline/referral clinical data (BPI, PCS, PSEQ, and DASS-21). The clinical outcome measures at 3 months were the outcome measures (BPI, PCS, PSEQ, and DASS-21). All regression models controlled for baseline values of the clinical outcome measures by entering them into the model as co-variates. For the demographic predictor variables of ethnicity, gender, work status, and condition, the reference group for the analyses was European, female, unemployed, and chronic pain, respectively. Due to the small sample size, only the ethnicity categories of European, Maori, and Other were able to be included in the models. Analysis was conducted using SPSS version 25 software (IBM, USA).

4.3. **Results**

A total of 270 people went through the 3-week in-patient MPMP at QE Health in the period from February 2018 to December 2019. Of the 270 potential participants, 70 patients (26%) chose not to participate in the study and 200 patients (74%) agreed to participate. Of these 36 (18%) participants did not complete the programme. Of the remaining possible participants for this study, 164 (82%) completed both the beginning referral and completion of the programme discharge questionnaires, which are part of QE Health's standard assessment. And 100 participants (61%) returned their survey at the three months post discharge collection point (see Figure 2).

Figure 2. The data collection process.



An overview of the baseline characteristics of the participants is shown in 9 and 10.

Table 9. Summary of the demographic characteristics of participants.

	N	%
Age, years (mean, SD)	56	16.7
Female	132	82%
Ethnicity:		
European	131	80%
Māori	20	12%
Other	7	4%
Asian	5	3%
Pacific	1	0.6%
Condition:		
Fibromyalgia	59	36%
Other chronic pain	66	40%
Osteoarthritis	24	15%
Rheumatoid conditions	15	9%
Employment status:		
Unemployed	45	27%
Retired	43	26%
Full time	37	23%
Other	26	16%
Part time	13	8%
Length of time with pain:		
Pain for 5 years or more	107	65%
Pain for between 2-5 years	31	19%
Pain for 12months-2 years	13	8%

The repeated measures ANOVAs and Friedman's tests showed all outcome measures had significant changes over time. Follow-up tests indicated significant improvements in all outcomes from baseline to discharge. All outcomes then deteriorated from discharge to follow-up, apart from PCS magnification (10). However, all outcome measures remained significantly better at follow-up compared to baseline except for PCS rumination and DASS-21 anxiety.

Table 10. Group results showing the outcome measures across the three time periods. Results shown as mean (standard deviation) or median (interquartile range). Results of the comparisons over time are also presented.

Variable	Admission (T1)	Discharge (T2)	3-month (T3)	*F*-value/ Chi-square	P-value	Pairwise comparison	P-value
BPI Intensity (mean, SD)	5.6 (1.7)	4.2 (1.7)	4.5 (0.20)	55.45	<0.001*	T1 vsT2	<0.001*
						T2 vs T3	0.030*
						T1 vs T3	<0.001*
BPI Interference (mean, SD)	6.4 (1.8)	3.7(2.1)	4.5(2.6)	71.02	<0.001*	T1 vsT2	<0.001*
						T2 vs T3	0.001*
						T1 vs T3	<0.001*
PSEQ	28 (19-39)	41 (33-48)	36 (23-46)	33.92	0.007*	T1 vs T2	<0.001*
						T2 vs T3	<0.001*
						T1 vs T3	<0.001*
PCS Rumination	7 (4-12)	3.5 (2-7)	4.5(0-10)	57.189	0.003*	T1 vs T2	<0.001*
						T2 vs T3	0.009*
						T1 vs T3	0.085
PCS Magnification	5 (3-7)	2 (1-4)	2 (0-20)	25.146	<0.001*	T1 vs T2	<0.001*
						T2 vs T3	0.127
						T1 vs T3	<0.001*
PCS Helplessness	10 (5-15)	4 (2-9)	6(2-11)	54.946	<0.001*	T1 vs T2	<0.001*
						T2 vs T3	0.002*
						T1 vs T3	<0.001*
DASS-21 Stress	16 (8-26)	8 (4-14)	10 (4-16)	13.129	<0.001*	T1 vs T2	<0.001
						T2 vs T3	0.028*
						T1 vs T3	0.001*
DASS-21 Depression	12 (4-20)	4 (0-8)	8(2-13)	36.445	<0.001*	T1 vs T2	<0.001*
						T2 vs T3	<0.001*
						T1 vs T3	0.027*
DASS-21 Anxiety	10 (4-20)	6 (4-14)	7(2-16)	9.454	<0.001*	T1 vs T2	<0.001*
						T2 vs T3	0.004*
						T1 vs T3	0.283

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

4.3.1. *Regression analyses*

There were numerous significant associations between the outcome measures and predictor variables, including both patient characteristics and baseline clinical variables. The findings are summarised below and the outcomes from all regression analyses are presented in Tables 11-24.

Regression analysis for ethnicity (Table 11) showed that being Māori was associated with higher BPI interference and PCS magnification compared to European at follow up. For the analysis of condition, having fibromyalgia was associated with higher (better) PSEQ but also higher (poorer) DASS-21 depression at follow up (Table 12).

Table 11. Results of the regression analyses for ethnicity and clinical outcome variables at follow-up. European is the reference category. Analyses controlled for baseline values of the clinical outcomes.

Variable	β	SE	*t*	P	CI	
BPI Intensity:						
Māori	0.85	0.59	1.43	0.16	-0.33	2.03
Other	1.09	0.76	1.44	0.15	-0.41	2.59
BPI interference:						
Māori	1.56	0.78	2.00	0.05*	0.01	3.10
Other	1.42	0.98	1.45	0.15	-0.52	3.35
PSEQ:						
Māori	-6.59	4.44	-1.49	0.14	-15.39	2.21
Other	-4.91	5.60	-0.88	0.38	-16.04	6.20
PCS Rumination:						
Māori	2.66	1.41	1.90	0.06	-0.13	5.45
Other	0.53	1.71	0.31	0.76	-2.87	3.92
PCS Magnification:						
Māori	2.76	1.06	2.60	0.01*	0.65	4.87
Other	0.87	1.31	0.661	0.51	-1.74	3.48
PCS Helplessness:						
Māori	1.27	1.84	0.69	0.49	-2.40	4.92
Other	1.76	2.30	0.77	0.45	-2.81	6.34
DASS-21 Stress:						
Māori	4.77	2.98	1.60	0.11	-1.15	10.69
Other	6.23	3.72	1.68	0.10	-1.14	13.60
DASS-21 Depression:						
Māori	3.99	2.86	1.40	0.17	-1.68	9.67
Other	4.91	3.49	1.41	0.16	-2.02	11.85
DASS-21 Anxiety:						
Māori	2.53	2.89	0.88	0.38	-3.21	8.27
Other	5.44	3.56	1.53	0.13	-1.63	12.52

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 12. Results of regression analysis for condition and 3-month clinical outcome variables. Other chronic pain is the reference category.

Variable	β	SE	*t*	P	CI	
BPI Intensity:						
Fibromyalgia	0.073	0.446	0.163	0.870	-0.814	0.960
osteoarthritis	-0.053	0.546	-0.097	0.923	-1.138	1.032
Rheumatoid arthritis	-0.840	0.590	-1.423	0.158	-2.012	0.332
BPI Interference:						
Fibromyalgia	0.770	0.590	1.305	0.195	-0.402	1.941
osteoarthritis	0.272	0.724	0.376	0.708	-1.165	1.709
Rheumatoid arthritis	0.221	0.785	0.282	0.779	-1.337	1.779
PCS Magnification:						
Fibromyalgia	0.271	0.796	0.341	0.734	-1.310	1.852
osteoarthritis	-0.698	0.978	-0.713	0.477	-2.639	1.244
Rheumatoid arthritis	0.695	1.071	0.649	0.518	-1.433	2.823
PCS Rumination:						
Fibromyalgia	-0.006	0.996	-0.006	0.995	-1.983	1.971
osteoarthritis	-1.944	1.246	-1.560	0.122	-4.419	0.531
Rheumatoid arthritis	-2.534	1.353	-1.872	0.064	-5.221	0.153
PCS Helplessness:						
Fibromyalgia	0.514	1.388	0.371	0.712	-2.242	3.271
osteoarthritis	-0.784	1.694	-0.463	0.644	-4.149	2.580
Rheumatoid arthritis	-0.348	1.856	-0.187	0.852	-4.035	3.339
DASS-21 Depression:						
Fibromyalgia	5.114	2.016	2.537	0.013*	1.111	9.117
osteoarthritis	0.855	2.553	0.335	0.739	-4.216	5.926
Rheumatoid arthritis	-0.070	2.658	-0.026	0.979	-5.348	5.208
DASS-21 Anxiety:						
Fibromyalgia	0.741	2.147	0.345	0.731	-3.523	5.006
osteoarthritis	-1.226	2.683	-0.457	0.649	-6.555	4.104
Rheumatoid arthritis	-0.375	2.882	-0.130	0.897	-6.098	5.348
DASS-21 Stress:						
Fibromyalgia	1.430	2.213	0.646	0.520	-2.965	5.825
osteoarthritis	-2.982	2.779	-1.073	0.286	-8.501	2.537
Rheumatoid arthritis	2.637	2.902	0.909	0.366	-3.126	8.400
PSEQ:						
Fibromyalgia	7.006	3.230	2.169	0.033*	0.594	13.419
osteoarthritis	5.351	3.980	1.344	0.182	-2.551	13.253
Rheumatoid arthritis	7.495	4.307	1.740	0.085	-1.056	16.046

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Regression analysis of age and gender (Table 13 and Table 14) showed no significant associations with the outcome measures. In relation to work status, working part time was associated with lower PCS helplessness and rumination at three months follow up compared to those who were unemployed (Table 15).

Table 13. Results of regression analysis for age and three-month clinical outcome variables.

	β	SE	*t*	P	CI	
BPI Intensity	0.020	0.011	1.812	0.073	0.435	0.817
BPI Interference	0.000	0.016	0.015	0.988	-0.031	0.032
PCS Magnification	-0.019	0.019	-0.992	0.324	-0.056	0.019
PCS Rumination	-0.035	0.025	-1.418	0.159	-0.085	0.014
PCS Helplessness	0.002	0.027	0.072	0.943	-0.051	0.055
DASS-21 Stress	-0.057	0.054	-1.054	0.294	-0.165	0.050
DASS-21 Depression	-0.050	0.051	-0.976	0.331	-0.150	0.051
DASS-21 Anxiety	-0.029	0.052	-0.553	0.582	-0.131	0.074
PSEQ	0.541	0.081	-0.310	0.757	-0.187	0.136

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 14. Results of regression analysis for gender and three-month clinical outcome variables. Male is the Reference category.

	β	SE	*t*	P	CI	
BPI Intensity	-0.654	0.466	-1.403	0.164	-1.578	0.271
BPI Interference	-0.353	0.683	-0.517	0.607	-1.708	1.003
PCS Magnification	-0.587	0.850	-0.690	0.492	-2.274	1.101
PCS Rumination	-0.262	1.140	-0.230	0.819	-2.525	2.001
PCS Helplessness	-0.077	1.400	-0.055	0.956	-2.857	2.702
DASS-21 Stress	-4.499	2.353	-1.912	0.059	-9.170	0.171
DASS-21 Depression	0.571	2.237	0.255	0.799	-3.869	5.011
DASS-21 Anxiety	-2.264	2.258	-1.003	0.319	-6.745	2.217
PSEQ	0.705	3.580	0.196	0.845	-6.412	7.821

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 15. Results of regression analysis of employment status and three-month clinical outcome variables. Unemployment is the reference category.

	β	SE	*t*	P	CI	
BPI Intensity:						
Full time	-0.683	0.767	-0.891	0.375	-2.206	0.839
Others	0.004	0.259	0.017	0.987	-0.510	0.519
Part time	-0.281	0.205	-1.375	0.172	-0.688	0.125
Retired	0.073	0.071	1.027	0.307	-0.068	0.214
BPI Interference:						
Full time	0.489	0.584	0.837	0.405	-0.671	1.649
Others	0.022	0.195	0.110	0.912	-0.365	0.408
Part time	-0.271	0.153	-1.772	0.080	-0.575	0.033
Retired	0.082	0.053	1.541	0.127	-0.024	0.188
PCS Magnification:						
Full time	-0.196	1.042	-0.188	0.851	-2.265	1.873
Others	0.218	0.352	0.618	0.538	-0.482	0.918
Part time	-0.217	0.293	-0.742	0.460	-0.799	0.364
Retired	0.112	0.097	1.150	0.253	-0.081	0.305
PCS Rumination:						
Full time	-2.099	1.317	-1.593	0.115	-4.715	0.517
Others	-0.508	0.439	-1.156	0.251	-1.380	0.364
Part time	-1.106	0.344	-3.213	0.002*	-1.790	-0.423
Retired	-0.127	0.122	-1.038	0.302	-0.370	0.116
PCS Helplessness:						
Full time	-2.824	1.808	-1.562	0.122	-6.416	0.768
Others	-0.380	0.598	-0.636	0.527	-1.567	0.807
Part time	-1.104	0.497	-2.219	0.029*	-2.092	-0.115
Retired	-0.100	0.165	-0.604	0.547	-0.427	0.228
DASS-21 Stress:						
Full time	-2.577	2.977	-0.866	0.389	-8.488	3.334
Others	-0.272	1.009	-0.270	0.788	-2.276	1.731
Part time	-0.653	0.800	-0.816	0.417	-2.241	0.936
Retired/control	0.029	0.279	0.105	0.917	-0.525	0.584
DASS-21 Depression:						
Full time	-5.101	2.735	-1.865	0.065	-10.532	0.329
Others	-1.460	0.928	-1.573	0.119	-3.303	0.383
Part time	-1.000	0.731	-1.368	0.175	-2.451	0.451
Retired	-0.296	0.254	-1.167	0.246	-0.801	0.208
DASS -21 Anxiety:						
Full time	-2.482	2.810	-0.883	0.379	-8.064	3.099
Others	0.009	0.953	0.009	0.992	-1.883	1.901
Part time	-0.947	0.751	-1.261	0.211	-2.440	0.545
Retired	-0.026	0.263	-0.101	0.920	-0.548	0.495
PSEQ:						
Full time	-3.593	4.427	-0.812	0.419	-12.382	5.196
Others	-0.111	1.504	-0.074	0.941	-3.098	2.876
Part time	0.962	1.178	0.817	0.416	-1.377	3.300
Retired/control	-0.159	0.408	-0.389	0.698	-0.969	0.651

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

The following Tables (16-24) represent the findings from regression analysis that examined baseline clinical variables and the clinical variables at follow-up. High baseline BPI intensity was associated with higher BPI intensity, DASS-21 stress, DASS-21 depression and PCS rumination at three months. Higher baseline BPI interference was associated with higher BPI intensity, BPI inference, DASS-21 depression, stress and anxiety and PCS helplessness. Of the catastrophising baseline variables, high baseline rumination was associated with higher BPI inference, PCS magnification, PCS helplessness PCS rumination, DASS-21 stress, and DASS-21 depression. A high baseline magnification predicted higher PCS magnification, PCS helplessness, and DASS-21 depression at three months. A high baseline helplessness predicted higher PCS helplessness ad DASS-21 depression at 3 months. Those with a high PSEQ maintained a higher PSEQ at 3 months, but there were no further significant relationships. Of the psychosocial variables, those with high baseline DASS-21 depression had higher three-month DASS-21 depression and DASS-21 stress at three months. Those with high baseline DASS-21 anxiety had higher DASS-21 anxiety, DASS-21 stress and DASS-21 depression at three months. And those with higher baseline DASS-21 stress had higher three-month DASS-21 stress at three months. Those with a high PSEQ maintained a higher PSEQ at 3 months.

Table 16. Regression analysis for 3-month BPI intensity with the baseline predictor variables. Analysis controlled for baseline BPI intensity.

	β	SE	*t*	P	CI	
PSEQ	0.019	0.015	1.327	0.188	-0.010	0.049
BPI Intensity	0.527	0.103	5.124	<0.001*	0.323	0.731
BPI Interference	0.184	0.123	1.503	0.136	-0.059	0.427
PCS Rumination	0.014	0.042	0.336	0.737	-0.069	0.097
PCS Magnification	0.056	0.064	0.874	0.384	-0.071	0.182
PCS Helplessness	-0.015	0.035	-0.445	0.657	-0.084	0.053
DASS Stress	-0.026	0.018	-1.479	0.143	-0.062	0.009
DASS Anxiety	0.008	0.019	0.428	0.670	-0.030	0.047
DASS Depression	0.013	0.020	0.639	0.524	-0.027	0.052

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 17. Regression analysis for 3-month BPI interference with the baseline predictor variables. Analysis controlled for baseline BPI interference.

	β	SE	*t*	P	CI	
PSEQ	0.023	0.021	1.062	0.291	-0.020	0.065
BPI Intensity	0.103	0.158	0.650	0.517	-0.212	0.418
BPI Interference	0.703	0.139	5.069	<0.001*	0.428	0.978
PCS Rumination	0.124	0.055	2.245	0.027*	0.014	0.233
PCS Magnification	0.147	0.086	1.718	0.089	-0.023	0.317
PCS Helplessness	0.000	0.047	-0.010	0.992	-0.095	0.094
DASS-21 Stress	-0.011	0.024	-0.448	0.655	-0.058	0.037
DASS-21 Anxiety	0.018	0.027	0.680	0.498	-0.035	0.071
DASS-21 Depression	0.031	0.028	1.085	0.281	-0.025	0.087

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 18. Regression analysis for 3-month DASS-21 Depression with the baseline predictor variables. Analysis controlled for baseline DASS-21 Depression.

	β	SE	*t*	P	CI	
PSEQ	-0.089	0.074	-1.198	0.234	-0.235	0.058
BPI Intensity	1.232	0.486	2.538	0.013	0.269	2.196
BPI Interference	1.507	0.541	2.788	0.006*	0.434	2.581
PCS Rumination	0.780	0.205	3.802	<0.001*	0.373	1.187
PCS Magnification	1.108	0.342	3.242	0.002*	0.430	1.787
PCS Helplessness	0.396	0.176	2.242	0.027*	0.045	0.746
DASS-21 Stress	0.153	0.104	1.463	0.147	-0.055	0.360
DASS-21 Anxiety	0.301	0.124	2.435	0.017*	0.056	0.546
DASS-21 Depression	0.473	0.087	5.421	<0.001*	0.300	0.646

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 19. Regression analysis for 3-month DASS-21 Anxiety with the baseline predictor variables. Analysis controlled for baseline DASS-21 Anxiety.

	β	SE	*t*	P	CI	
PSEQ	0.067	0.075	0.901	0.370	-0.081	0.216
BPI Intensity	0.983	0.506	1.942	0.055	-0.022	1.989
BPI Interference	1.480	0.528	2.805	0.006*	0.432	2.527
PCS Rumination	0.414	0.241	1.717	0.089	-0.065	0.892
PCS Magnification	0.685	0.388	1.763	0.081	-0.086	1.456
PCS Helplessness	0.127	0.197	0.646	0.520	-0.264	0.518
DASS-21 Stress	-0.033	0.121	-0.275	0.784	-0.274	0.207
DASS-21 Anxiety	0.575	0.087	6.625	<0.001*	0.403	0.748
DASS-21 Depression	-0.010	0.132	-0.076	0.939	-0.273	0.253

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 20. Regression analysis for 3-month DASS-21 Stress with the baseline predictor variables. Analysis controlled for baseline DASS- 21 Stress.

	β	SE	*t*	P	CI	
PSEQ	-0.053	0.076	-0.692	0.491	-0.205	0.099
BPI Intensity	1.074	0.532	2.018	0.046*	0.018	2.130
BPI Interference	1.783	0.534	3.343	0.001*	0.724	2.842
PCS Rumination	0.790	0.234	3.383	0.001*	0.326	1.254
PCS Magnification	1.155	0.343	3.365	0.001*	0.474	1.837
PCS Helplessness	0.202	0.195	1.038	0.302	-0.185	0.589
DASS-21 Stress	0.379	0.085	4.486	<0.001 *	0.211	0.547
DASS-21 Anxiety	0.447	0.128	3.496	0.001*	0.193	0.701
DASS-21 Depression	0.277	0.122	2.269	0.025*	0.035	0.519

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 21. Regression analysis for 3-month PCS Rumination with the baseline predictor variables. Analysis controlled for baseline PCS Rumination.

	β	SE	*t*	P	CI	
PSEQ	-0.033	0.035	-0.934	0.353	-0.102	0.037
BPI Intensity	0.530	0.239	2.218	0.029*	0.056	1.003
BPI Interference	0.811	0.244	3.323	0.001*	0.326	1.295
PCS Rumination	0.672	0.091	7.373	<0.001*	0.491	0.852
PCS Magnification	0.285	0.192	1.484	0.141	-0.096	0.666
PCS Helplessness	0.054	0.099	0.545	0.587	-0.143	0.251
DASS-21 Stress	-0.071	0.047	-1.510	0.134	-0.164	0.022
DASS-21 Anxiety	-0.030	0.053	-0.557	0.579	-0.136	0.076
DASS-21 Depression	0.017	0.050	0 .338	0.736	-0.083	0.117

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 22. Regression analysis for 3-month PCS Magnification with the baseline predictor variables. Analyses controlled for baseline PCS Magnification**.**

	β	SE	*t*	P	CI	
PSEQ	0.008	0.029	0.283	0.778	-0.049	0.065
BPI Intensity	-0.040	0.196	-0.203	0.840	-0.430	0.350
BPI Interference	0.251	0.206	1.222	0.225	-0.157	0.660
PCS Rumination	0.238	0.099	2.419	0.017*	0.043	0.434
PCS Magnification	0.512	0.106	4.848	<0.001*	0.302	0.721
PCS Helplessness	-0.027	0.083	-0.326	0.745	-0.191	0.138
DASS-21 Stress	-0.030	0.036	-0.822	0.413	-0.102	0.042
DASS-21 Anxiety	-0.009	0.045	-0.209	0.835	-0.099	0.080
DASS-21 Depression	0.021	0.043	0.485	0.628	-0.064	0.106

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 23. Regression analysis for 3-month helplessness with the baseline predictor variables. Analysis controlled for baseline PCS Helplessness.

	β	SE	*t*	P	CI	
PSEQ	-0.044	0.050	-0.891	0.375	-0.143	0.054
BPI Intensity	0.400	0.349	1.148	0.254	-0.292	1.093
BPI Interference	1.089	0.354	3.075	0.003*	0.386	1.792
PCS Rumination	0.408	0.165	2.467	0.015*	0.080	0.736
PCS Magnification	0.666	0.266	2.500	0.014*	0.137	1.194
PCS Helplessness	0.430	0.095	4.528	<0.001*	0.241	0.618
DASS Stress	-0.084	0.064	-1.319	0.191	-0.210	0.042
DASS Anxiety	0.028	0.075	0.375	0.708	-0.121	0.177
DASS Depression	0.058	0.071	0.819	0.415	-0.082	0.198

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 24. Regression analysis for 3-month PSEQ with the baseline predictor variables. Analysis controlled for baseline PSEQ**.**

	β	SE	*t*	P	CI	
PSEQ	0.382	0.104	3.676	<0.001*	0.176	0.589
BPI Intensity	-0.326	0.805	-0.405	0.686	-1.925	1.273
BPI Interference	-1.123	0.907	-1.237	0.219	-2.923	0.678
PCS Rumination	-0.282	0.326	-0.865	0.389	-0.929	0.365
PCS Magnification	0.150	0.511	0.293	0.770	-0.865	1.165
PCS Helplessness	0.424	0.268	1.581	0.117	-0.109	0.957
DASS Stress	0.215	0.136	1.583	0.117	-0.054	0.484
DASS Anxiety	0.057	0.154	0.366	0.715	-0.250	0.363
DASS Depression	0.124	0.158	0.782	0.436	-0.190	0.437

*Highlights results with significant P values <0.05. SE = standard error, CI = 95% confidence interval, BPI =Brief Pain Inventory, PSEQ= The Pain Self-Efficacy Questionnaire, PCS = Pain Catastrophising Scale, DASS= Depression, Anxiety and Stress Scale.

Table 25 is a summary of the significant findings from all the predictor variables examined and their relationship with the outcome measures at follow-up. Overall, these results show that all baseline clinical outcome measures were significant predictors of themselves at follow-up. BPI intensity and interference and PCS rumination predicted the greatest number of clinical outcomes at follow-up, and there were few significant demographic predictor variables.

Table 25. Summary table showing the demograhic and clinical baseline variables that were significantly associated with 3 month outcome.

Baseline variable	Three-month outcome	Better/poorer
Ethnicity:		
Māori:	Pain interference	poorer
	Magnification	poorer
Condition:		
Fibromyalgia:	PSEQ	better
	Depression	poorer
Work Status:		
Part time workers:	Rumination	better
	Helplessness	better
Pain Intensity:		
	Intensity	poorer
	Stress	poorer
	Rumination	poorer
	Depression	poorer
Pain Interference:		
	Interference	poorer
	Intensity	poorer
	Depression	poorer
	helplessness	poorer
	Stress	poorer
	Anxiety	poorer
Depression:		
	Depression	poorer
	Stress	poorer
Anxiety:		
	Anxiety	poorer
	Stress	poorer
	Depression	poorer
Stress:		
	Stress	poorer
Magnification:		
	Magnification	poorer
	Depression	poorer
	Helplessness	poorer
Rumination:		
	Rumination	poorer
	Depression	poorer
	Interference	poorer
	Magnification	poorer
	Helplessness	poorer
	Stress	poorer
Helplessness:		
	Helplessness	poorer
	Depression	poorer
PSEQ:		
	PSEQ	better

4.4. **Discussion**

This study explored whether the baseline characteristics of the patients attending an inpatient MPMP predicted treatment outcome at three months post-programme. The results of this study found that all clinical outcome measures were significant predictors of themselves at follow-up; however, there were not many demographic variables that were predictive of outcome. This discussion examines these findings in detail in the context of findings from previous research, highlighting the study's novel contributions. The discussion is organised into predictor variable categories of biomedical, psychosocial, and demographic.

4.4.1. *Biomedical variables*

While baseline BPI pain intensity and interference were both strongly related to their own follow-up values, they both also predicted multiple other outcome measures. Both were associated with subcomponents of the mood and catastrophising outcomes. BPI pain interference was one of the most robust predictors as it was associated with all the DASS-21 subcomponents and the helplessness component of the PCS.

These findings largely support the studies reviewed in Chapter 2 that found that pain is a good predictor of outcome, in that those with high pain at the beginning of the programme still have relatively high pain at discharge (Angst et al., 2014; Aronoff & Evans, 1982; Moore et al., 1984; Keefe et al., 1981; Borys et al. 2015; Neuner et al. 2013).

The findings from this study also support the review from Chapter 2 that showed that poorer baseline physical function predicts poorer outcome (Neuner et al. 2013; Verra et al., 2009; Angst et al. 2014; Bremander et al. 2011). In contrast Van der Hulst's (2005) systematic review examining outpatients attending a back pain MPMP concluded that physical variables had no

predictive value, and that a high level of perceived disability at baseline was predictive of better outcome.

The reason why pain interference predicts such a variety of outcomes is potentially due to the multiple dimensions BPI interference assesses. The BPI interference assessment represents two dimensions. One is activity interference, which includes interference with work, general activity and walking. The second is an affective interference, which includes interference with relationships, sleep and enjoyment of life (Cleeland, 1991). The affective dimension of the BPI interference scale is associated with BPI intensity (Hølen et al. 2016), depression and pain catastrophising (Walton et al. 2016). BPI interference therefore seems to be related to problems across multiple domains and these may require more time or alternative strategies to be addressed during inpatient MPMPs (Miettinen et al, 2019). This supports the findings from this study that found that BPI interference was associated with all DASS-21 measures, a PCS outcome and BPI pain and interference scores.

4.4.2. *Psychosocial variables*

Like the biomedical predictor findings mentioned above, each baseline clinical DASS-21, PCS and PSEQ score was positively associated with its score at three months. Overall, the subcomponents of the DASS-21 did not predict many outcomes. The only significant findings were that high baseline DASS-21 depression was associated with a high DASS-21 stress score, but high baseline anxiety was only associated with high DASS-21 depression and stress at follow-up. These findings are contradictory to the review in Chapter 2, which found that anxiety and depression were more consistent predictors of outcome than demographic variables such as age and gender. Previous studies have found that participants who were

more depressed and anxious at baseline had better programme success (Bremander et al. 2011; Hampel et al. 2009) and that those who were more depressed had a decrease in reported anxiety and depression (Borys et al., 2015; Kleinke & Spangler, 1988; Keel et al., 1998). Other reviews also found depression was a strong predictor of treatment success for patients with chronic back pain (Feuerstein and Beattie 1995; Gatchel and Gardea, 1993; Mc Cracken and Turk 2002; Turk 1998). Van der Hulst's systematic review showed that depression was an inconsistent predictor of outcome (Van der Hulst et al., 2005). This current study also showed that DASS-21 depression and anxiety were not strong predictors of outcome. The current study did not show that stress was a predictor of any outcome except for stress itself.

As found with the other predictor variables, the PCS variables at baseline were all positively associated with themselves at three months. Baseline rumination was associated with the largest number of clinical outcomes (6) of all the predictor variables. PCS magnification and helplessness were associated with three and two outcomes, respectively. Previous findings show that out of the three scales tested, rumination is the most dominant subscale and has the most variation within the PCS (Sullivan & Bishop, 1995). From the review in Chapter 2, catastrophising was a strong predictor of outcome, with low baseline catastrophising being associated with treatment success (Angst et al., 2014) and a greater reduction in anxiety, depression and catastrophising outcomes (Farin, 2015). Pain catastrophising has repeatedly been associated with increased pain sensitivity, increased risk of persistent pain, heightened pain intensity and severity, increased disability and higher levels of psychological distress and depressive symptoms (Sullivan et al., 2001; Lewis et al., 2015; Edwards et al., 2006; Keefe et al., 1989; Keefe et al., 2004; Turk & Okifuji, 2002). Pain catastrophising is a modifiable variable (Keefe et al., 2004; Sullivan et al., 2005) and addressing catastrophic thinking is a key factor in

determining the success of interventions for chronic pain (Spinhoven et al., 2004; Sullivan et al., 2005). This is important, because identifying those who have high catastrophising means that individualised interventions can be targeted towards improving outcome. Intervention studies have shown that catastrophic thinking decreases as a result of participation in treatment aimed at facilitating recovery or adaptation to chronic pain (Smeets et al., 2006; Spinhoven et al., 2004). Incorporating treatments towards elevated catastrophising is part of the highest level of care in MPMP (Williams et al., 2012). Therefore, it would be beneficial if prior to or during MPMP treatment, interventions specifically focus on those with high catastrophising to see if this attitude could positively be associated with better outcomes at three months.

The final psychosocial predictor variable utilised in this study was the PSEQ. Self-efficacy measures how confident a patient is that he or she can do a range of activities despite their pain (Nicolas, 1989, 2007). High self-efficacy results in new experiences being pursued and therefore additional confidence being obtained (Jackson, 2014). Having high self-efficacy means individuals interpret their pain more optimistically, therefore lowering levels of reported pain intensity, disability, and improving physical functioning (Martinez-Calderon et al., 2018). On the other hand, low self-efficacy means that people will be reluctant to take on new experiences, which perpetuates perceptions of inefficacy. A meta-analysis showed that low pain efficacy had a significant overall association with impairment, affective distress, and pain severity within chronic pain samples (Jackson et al., 2014). This study showed that those with a high baseline PSEQ tended to still have higher values through to three months post discharge. Other studies support this and found that those who have more active self-management skills tend to maintain this quality (McCracken and Turk et al. 2002).

4.4.3. *Demographic variables*

Compared to European ethnicity, being Māori was associated with poorer scores in PCS magnification and BPI interference at three months. Pain control and perceptions of pain are culturally specific (Narayan, 2010; Briggs, 2008) and it is acknowledged that there are significant differences in pain tolerances and thresholds depending on the ethnicity that people identify with (Lu et al., 2013; Rahim-Williams et al., 2012). Perceptions of pain in minority ethno cultural groups have been studied extensively in the United States (Kellner et al, 2013; Kvarén et al, 2004) and are beginning to extend to other parts of the world. Recent New Zealand research found that Māori had poorer baseline clinical values prior to participating in MPMP (Lewis & Upsdell, 2018; Burri, et al., 2018). Although there is evidence that differences exist in the experience of chronic pain across ethnicities, less is known about the differences that occur in treatment outcomes (Gagnon et al. 2013). Therefore, this study is unique in that it was able to evaluate patient ethnicity as a predictor variable and showed that being Māori was associated with significantly poorer outcomes in two of the clinical measures.

Many of the problems that influence Māori health are complex socio-political issues and not able to be remedied during a three-week pain programme. It is possible that the QE Health MPMP is not as efficacious for Māori in relation to pain interference or magnification, or that, after discharge, Māori were not able to maintain as many positive treatment gains due to stressors faced in the real world. The 2017/18 New Zealand Health Survey showed that Māori have higher anxiety, depression and psychological distress than non-Māori in New Zealand (Ministry of Health, 2018). Therefore, these psychosocial variables significantly impact on work and role functioning (Collings & MaGPIe Research Group, 2005). Maclennan et al. (2014),

found that Māori had a 2.5 times higher risk of experiencing psychological distress at 12 months post injury, than non-Māori. This may explain why PCS magnification and BPI interference were higher at three months in Māori compared to those participants of European descent in this study. Could it also be that the program was not culturally adapted to be meaningful to Maori participants?

As far as the predictor variable of the patient's presenting condition, this study showed that those with fibromyalgia had poorer DASS-21 depression scores but better PSEQ scores than other chronic pain conditions at follow up. This was the only statistically significant association with condition. Although all chronic pain populations are at risk of experiencing depression, the literature suggests that this is particularly the case for those with fibromyalgia. Those with fibromyalgia report high prevalence rates of depression (Hudson et al., 1992; Fietta et al., 2007; Ross et al., 2010). Borchers and Gershwin (2015) hypothesise three theories as to why there is a higher prevalence of depression in those with fibromyalgia. Firstly, it could be a consequence of living with chronic pain and other debilitating symptoms associated with this type of pain. Secondly, that depression and fibromyalgia are part of the same spectrum, sharing the same underlying aetiology and finally, that fibromyalgia could represent an unusual manifestation of depression. De Rooij et al.'s (2013) systematic review of predictors of MPMP outcomes for people with fibromyalgia found that depression is a barrier to effective MPMP treatment. Often depression is not a specific outcome variable that is successfully remedied; however, there is promising research that has found that increasing self-efficacy results in positive effects (Van Liew et al., 2013).

Knowing how embedded depression is in those with fibromyalgia, high depression scores at three months is possibly not surprising, regardless of the intervention given during the three-

week MPMP. Although literature shows that promoting self-efficacy has been shown to have promising results for those with fibromyalgia, this study found that fibromyalgia patients had elevated self-efficacy, yet poorer depression at three months. These findings therefore contradict the suggested link between self-efficacy and depression (Van Liew et al., 2013).

Although not statistically significant, those with RA had a trend towards a better outcome in PCS rumination compared to other conditions (p=0.06). Patients with RA attending QE Health's MPMP receive an additional one hour a week education session with a registered nurse, to go over medications and review other issues as necessary. It is possible that this additional input is contributory to this positive effect.

There were no statistically significant associations between age and the clinical outcomes. These findings align with the review of the literature that showed most studies (77%) demonstrated no relationship between age and outcomes (Tota-Faucette et al., 1993; Moore et al., 1984; Goldberg & Maciewicz, 1994; Guck, 1988; King et al., 1994). This is also in agreement with other predictor studies of outpatient MPMPs in back schools that concluded that age was not a predictor of outcome (Bendix et al., 1998; Haazen et al., 1994; Härkäpää et al., 1991, Vendrig et al., 2000).

This current study also showed no significant relationships between gender and any outcomes, again aligning with previous predictor studies indicating that gender is not a predictor of outcome in inpatient MPMPs (Kleinke & Spangler, 1988; Kool et al., 2007; Tota-Faucette et al., 1993; Williams et al., 1988) or outpatient multidisciplinary back schools (Bendrix et al., 1998; Haazen et al., 1994; Härkäpää et al., 1991). In contrast, two studies showed that females had greater improvement in anxiety and depression following inpatient MPMPs (Hampel et al., 2009; Murphy et al., 2016). The current study supports this to some

small degree, in that the only marginal effect of gender was that females showed slightly lower stress at 3 months (p=0.059).

Around a quarter were unemployed (27.4%), retired (26.2%), or worked full time (22.6%), with a smaller number working part time (8%). Part time work was associated with better PCS rumination and helplessness scores at follow up. This could be because working part time means less psychological and or physical stress. Kruse (2017) found that work-life balance increases performance, productivity and promotes creativity, and in addition that job satisfaction has been shown to be higher among both full time and part time employees if it is concurrent with what the employee wants (Armstrong-Stassen et al., 1994; Tansky & Gallagher., 1995). Warner-Smith & Mishra (2002) found that middle aged women who worked part time had better mental and physical health than women who would like to work either more hours or fewer hours. This may explain the positive effect of part time work in this study.

4.5. **Summary**

This research analysed whether patient baseline variables could predict outcome from QE Health's MPMP at three months. By initiating a three month follow up questionnaire, it was possible to examine factors that were able to predict those who did and did not do so well at follow-up across multiple clinical outcomes.

It is clear from this study that all clinical variable scores at baseline were predictive of their scores on the same variable at follow-up. Three variables, high PCS rumination, BPI intensity and interference, were predictive of multiple poorer outcomes at 3 months. This aligned with many previous predictor studies from the review in Chapter 2, and from a systematic review on MPMP in lower back pain patients (Van der Hulst et al. 2005), all of which identified that these variables are more problematic. This study did not show that the other psychosocial variables had much impact on three-month outcomes, which contrasts with much of the previous evidence presented.

This research aligned with other studies, demonstrating that demographic variables of age and gender were not predictive of outcome. As far as ethnicity was concerned, Māori had poorer clinical outcomes at three months than patients of European ethnicity, however this was only in two variables. This is the first-time ethnicity has been examined as a predictor in a prospective study on MPMPs, as studies do not normally have enough variation in ethnicity to analyse this variable. Having said that, this study could only include European, Māori and the Other ethnicity categories in the regression analyses due to low numbers of Pacific and Asian people. The only other significant findings related to better outcomes were for those working part time, while those with Fibromyalgia had conflicting outcomes.

Strengths and Limitations

The study had several strengths. Patients recruited in the MPMP, were followed up at three months. It was thus possible to estimate who in the chronic pain population was at risk of poorer outcomes, providing insights beyond what could be ascertained by discharge outcomes alone. Being a prospective cohort study has eliminated recall bias. Another advantage of this study was the use of standardised, validated outcome measures. The outcome measures are reliable and validated and used by most chronic pain services across New Zealand and Australia, and the findings are therefore readily applicable to these services. There was a high recruitment rate for this study, which in turn reflects QE Health's MPMP population. There was also a good representation of ethnicities in the study, so ethnicity was able to be explored as a predictor. This is unique as no other studies have looked at predicting three-month outcomes from MPMP in New Zealand or internationally.

There were however also some limitations to the study. There was only a 60% return rate of the three-month surveys. It was noted by the staff at QE Health that this could be attributed to the numeracy and literacy skills of the participants, which could interfere with compliance. Those with poorer literacy skills are more likely to be in low paying jobs, have poorer health or be unemployed (OECD, 2013). Some people may have physically and psychologically distanced themselves from the programme, as they moved on with their lives. The relatively high drop-out rate could introduce a nonresponse bias and the findings may not be reflective of all those who started the programme.

The participants and treatments used at QE Health are not entirely representative of all other New Zealand MPMPs. There are three unique features of the QE Health programme: the use of spa therapies including the use of thermal mud, using massage, and having participants stay

on site during the weeks of treatment. QE Health's thermal element means patients present with more rheumatological conditions, so they are not a true reflection of those who present to other chronic pain services in New Zealand. This potentially limits the generalisability of the findings to other MPMPs in New Zealand and worldwide.

4.6. **Clinical recommendations**

There are several recommendations that can be made in relation to the main findings of this study. Identifying risk factors for those who may not do as well from the QE Health MPMP means there is an opportunity to put in place targeted interventions that align with these presenting traits prior to and during the MPMP. The two clinical variables that were associated with poorer outcomes across multiple domains in this study were high BPI interference and high PCS rumination. Given that the affective aspect of the interference scale is more contributory to outcome than the activity aspect (Holden et al. 2016), targeting interventions toward this element, e.g. sleep interference, may help QE Health to improve three-month outcome with those who present with high baseline scores. For example, CBT techniques have been effective in reducing pain and improving insomnia in those with chronic pain by changing negative sleep cognitions (Finan et al., 2014), while techniques such as mindfulness-based therapy that apply acceptance and letting go principles have also shown to be beneficial for insomnia (Ong et al., 2008),

For those with the other risk factor of high PCS rumination, treatment needs to challenge the beliefs people hold about their own thinking (Flink et al., 2013). Watkins (2016) developed a technique called Rumination Focused Cognitive Behavioural Therapy (RFCBT) that encourages changing thoughts specific to rumination. This is a CBT treatment that works on the belief that

the negative consequences of rumination are due to abstract cognitive processing and that excessive rumination is a mental habit (Borders, 2020). Although initially designed as an individual therapy, RFCBT has also been developed for groups and including internet adaptations, with the advantage in the group setting that members are able to normalise, provide support to each other and generate helpful alternatives (Watkins, 2016). Therefore, this specific technique could be incorporated into the programme, or delivered prior to the programme, for those with high baseline PCS rumination.

Having more Māori participate in the three-week programme would be advantageous. This could be achieved by having increased avenues for referral, providing offerings of the programme specifically designed just for Māori and/or increasing Māori staff. It may also be possible to blend more culturally responsive aspects into delivery of the MPMP, such as incorporating the Te Whare Tapa Whā model of health (Durie, 1985). Mathieson et al. (2012) found potential for improved clinical outcomes for psychological distress by adapting an existing cognitive behavioural therapy–based, guided self-management intervention for near-threshold mental health syndromes in primary care. This was achieved by making content more culturally inclusive, placing an emphasis on forming relationships and guiding spirituality. Further interventions such as increasing the use of Māori language and changing imagery in self-management booklets, providing relevant scenarios, and by the use of karakia, and whakawhanaungatanga (Mathiesion et al., 2012) were also used. Indigenous research has consistently shown a strong correlation between connectedness and the mental wellbeing of Māori, with connectedness to whānau, society and culture being considered key for Māori health and wellbeing (Dallas-Katoa et al., 2019; Hudson & Hughes, 2007; Pere, 2006; Kingi, 2002). These models and philosophies could be blended into QE Health's programme.

For those who work part time there were some positive effects compared to the reference group of unemployed participants. Therefore, for those who are unemployed and who want to work, there could be benefit in encouraging part time work rather than fulltime work, as a way of getting people into the workforce. For these people, more of a focus in the programme could be placed on vocational opportunities and how to manage and balance work, life and pain.

The QE Health MPMP also showed some specific beneficial effects for other subgroups; patients with fibromyalgia had higher levels of PSEQ at follow up and those with RA showed reduced PCS rumination. These findings may be due to the targeted sessions offered (for RA at least). QE Health could consider whether other condition/population groups receive targeted intervention specific to their needs.

It would also be recommended to continue to incorporate the new initiatives that QE Health put in place due to this research. One of these is to continue with the follow up assessment to ascertain the longitudinal benefit of the programme, with potential further follow up points at 6- and 12-months. This will inform if there are any positive or negative effects of the programme over time as patients return to life in the community. Continuing to use the validated assessment tools that cover the domains recommended by ePOCC would also ensure comparison with other Australasian chronic pain facilities that also use these assessment tools.

Due to the difficulty retrieving questionnaires via mail, adapting the follow up survey to a phone app or electronic survey would likely make for quicker and more efficient data collection. Belesario et al (2015) found that there is still not enough evidence to make recommendations of what apps may have on responses to surveys, but suggest survey

questionnaires on apps could enhance data collection speed, reduce costs and open up the proportion of people who can be surveyed.

The representation of Māori and males were lower than expected in this study. Therefore, promoting programmes more towards these demographics or adapting components to be more appealing to this group may be beneficial. If QE Health were to follow the previously suggested recommendation, including more culturally responsive content, there might be improved participation. Promotion of a 'well man' service may have some benefit in increasing male attendance, as this approach has shown benefit in other clinical settings (Kirby et al., 2009).

4.7. **Recommendations for future research**

It was beyond the scope of this dissertation to look at other potential relationships between the variables in this study. For example, whether the clinical outcomes at discharge, rather than at referral, were better at predicting three-month outcomes. Or, alternatively, if changes in the clinical outcomes from baseline to discharge were able to predict three-month outcomes. The current data would enable these analyses to be undertaken, or any other combination of baseline and discharge data, to identify if there are other important determinants of long-term outcomes.

Exploring whether the differential outcomes for those with fibromyalgia and RA were due to a tailored programme approach would clarify if other subgroups might benefit from targeted intervention in addition to the structured programme. For example, a randomised controlled study (RCT) could be undertaken of patients in the fibromyalgia subgroup to establish whether benefit from increased techniques targeted towards depression, where one group of

fibromyalgia patients were provided with an extra substitute module targeting depression while the other group received the standard programme. Alternatively, an RCT exploring whether interventions targeting pain interference and/or catastrophising could be beneficial.

A qualitative study could be implemented to explore how to improve attendance of and outcomes for Māori, to address the noted poorer outcomes in some domains and reduced attendance for Māori. This would involve interviews or hui/focus groups with the local Māori community to gain their views of QE Health and the MPMP, and with Māori patients who have been through the programme to ascertain their views on the programme's cultural responsiveness.

Chapter 5. CONCLUSION

Pain is neither a physical nor a psychological experience, but one influenced by biomedical, psychosocial and cognitive factors. Chronic pain is like living with an open Pandora's box, it exposes an individual to a plethora of negative emotions, including an overall reduced enjoyment of life and an increase in psychosocial variables such as depression, anxiety, and stress. It can impair relationships with others and cause a decrease in physical functioning such as poor sleep, to name but a few.

These clinical characteristics can exacerbate and maintain levels of pain and, subsequently, disability. Hope for those with chronic pain comes in the form of the MPMP, teaching patients strategies to cope, and providing relief of chronic pain symptoms across both biomedical and psychosocial presenting characteristics. Although it is accepted that MPMPs are credible and offer precedent care, there are large gaps in understanding the exact treatment formulae of what works well and for whom within MPMPs. Therefore, understanding and analysing what is effective and why means that personalised health outcomes for chronic pain patients can be achieved.

This research therefore presented two well designed research projects, both of which contribute to global understanding of components of care in MPMP. In particular, this research focused on components of programme delivery, and addressed whether an intervention to provide more group delivery was any more effective than the same programme delivered with a more individual focus. Furthermore, to determine whether 3-month outcomes could be predicted by patient characteristics at baseline.

Assessment of practice at QE Health has enabled some recommendations to be implemented. It was found that a group delivery approach is just as effective as individual therapy for the

outcomes of anxiety, depression and the QE Health scale. Further, a subgroup (those with OA and RA) responded particularly well to group intervention. Therefore, continuing with either approach is recommended based on these outcomes; however, group delivery may be more cost effective.

This research also has highlighted subgroups that are not so successful. For example, all clinical outcome measures were significant predictors of themselves at follow-up. This suggests that those who came in with more severe symptoms were still more severe at follow-up. In particular, high levels of PCS rumination, BPI pain intensity and BPI pain interference were predictive of multiple poorer outcomes at 3 months. Identifying patients with these characteristics on admission to the programme and targeting specific intervention towards these characteristics might help to strengthen the programme and promote better patient outcomes across the board.

This study was unique in that it was able to look at ethnicity as a predictor of success, which has not previously been undertaken in MPMP literature. This research found that being of Māori ethnicity was associated with poorer outcomes at three months when compared with European ethnicity, therefore highlighting ethnic disparities in outcomes.

Change within the way QE health collected data was also able to be initiated as a result of completing this doctorate. QE Health adapted its assessment tools to align with the ePPOC outcome measurements and IMMPACT domains. These standardised measures now align with best practice and can be used to compare treatment outcomes with other programmes, promoting comparison between MPMPs. A further change that occurred was the initiation of a 3-month follow up. This has been shown to be a very useful clinical practice to gauge the longer term effectiveness of treatment.

This doctoral thesis has contributed to knowledge and understanding in components of care, and of therapeutic effectiveness, and for whom on average show the greatest and poorest improvement and of whom need prioritising, along with advancing professional practice in a real-world setting. This advancement of MPMP practice can be applied at three strategic levels: at an agency level by promoting change at QE health, at a national level by analysing a MPMP within a New Zealand context, and thirdly adding to a global understanding of MPMP care.

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APPENDIX A. THE QE HEALTH SCALE (QEHS)

In the past week, how frequently did you..	All the time				Never
1. Have fun, lots of laughter, and sharing with those around you.....	1	2	3	4	5
2. Find you could understand what was happening to yourself and others because you felt you belonged to and were a part of nature, people and life in general.....	1	2	3	4	5
3. Take time to really look at yourself and understand what makes your illness worse or better.....	1	2	3	4	5
4. See yourself as a unique person	1	2	3	4	5
5. Discover that you have an inner strength that was real and enduring.....	1	2	3	4	5
6. Understand, accept and value yourself, warts and all.....	1	2	3	4	5
7. Feel your life had purpose and meaning.....	1	2	3	4	5
8. Feel grateful for your life and appreciate the wonders of life.....	1	2	3	4	5
9. Feel at peace with your life and yourself.....	1	2	3	4	5
10. Look after your spiritual, emotional and mental self, and find your physical condition was also better.....	1	2	3	4	5
11. Care for people, animals or the environment that are important to you.....	1	2	3	4	5
12. See life and health in a way you previously would not have believed possible.....	1	2	3	4	5
13. Feel you loved yourself and enjoyed your own company.....	1	2	3	4	5
14. Make a difference by serving, helping, sharing, listening, or educating others so that they were happy and fulfilled.....	1	2	3	4	5

15. Give and receive love in a way that made you feel at one with other people, nature and the universe/God/the spiritual world.....	1	2	3	4	5
16. Connect to something beyond yourself that was spiritual, which increased your faith, hope, strength, peace, guidance, knowledge, love or warmth, etc.....	1	2	3	4	5
17. Find your disease/illness/disability provided you with an exciting challenge that helped you to be whole and resilient.....	1	2	3	4	5
18. Go easy on yourself and not worry when you didn't get it ‘right’.....	1	2	3	4	5
19. Feel that you were in a safe, secure and positive environment.....	1	2	3	4	5
20. Realize you were no longer what you were but were something more than you were.....	1	2	3	4	5
21. Have an ultimate goal, and set small, achievable steps to reach it.....	1	2	3	4	5
22. Feel you were whole and had value because you are you.....	1	2	3	4	5
23. Find that health professionals helped you to solve problems, rather than telling you what to do.....	1	2	3	4	5
24. Find that what you are doing now was different from what you were doing in the past and believe that this will be different from what you will do in the future.....	1	2	3	4	5
25. Listen to yourself, work out what was right for you, choose what you needed to do and then do it.....	1	2	3	4	5
26. Face up to and accept your own limitations as a part of who you are.....	1	2	3	4	5
27. Find that you could make choices because you were in an environment where others told you the truth, even though it was hard to take.....	1	2	3	4	5
28. Find that your plans were working and you were achieving your goals.....	1	2	3	4	5

APPENDIX B. BRIEF PAIN INVENTORY

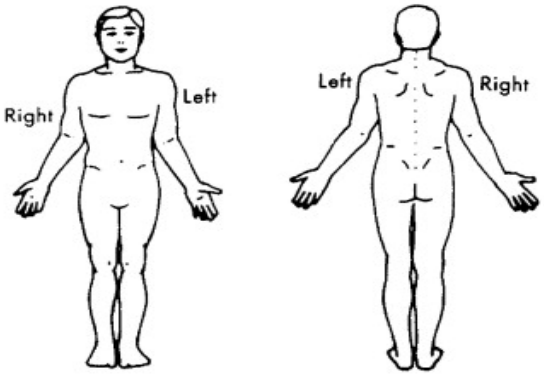
FORM 3.2 **Brief Pain Inventory**

Date____ / ____ / ____ Time:_____

Name: _____ _____ _____
Last First Middle Initial

1) Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprains, and toothaches). Have you had pain other than these everyday kinds of pain today?
1. Yes 2. No

2) On the diagram shade in the areas where you feel pain. Put an X on the area that hurts the most.



3) Please rate your pain by circling the one number that best describes your pain at its **worst** in the past 24 hours.

0 1 2 3 4 5 6 7 8 9 10
No pain — pain as bad as you can imagine

4) Please rate your pain by circling the one number that best describes your pain at its **least** in the past 24 hours.

0 1 2 3 4 5 6 7 8 9 10
No pain — pain as bad as you can imagine

5) Please rate your pain by circling the one number that best describes your pain on the **average**

0 1 2 3 4 5 6 7 8 9 10
No pain — pain as bad as you can imagine

6) Please rate your pain by circling the one number that tells how much pain you have **right now**.

0 1 2 3 4 5 6 7 8 9 10
No pain — pain as bad as you can imagine

7) What treatments or medications are you receiving for your pain?

_____

_____

8) In the Past 24 hours, how much **relief** have pain treatments or medications provided? Please circle the one percentage that most shows how much releif you have received

0% 10 20 30 40 50 60 70 80 90 100%
No relief — Complete relief

9) Circle the one number that describes how, during the past 24 hours, pain has **interfered** with your:
A. General activity

0 1 2 3 4 5 6 7 8 9 10
Does not interfere — Completely interferes

B. Mood

0 1 2 3 4 5 6 7 8 9 10
Does not interfere — Completely interferes

C. Walking ability

0 1 2 3 4 5 6 7 8 9 10
Does not interfere — Completely interferes

D. Normal work (includes both work outside the home and housework

0 1 2 3 4 5 6 7 8 9 10
Does not interfere — Completely interferes

E. Relations with other people

0 1 2 3 4 5 6 7 8 9 10
Does not interfere — Completely interferes

F. Sleep

0 1 2 3 4 5 6 7 8 9 10
Does not interfere — Completely interferes

G. Enjoyment of life

0 1 2 3 4 5 6 7 8 9 10
Does not interfere — Completely interferes

APPENDIX C: HOSPITAL ANXIETY AND DEPRESSION SCALE

Hospital Anxiety and Depression Scale (HADS)

Tick the box beside the reply that is closest to how you have been feeling in the past week.
Don't take too long over you replies: your immediate is best.

D	A		D	A	
		I feel tense or 'wound up':			**I feel as if I am slowed down:**
	3	Most of the time	3		Nearly all the time
	2	A lot of the time	2		Very often
	1	From time to time, occasionally	1		Sometimes
	0	Not at all	0		Not at all
		I still enjoy the things I used to enjoy:			**I get a sort of frightened feeling like 'butterflies' in the stomach:**
0		Definitely as much		0	Not at all
1		Not quite so much		1	Occasionally
2		Only a little		2	Quite Often
3		Hardly at all		3	Very Often
		I get a sort of frightened feeling as if something awful is about to happen:			**I have lost interest in my appearance:**
	3	Very definitely and quite badly	3		Definitely
	2	Yes, but not too badly	2		I don't take as much care as I should
	1	A little, but it doesn't worry me	1		I may not take quite as much care
	0	Not at all	0		I take just as much care as ever
		I can laugh and see the funny side of things:			**I feel restless as I have to be on the move:**
0		As much as I always could		3	Very much indeed
1		Not quite so much now		2	Quite a lot
2		Definitely not so much now		1	Not very much
3		Not at all		0	Not at all
		Worrying thoughts go through my mind:			**I look forward with enjoyment to things:**
	3	A great deal of the time	0		As much as I ever did
	2	A lot of the time	1		Rather less than I used to
	1	From time to time, but not too often	2		Definitely less than I used to
	0	Only occasionally	3		Hardly at all
		I feel cheerful:			**I get sudden feelings of panic:**
3		Not at all		3	Very often indeed
2		Not often		2	Quite often
1		Sometimes		1	Not very often
0		Most of the time		0	Not at all
		I can sit at ease and feel relaxed:			**I can enjoy a good book or radio or TV program:**
	0	Definitely	0		Often
	1	Usually	1		Sometimes
	2	Not Often	2		Not often
	3	Not at all	3		Very seldom

Please check you have answered all the questions

Scoring:
Total score: Depression (D) _____ Anxiety (A) _____
0-7 = Normal
8-10 = Borderline abnormal (borderline case)
11-21 = Abnormal (case)

APPENDIX D: PAIN CATASTROPHISING SCALE

PCS

Client No.: _____ Age: _____ Sex: M(__) F(__) Date: _____

Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.

We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

0 – not at all **1** – to a slight degree **2** – to a moderate degree **3** – to a great degree **4** – all the time

When I'm in pain …

1. ☐ I worry all the time about whether the pain will end.
2. ☐ I feel I can't go on.
3. ☐ It's terrible and I think it's never going to get any better.
4. ☐ It's awful and I feel that it overwhelms me.
5. ☐ I feel I can't stand it anymore.
6. ☐ I become afraid that the pain will get worse.
7. ☐ I keep thinking of other painful events.
8. ☐ I anxiously want the pain to go away.
9. ☐ I can't seem to keep it out of my mind.
10. ☐ I keep thinking about how much it hurts.
11. ☐ I keep thinking about how badly I want the pain to stop.
12. ☐ There's nothing I can do to reduce the intensity of the pain.
13. ☐ I wonder whether something serious may happen.

APPENDIX E. PAIN SELF EFFICACY QUESTIONNAIRE

PAIN SELF EFFICACY QUESTIONNAIRE (PSEQ)

M.K.Nicholas (1989)

NAME: _____ DATE: _____

Please rate how **confident** you are that you can do the following things at present, **despite the pain**. To indicate your answer circle **one** of the numbers on the scale under each item, where 0 = not at all confident and 6 = completely confident.

For example:

0	1	2	3	4	5	6
Not at all Confident						**Completely confident**

Remember, this questionnaire is **not** asking whether of not you have been doing these things, but rather **how confident you are that you can do them at present, despite the pain.**

---

1. I can enjoy things, despite the pain.

0	1	2	3	4	5	6
Not at all Confident						**Completely confident**

2. I can do most of the household chores (e.g. tidying-up, washing dishes, etc.), despite the pain.

0	1	2	3	4	5	6
Not at all Confident						**Completely confident**

3. I can socialise with my friends or family members as often as I used to do, despite the pain.

0	1	2	3	4	5	6
Not at all Confident						**Completely confident**

4. I can cope with my pain in most situations.

0	1	2	3	4	5	6
Not at all Confident						**Completely confident**

Turn over

5. **I can do some form of work, despite the pain. ("work" includes housework, paid and unpaid work).**

0	1	2	3	4	5	6
Not at all Confident						Completely confident

6. **I can still do many of the things I enjoy doing, such as hobbies or leisure activity, despite pain.**

0	1	2	3	4	5	6
Not at all Confident						Completely confident

7. **I can cope with my pain without medication.**

0	1	2	3	4	5	6
Not at all Confident						Completely confident

8. **I can still accomplish most of my goals in life, despite the pain.**

0	1	2	3	4	5	6
Not at all Confident						Completely confident

9. **I can live a normal lifestyle, despite the pain.**

0	1	2	3	4	5	6
Not at all Confident						Completely confident

10. **I can gradually become more active, despite the pain.**

0	1	2	3	4	5	6
Not at all Confident						Completely confident

Source: Nicholas M.K. Self-efficacy and chronic pain. Paper presented at the annual conference of the British Psychological Society. St. Andrews, 1989.
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APPENDIX F. DEPRESSION ANXIETY STRESS SCALE 21

DASS21

Name: Date:

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree or a good part of time
3 Applied to me very much or most of the time

1 (s)	I found it hard to wind down	0	1	2	3
2 (a)	I was aware of dryness of my mouth	0	1	2	3
3 (d)	I couldn't seem to experience any positive feeling at all	0	1	2	3
4 (a)	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5 (d)	I found it difficult to work up the initiative to do things	0	1	2	3
6 (s)	I tended to over-react to situations	0	1	2	3
7 (a)	I experienced trembling (e.g. in the hands)	0	1	2	3
8 (s)	I felt that I was using a lot of nervous energy	0	1	2	3
9 (a)	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10 (d)	I felt that I had nothing to look forward to	0	1	2	3
11 (s)	I found myself getting agitated	0	1	2	3
12 (s)	I found it difficult to relax	0	1	2	3
13 (d)	I felt down-hearted and blue	0	1	2	3
14 (s)	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15 (a)	I felt I was close to panic	0	1	2	3
16 (d)	I was unable to become enthusiastic about anything	0	1	2	3
17 (d)	I felt I wasn't worth much as a person	0	1	2	3
18 (s)	I felt that I was rather touchy	0	1	2	3
19 (a)	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20 (a)	I felt scared without any good reason	0	1	2	3
21 (d)	I felt that life was meaningless	0	1	2	3

APPENDIX G. RECRUITMENT FLYER

Volunteers wanted for a study investigating patient outcomes from QE Health's pain management programme

We are conducting a study to determine if we can predict which patients receive the most benefit from the pain management programme at QE Health. To be eligible for the study, you must:

- be accepted into QE Health's pain management programme
- be over 18 years of age
- not have any major psychiatric conditions

If you take part, you will complete questionnaires that evaluate your current pain and well-being 3-months after you have finished the programme.

To obtain more information about this study, please read the Information Sheet enclosed or contact:

Rebecca Mowat on 0800 864646 x8797 or email rebecca.mowat@toiohomai.ac.nz

APPENDIX H. PARTICIPANT INFORMATION SHEET

TE WĀNANGA ARONUI O TĀMAKI MAKAU RAU

Participant Information Sheet

Date Information Sheet Produced:

28 March, 2018

Project Title

Exploring the effectiveness of the pain management programme at Queen Elizabeth Health (QE Health), Rotorua, New Zealand.

An Invitation

My name is Rebecca Mowat and I am working towards a Doctor of Health Science qualification at Auckland University of Technology. I am working with QE Health to see which patients respond the best to their three-week chronic pain programme. Participation in this project is voluntary and you may withdraw at any time prior to the completion of data collection.

What is the purpose of this research?

The purpose of this study is to see if we can identify the types of people who benefit the most from the QE Health's pain management programme. This will help QE Health to see how successful their programme is and identify ways in which the programme could be improved. The data will be written up for publication in a journal and will be used for a Doctor of Health Science thesis.

How was I identified and why am I being invited to participate in this research?

You have been identified because you have been accepted to participate in QE Health's pain management programme and you are over 18 years of age. All people over 18 years who have been accepted into the pain management programme have been invited to participate. You may be excluded from participating if you are unable to communicate in English, have a psychiatric condition, or are taking psychiatric medication.

How do I agree to participate in this research?

To agree to participate you will complete a Consent Form that will be provided on your first day at QE Health.

Your participation in this research is voluntary (it is your choice) and whether or not you choose to participate will neither advantage nor disadvantage you. Participation in the study will not influence the treatment that you receive at QE Health or elsewhere. You are able to withdraw from the study at any time. If you choose to withdraw from the study, then you will be offered the choice between having any data that is identifiable as belonging to you removed or allowing it to continue to be used. However, once the findings have been produced, removal of your data may not be possible.

What will happen in this research?

QE Health currently uses questionnaires to collect information on your pain at admission to the programme and at the end of your time in the programme. We would like to obtain these data from before and after the programme (pain questionnaires, age, gender, height, weight, ethnicity, diagnosis) and also collect the same information three months after you leave the programme. Three months after completing the programme, we will send you the same questionnaires that you completed previously, and ask you to fill them in and send them back to QE Health in a pre-paid envelope. Staff at QE Health will enter the questionnaire data into their database and then give the questionnaires to the researchers. This information will be used to identify the types of people whose pain improved the most after the three-week programme.

What are the discomforts and risks?

There is no risk that you will be identified in any way, so there is no risk by participating in this research. Your questionnaire data will be given to the researcher by QE Health's administrator after removing any identifying information, such as your name, address, or NHI number. The researcher will not have access to any medical notes.

What are the benefits?

You will receive no direct benefit from participating in this research. However, by participating you will help QE Health to understand which patients do well through attending the three-week chronic pain programme. This may help QE Health to improve the programme to benefit more people.

How will my privacy be protected?

You will be given a code upon entry to the study and your name will not be used. The Consent Form that contains your name and your code will be stored in a locked filing cabinet. No individual results will be identifiable in the study.

What are the costs of participating in this research?

The cost of participating in this project will be your time. The questionnaires will take approximately 20 minutes to complete and will require that you place the forms in a prepaid, self-addressed envelope and send them back to QE Health.

What opportunity do I have to consider this invitation?

You will have up to three weeks to consider this invitation. Prior to coming to QE Health, you can contact the researchers to ask any questions. At your first day at QE Health, staff will explain the project to you and you will be able to ask questions. You will have up until the end of the programme to decide if you would like to participate.

Will I receive feedback on the results of this research?

On the Consent Form, you have the option to indicate if you would like to receive a 1-page summary of the findings.

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, *Gwyn Lewis, gwyn.lewis@aut.ac.nz, 09 921 9999 x7621*.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC, Kate O'Connor, *ethics@aut.ac.nz*, 921 9999 ext 6038.

Whom do I contact for further information about this research?

Please keep this Information Sheet and a copy of the Consent Form for your future reference. You are also able to contact the research team as follows:

Researcher Contact Details:

Rebecca Mowat
Ph: 0800 864646 x8797
rebecca.mowat@toiohomai.ac.nz

Project Supervisor Contact Details:

Dr Gwyn Lewis
Ph: 09 921 9999 x7621
Email: gwyn.lewis@aut.ac.nz

Approved by the Auckland University of Technology Ethics Committee on *type the date final ethics approval was granted*, AUTEC Reference number *type the reference number*.

APPENDIX I. CONSENT FORM

Consent Form

Project title: ***Exploring the effectiveness of the pain management programme at Queen Elizabeth Health (QE Health), Rotorua, New Zealand.***

Project Supervisor: ***Dr Gwyn Lewis***

Researcher: ***Rebecca Mowat***

- ○ I have read and understood the information provided about this research project in the Information Sheet dated 28 March, 2018.
- ○ I have had an opportunity to ask questions and to have them answered.
- ○ I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without being disadvantaged in any way.
- ○ I understand that if I withdraw from the study then I will be offered the choice between having any data or tissue that is identifiable as belonging to me removed or allowing it to continue to be used. However, once the findings have been produced, removal of my data may not be possible.
- ○ I agree to having the information collected on the QE Health questionnaires, along with personal information (age, gender, height, weight, ethnicity) provided to the researchers for the study.
- ○ I agree to take part in this research.
- ○ I wish to receive a summary of the research findings (please tick one): Yes ○ No ○
- ○ I wish to be contacted in relation to any other pain research being conducted by the Health and Rehabilitation Research Institute at AUT (please tick one): Yes ○ No ○

Participant's signature: .....

Participant's name: .....

Participant's Contact Details (if appropriate):

.....

.....

.....

.....

Date:

Approved by the Auckland University of Technology Ethics Committee on 11/2018AUTEC Reference number 18/66

Note: The Participant should retain a copy of this form.