The role of selected factors in the short-term prognosis of acute and chronic low back pain in patients attending the Durban University of Technology Chiropractic Day Clinic.

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I, Keric P. Allenbrook, do declare that this dissertation is representative of my own work in both conception and execution (except to where acknowledgements indicate to the contrary)

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DEDICATION

This dissertation is dedicated to my parents,
for allowing me to follow my dream for so long,
and the support and understanding that has
and will always continue to go along with it.

I thank you.

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ABSTRACT

Background: The increasing cost and prevalence of chronic low back pain (LBP), has resulted in more resources being devoted to its treatment and management than ever before, despite only approximately 10% of acute cases progressing to chronicity. Determining prognostic factors for the short-term improvement of acute and chronic patients with LBP has become a research focus area to try and identify baseline factors that may affect a patients' improvement with conservative treatment. Internationally studies have been conducted in developed countries however similar studies are lacking in developing settings like South Africa. It is unclear if the prognostic factors identified would be similar across populations. Thus, this study aimed to determine if pain, disability (social and physical), anxiety, depression, work fear-avoidance and locus of control, were associated with short-term prognosis, as determined by self-reported improvement using a Patients Global Impression of Change (PGIC) scale, in acute and chronic LBP patients attending the Durban University of Technology Chiropractic Day Clinic (DUT CDC).

Method: Consecutive patients seeking treatment at the DUT CDC with a new episode of non-specific LBP, who met the study criteria, were approached for participation in the study. On agreeing to participate they were given the Bournemouth Questionnaire (BQ), a demographic questionnaire and a letter of information and consent (LOIC) at the initial consultation by student chiropractors. Those participants that were still attending treatment at the $4^{th}/5^{th}$ and tenth visit were required to complete the BQ and the PGIC.

Results: A hundred participants were enrolled in the study, 65% had acute LBP and 52% were male. Only 20% of the initial group were still attending treatment at the $4^{th}/5^{th}$ follow-up. Baseline comparisons of those with acute and chronic pain revealed no significant difference in gender or age. Acute patients at the initial visit had higher levels of disability (social and physical), anxiety, depression and fear-avoidance beliefs than the chronic pain participants. At the $4^{th}/5^{th}$ treatment, the acute pain patients showed a significant decrease in pain (p=0.002) and disability (p=0.032), with all other measures decreasing from baseline measures. Similarly, chronic pain participants had a significant decrease in pain (p=0.038) but a significant increase in depression (p=0.015) scores, with all other prognostic factors being rated higher than at the initial

consultation. The majority of participants (85%) in this study reported a clinical improvement in their LBP. In the acute pain sufferers, all but one participant reported improvement, thus identification of prognostic factors or this group was not possible. In the chronic pain participants, no factors were identified as prognostic for improvement, regardless of the low numbers still attending at the 4^{th}/5^{th} visit.

Conclusions: Trends suggested that chronic pain sufferers were less likely to report decreases in the prognostic factors (except for pain), when compared to the acute pain participants. In the chronic LBP participants, no factors were associated with improved prognosis. The predictive value in determining which patients were less likely to improve was limited in the current study due to a small sample size.

Key indexing terms:

Prognostic factors, low back pain, chiropractic, yellow flags, risk factors, prognosis.

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DEFINITIONS

Acute pain: ‘Pain of recent onset and probable limited duration. It usually has an identifiable temporal and causal relationship to injury or disease’ (Australian and New Zealand College of Anaesthetists (ANZCA), 2010).

Braggards Test: An orthopaedic test which is a continuation of the Straight Leg Raise test by the examiner lowering the extended leg by 10° and passively dorsiflexing the ankle. If the pain increases it may indicate stretching of the dura mater (Magee, 2006).

Chronic pain: ‘Commonly persists beyond the time of healing of an injury and frequently there may not be any clearly identifiable cause’ (ANZCA, 2010).

Chronicity: When a patient has a condition that develops from an acute or subacute state into a chronic state (Liebenson, 2009).

Dry needling: A therapeutic technique that involves inserting tiny acupuncture needles into the skin and muscle in order to relieve the tenderness and tension in an active myofascial trigger point (Ott, Adams & Howe, 2011).

Gaenslens Test: An orthopaedic test that tests for sacroiliac involvement in a patient presenting with low back pain (Magee, 2006).

Ischaemic compression: Also referred to as trigger point pressure release, is an increasing application of pressure, usually with the thumb, over an active myofascial trigger point in order to relieve the tenderness and tension in the trigger point (Giamberardino, Affaitati, Fabrizio & Costantini, 2011).

Kemp's Test: An orthopaedic test that tests for any narrowing of the intervertebral foramen or local pain at the facet joints (Magee, 2006).

Locus of control: This refers to the perceived control that a patient has over their health (Oliveira, Furiati, Sakamoto, Ferreira, Ferreira & Maher, 2008). In this study it refers to the perceived control the participant had over their low back pain.

Low Back Pain (LBP): Pain occurring below the twelfth rib and above the gluteal fold (Borenstein, 2013a).

Maintenance Treatment: The management program that is used to either prevent new episodes of low back pain due to its cyclical nature or to manage a chronic condition by regular treatments (Sandnes, Bjornstad, Leboeuf-Yde & Hestbaek, 2010).

Myofascial pain syndrome: Caused by active myofascial trigger points that refer autonomic phenomena, cause spontaneous pain and incorporate the associated motor and sensory symptoms (Giamberardino *et al.,* 2011).

Non-specific low back pain: A classification of LBP where the specific diagnosis may not be defined on the basis of physiological or anatomical abnormalities alone (Cuesta-Vargas, Farasyn, Gabel, & Luciano, 2014).

Pain: An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (ANZCA, 2010).

Patrick FABER test: An orthopaedic test where the patient lies supine and the affected leg is flexed at the knee and externally rotated and abducted in order to place the ankle on top of the opposite knee. The leg is then allowed to fall to the bed with a positive

test being pain posteriorly in the sacroiliac joint or hip joint involvement and/or iliopsoas spasm if the leg does not reach the bed surface (Magee, 2006).

Prognostic factors: Characteristics that are objectively measured and provide information of the likely outcome of a medical condition in untreated individuals (Italiano, 2011). The prognostic factors being investigated in this study are pain, disability (social and physical), anxiety, depression, work fear-avoidance and locus of control.

Red flags: A clinical symptom or sign that may indicate sinister pathology as a source of the patient's spinal pain (Liebenson, 2009).

Spinal manipulative therapy (SMT): Various techniques used to improve joint range of motion. The most common modality used is the high velocity, low amplitude (HVLA) thrust applied to the joint in order to take it through its available range of motion. This technique is often termed an 'adjustment' or 'manipulation' (Globe, Farabaugh, Hawk, Morris, Baker, Whalen, Walters, Kaeser, Dehen & Augat, 2016*)*.

Straight Leg Raise: An orthopaedic test done passively with the patient supine and relaxed in which the doctor lifts the leg in full extension to a point in which the patient describes pain or tightness in the back of the leg. If a disc herniation is present then the pain is more likely to be located in the back but if the sensation travels down the leg then the pathology is more likely to have neurological involvement (Magee, 2006).

Subluxation: In the context of this research subluxation refers to a clinical condition or syndrome of LBP (Bergmann & Peterson, 2011).

Yellow flags: A sign or symptom that should raise the index of suspicion regarding the development of chronicity in a patient with spinal pain (Liebenson, 2009).

ABBREVIATIONS

antiCCP- Anticyclic citrullinated peptide

ADL - Activities of daily living

BQ - Bournemouth Questionnaire

CAM - Complementary and alternative medicine

CI - Confidence interval

CPG - Clinical practice guidelines

CT - Computed tomography

DUT CDC - Durban University of Technology Chiropractic Day Clinic

FAB - Fear avoidance beliefs

FABQ - Fear-Avoidance Beliefs Questionnaire

GDP - Gross domestic product

GHQ - General Health Questionnaire

GIOC - Global impression of change

GP - General practitioner

H_o - Null hypothesis

HADS - Hospital Anxiety and Depression Score

HVLA - High velocity, low amplitude

IFC - Interferential current

IREC - Institutional Research and Ethics Committee

IVD - Intervertebral disc

LBP - Low back pain

LOIC - Letter of information and consent

MFTP - Myofascial trigger point

MRI - Magnetic resonance imaging

N - Number

NICE - National Institute for Health and Clinical Excellence

OSW - Oswestry Low Back Pain Disability Questionnaire

OTC - Over-the-counter

p - *p*-value

PGIC - Patients Global Impression of Change Scale

QUE - Quebec Back Pain Disability Scale

RMDQ- Roland-Morris Disability questionnaire

ROM - Range of motion

RF - Rheumatoid factor

SBST - Keele STarT Back Screening Tool

SD - Standard deviation

SF - Short-form

SI - Sacroiliac

SMT - Spinal manipulative therapy

SPSS - Statistical Package for the Social Science

SP - Spinous process

TENS - Transcutaneous electrical nerve stimulation

TVP - Transverse process

U.K. - United Kingdom

USA - United States of America

VAS - Visual analogue pain scale

Chapter One

Introduction

1.1 Background to the study

Musculoskeletal pain has a high burden of cost due to its treatment and management (Bolton & Hurst, 2011) with low back pain (LBP) being the most common form of musculoskeletal pain suffered by people today (Melloh, Elfering, Presland, Roeder, Barz, Salathe, Tamcan, Mueller & Theis, 2009). LBP is considered to be pain below the twelfth rib and above the gluteal fold (Borenstein, 2013a). The prevalence of LBP, irrespective of region, ranges between 60-90% (Gurcay, Bal, Eksioglu, Esen Hasturk, Gurhan Gurcay & Cakci, 2009). Although LBP is often self-limiting, there is a possibility that LBP can develop into a chronic condition which increases the costs and suffering associated with its management (Jenkins, 2002). Approximately only 10-15% of LBP cases progress to a chronic state, with a proportionate correlation between the length of the condition and the usage of resources spent (Gore, Sadosky, Stacey, Tai & Leslie, 2012). Thus the majority of dedicated resources are directed at chronic LBP (Croft, Macfarlane, Papageorgiou, Thomas & Silman, 1998; Itz, Geurts, van Kleef & Nelemans, 2013).

Due to the high burden of LBP costs, both for the country and for the patient (Gore *et al.,* 2012) efforts have been taken to determine factors that can be identified early in the management of LBP to alter the progression to chronicity. These factors, often referred to as prognostic factors, can assist clinicians in managing their patients with LBP, allowing the correct interventions to be made where necessary (Hilfiker, Bachmann, Heitz, Lorenz, Joronen & Klipstein, 2007). Prognostic factors include pain, disability, the presence of fear-avoidance behaviors (Poiraudeau, Rannou, Baron, Le Hananff, Coudeyre, Rozenberg, Huas, Martineau, Jolivet-Landreau, Garcia-Mace, Revel & Ravaud, 2006; Cook, Learman, O'halloran, Showalter, Kabbaz, Goode & Wright, 2013), duration of current episode of pain (Skargren & Öberg, 1998) and the presence of co-morbid conditions (Langworthy & Breen, 2007).

Studies (Skargren & Öberg, 1998; Poiraudeau *et al.*, 2006; Sorensen, Stochkendahl, Hartvigsen & Nilsson, 2006; Langworthy & Breen, 2007; Costa, Maher, McAuley, Hancock, Herbert, Refshauge & Henschke, 2009; Bolton & Hurst, 2011; Dunn, Jordan & Croft, 2011) investigating the role of these factors have predominantly been done in developed countries with little to no information available in resource-poor settings, like South Africa.

As populations differ throughout the world with regards to their specific characteristics, it is necessary to conduct studies on different populations, for example the number of patients in paid employment differ amongst countries, which has been implicated as an important factor in the prognosis of patients with musculoskeletal pain (Bolton & Hurst, 2011). LBP research in developing countries is lacking in comparison to developed countries and as a result there is little understanding of the influencing prognostic factors in these countries, especially in Africa (Louw, Morris & Grimmer-Somers, 2007). As research in African countries is increasing there is more evidence suggesting that prevalence rates of LBP may be similar to that of developed countries (Louw *et al.,* 2007; Morris, Daniels & Louw, 2016).

The Durban University of Technology Chiropractic Day Clinic (DUT CDC) is a chiropractic teaching clinic, located in Berea, Durban. It caters to the local population and allows for access to Chiropractic services at a rate lower than that which is available in private practice. This makes it accessible to those who may not be able to otherwise access chiropractic care. In a recent study it was found that half of the patients (n=291) presenting to the clinic did so for chronic musculoskeletal problems (51.2%, n=149), of which 35.7% attended for LBP (n=104) (McDonald, 2012).

The DUT CDC is found on the Ritson Road campus of the Durban University of Technology and provides an environment for chiropractic students to learn the necessary practical skills to go into private practice once qualified (McDonald, 2012). During the course of study at DUT chiropractic students are taught the diversified technique of manipulative therapy along with adjunctive therapies such as dry needling

and manual and linear traction, and modalities such as Interferential current (IFC), Ultrasound, Transcutaneous electrical nerve stimulation (TENS), and Laser therapy. Stretching, strengthening and rehabilitation forms part of the patient management strategies carried out by students in this setting and the students are taught following principles of the biopsychosocial paradigm of health care (Chiropractic & Somatology handbook, DUT, 2016).

In international clinical settings, factors such as a high pain rating (Costa *et al.,* 2009; Gurcay *et al.*, 2009; Bolton & Hurst, 2011), disability and high fear-avoidance behavior (Poiraudeau *et al.,* 2006; Bolton & Hurst, 2011) have been shown to be associated with a poorer prognosis for improvement in LBP patients. Yet no studies have been undertaken at the DUT CDC. It is unclear whether the prognostic factors identified in other settings around the world would be similar to those of the low back pain patients attending the DUT CDC as no research of this kind has been done before.

1.2 Research Aim and Objectives

1.2.1 Research Aim

The aim of this study is to determine to what extent the following prognostic factors: pain, disability (social and physical), anxiety, depression, work fear-avoidance and locus of control, are associated with short-term improvement in acute and chronic LBP patients attending the DUT CDC.

1.2.2 Objectives:

The following objectives were set for this study:

1. Objective One:
   To describe and compare the selected prognostic factors, as identified using the Bournemouth Questionnaire (BQ), at the initial consultation, 4th/5th visit and 10th visit in patients with acute and chronic LBP.

2. Objective Two:

To determine which selected prognostic factors, if any, are significantly associated with improvement, as determined by a self-reported improvement using the Patient's Global Impression of Change (PGIC) scale, in acute and chronic LBP patients at the $4^{th}/5^{th}$ and 10^{th} visits.

1.3 Research Hypotheses

1.3.1 Research Hypotheses (Hα)

1. H_a one:

The research hypothesis states that there will be a statistically significant ($p<0.05$) difference amongst the prognostic factors when comparing the acute and chronic LBP patients at the initial, $4^{th}/5^{th}$ and 10^{th} visits.

2. H_a two:

The research hypothesis states that there will be a statistically significant ($p<0.05$) difference between the prognostic factors and the self-reported improvement in patients with acute and chronic LBP amongst the initial, $4^{th}/5^{th}$ and 10^{th} treatment.

1.3.2 Null Hypotheses (H_o):

1. H_o one:

The null hypothesis states that there will be no statistically significant ($p<0.05$) difference amongst the selected prognostic factors when comparing the acute to the chronic LBP patients at the initial, $4^{th}/5^{th}$ and 10^{th} visits.

2. H_o two:

The null hypothesis states that there will be no statistically significant ($p<0.05$) differences between the selected factors and self-reported improvement in patients with acute and chronic LBP amongst the initial, $4^{th}/5^{th}$ and 10^{th} treatment.

1.4 Delimitations

Investigations into prognostic factors for short-term improvement is currently growing as researchers search for a comprehensive way of identifying which patients will respond best to different treatment and management plans (Bolton & Hurst, 2011). Over time there have been many factors that researchers have thought could be associated with a poor prognosis. In this study, only pain, disability (social and physical), anxiety, depression, work fear-avoidance and locus of control will be investigated in order to make comparisons with the current literature.

1.5 Flow of Dissertation

Chapter One provides the introduction to the study and highlights the research problem. The aims and objectives are stated, the hypotheses and null hypotheses are given and delimitations and flow of the dissertation are outlined.

Chapter Two will discuss the relevant literature to the research problem. LBP will be discussed with emphasis on prognostic factors, pain and clinical practice guidelines for management.

Chapter Three will discuss the research methodology: detailing how the study was conducted and how data was obtained.

Chapter Four provides the results obtained from the statistical analyses of the data, according to the study aim and objectives.

Chapter Five constitutes the discussion. This chapter compares, contrasts and discusses the results of the study in terms of the available literature relevant to the research problem.

Chapter Six concludes the findings of the study in terms of the aims and objectives, the study limitations and makes recommendations for future research.

Chapter Two

Literature Review

2.1 Introduction

Low Back Pain (LBP) is a common yet often disabling condition that has an enormous effect on the individual (Hoy, Brooks, Blyth & Buchbinder, 2010) and is associated with a high burden of loss to both the patient and the economy in terms of work days and production losses every year (Hansson & Hansson, 2005). In the USA it is estimated that the cost of LBP amounts to $25 billion each year, approximately three times the total cost of all types of cancer (Liebenson, 2007). As the population ages the percentage of patients with LBP increases, making the treatment and management of LBP central to all medical and health department programs (Hoy, Bain, Williams, March, Brooks, Blyth, Woolf, Vos & Buchbinder, 2012).

Some patients become incapable of attending work and others perform reduced tasks at work due to the effects of their LBP (Wynne-Jones, Dunn & Main, 2008). This loss of ability to work impacts not only the productivity of the country or work sector but also has financial implications on the patient. Costs can be both direct, such as examination, treatment, surgery and/or rehabilitation and indirect, such as lost income, travel to appointments and burden on the family or society (Hansson & Hansson, 2005). Thus identifying factors that may precipitate the development of chronic LBP has become a research focus area.

This chapter will contextualise low back pain by examining the prevalence, classification, diagnosis, management and prognosis of LBP. Emphasis will be made on prognostic factors and their role in LBP. The scholarly sources used to inform this literature review were sourced using the following search engines: ScienceDirect, EBSCOhost, Summon, PubMed.gov, Google Scholar. Key search terms included: chiropractic, low back pain, prognostic factors, pain, epidemiology, diagnosis, classification, risk factors, yellow flags, questionnaire, prognosis, management.

2.2 Low back pain

2.2.1 Epidemiology

The lifetime prevalence of LBP ranges from 60-90% with a one-year prevalence of 5-38% annually (Nyiendo, Haas, Goldberg & Sexton, 2001; Jenkins, 2002; Avery & O'Driscoll, 2004; Chan & Chiu, 2008; Costa *et al.*, 2009; Gurcay *et al.*, 2009; Dunn *et al.*, 2011). In 1995, it was reported that low back pain was a condition that affected up to seven percent of the adult population in any 12-month period (McCormick, Fleming & Charlton, 1995). Ten years later a systematic review revealed that the point prevalence of LBP among developed countries varied between 6.8% in North America and 33% in Belgium (Kent & Keating, 2005). A more recent study found the period prevalence to be slightly above 38% for mostly European and developed countries (Hoy *et al.,* 2010). The trend suggests that the prevalence of LBP appears to be on the rise, impacting the cost of treatment and management of LBP patients (Ivanova, Birnbaum, Schiller, Kantor, Johnstone & Swindle, 2011).

In Africa, Louw *et al.* (2007) reported that the prevalence of LBP was similar to that of developed countries, which was contrary to what was previously believed (Kent & Keating, 2005). Extensive LBP research is lacking in Africa compared to developed countries, resulting in little being known about its prevalence and associated risk factors in developing societies (Louw *et al.*, 2007). As there is an increase in research in the developing world so the underreporting of conditions such as LBP will decrease (Louw *et al.,* 2007). This may in part be due to the more serious health concerns, such as the management of HIV/AIDS (Morris *et al.*, 2016). In Africa, a prevalence of 46.8% of LBP was found amoung a Nigerian hospital patient population (n=485) (Ogunbode, Abedusoye & Alonge, 2013), with Morris *et al.* (2016) reporting a lifetime prevalence of LBP of 55.8%. Both of which are higher than that reported in some developed countries (Morris *et al.,* 2016). In South Africa, Louw *et al.* (2007) reported the mean point prevalence of LBP in adults to be 32%. Prevalence rates vary depending on the population being investigated. South African adult factory workers were found to have a point prevalence of 25% (van Vuuren, Zinzen, van Heerden, Becker & Meeusen, 2005) whereas black township residences had a 53.1% prevalence (n=1000) (van der Meulen, 1997). In contrast to an Indian and Coloured population who suffered a 45%

(n=500) and 32.6% (n=500) prevalence rate respectively (Docrat, 1999). At the DUT CDC 36% (N=291) of patients were found to present with LBP (McDonald, 2012).

Risk factors associated with LBP are numerous. The role of gender is not clear (Hoy *et al.,* 2010). Ogunbode *et al.* (2013) found a higher percentage of men with LBP (50.3%) when compared to women at a Nigerian hospital, which was in contrast to Bolton and Hurst (2011) (48.9% male) and Dunn *et al.* (2010) (45.8% male). Valat, Goupille and Vedere (1997) report that the male gender is more likely to suffer from chronic pain possibly due to not seeking care in contrast to women who have been found to seek treatment earlier and then adhere to a treatment program (Hoy *et al.,* 2010).

Licciardone (2008) reported that LBP increases with age and peaks between the third and fourth decade. Older age of patients with musculoskeletal complaints was found to be a factor in the delay of seeking treatment (Mallen *et al.*, 2007). Van der Meulen (1997) found that LBP was more prevalent in the older age groups. It has been reported that the prevalence of LBP decreases after the sixth decade (Hoy *et al.,* 2010) yet many prevalence studies do not often include institutions like old age homes (D'Astolfo & Humphreys, 2006) which may skew the data.

Ogunbode *et al.* (2013) noted a correlation between smoking and LBP in which current smokers were more likely to suffer from LBP in a Nigerian population. Docrat (1999) found that an increased number of children, a lower level of education, increased job vulnerability and poor accessibility of health services were associated with increased reporting of LBP. van der Meulen (1997) found factors such as referred lower limb pain (24.1%) and the taking of medication (49.5%) to be highly associated with LBP.

2.2.2 Classification of LBP

There have been many attempts to create classification systems for LBP in order to make treatment and rehabilitation more targeted for practitioners (Koes, van Tulder,

Lin, Macedo, McAuley & Maher, 2010). Two common classification systems utilized are discussed.

2.2.2.1 Classification of LBP according to duration

This classification system defines LBP according to the duration of the symptoms. Acute and chronic pain occur by different physiological mechanisms and therefore necessitate the need for different management programs and thus the need to identify the duration of the complaint (Helms & Barone, 2008). Acute and chronic LBP patients differ in their prognosis, with clinical practice guidelines for LBP prescribing different lengths of treatment duration (Verkerk, Luijsterburg, Miedema, Pool-Goudzwaard & Koes, 2012). The literature varies in terms of the duration classification, with some authors proposing three time durations as seen in table 2.1, whereas the National Institute for Health and Clinical Excellence (NICE) guidelines (2009) and Gurcay *et al.* (2009) allow for only two: current and persistent pain, thus removing the subacute classification.

Table 2.1 Classification of low back pain according to duration

Classification	**Author**
Acute – less than or equal to four weeks Subacute – four to 12 weeks Chronic – longer than 12 weeks	Hansson and Hansson (2005); Poiraudeau *et al.* (2006); Costa *et al*. (2009); McDonald (2012)
Acute – less than or equal to one week Subacute – one to four weeks Chronic – longer than four weeks	Skargren and Öberg (1998)
Acute – less than 12 weeks Chronic – equal to or greater than 12 weeks	Gurcay *et al.* (2009)
Acute – less than seven weeks Persistent – equal to or greater than seven weeks of LBP (chronic)	NICE (2009)

LBP = low back pain, NICE = National Institute for Health and Clinical Excellence

Acute pain is said to have an identifiable cause, of recent onset and probable duration with chronic pain being described as often having no identifiable cause and persisting beyond the time of tissue healing (Koneti & Jones, 2016). Acute pain has a tendency to frequently recur, thus often becoming chronic in nature and potentially has the tendency to develop psychological components which can exacerbate the duration of LBP (Jenkins, 2002).

In this study the classification of acute and chronic pain has been utilized in order to be able to compare the results with Bolton and Hurst (2011) who investigated prognostic factors using the Bournemouth Questionnaire (BQ) in a British population of LBP patients.

2.2.2.2 Classification of LBP according to aetiology

According to Colledge, Walker and Ralston (2010) the aetiological classification of LBP involves four categories as listed below. Identifying the exact cause of the pain is often challenging due to the numerous pain causing structures in the region (Jenkins, 2002). Thus this type of classification assists with diagnosis.

1.) Non-mechanical – These conditions need to be ruled out quickly and effectively upon presentation, examples are malignancy, fracture and infection. The patient is screened for *red flags* which are specific indicators that there might be a more sinister cause of the LBP. Immediate advanced investigation is needed which may entail imaging modalities such as Magnetic Resonance Imaging (MRI), Computed Tomography (CT), x-ray and referral to a specialist (Jenkins, 2002).

2.) Inflammatory – Inflammatory conditions often present with a gradual onset of pain which is often not localised to one segment but rather involves many segments and possibly even the thoracic spine. This type of inflammatory pain is characteristically associated with improvement with movement after a period of typical morning stiffness (Colledge *et al.,* 2010). Common diagnoses include ankylosing spondylitis,

rheumatoid arthritis, psoriatic arthritis, Reiter's syndrome and spondyloarthritis. Diagnosis may involve a combination of MRI (Weber, Ostergaard, Lambert & Maksymowych, 2011), x-rays (Cha & An, 2013) and blood tests assessing for rheumatoid factor (RF) and anticyclic citrullinated peptide (antiCCP) (Quilon & Brent, 2010).

3.) Mechanical – This type of LBP is common, it is often referred to as non-specific and results from poor posture, strain and sprain (Souza, 2009). This category constitutes approximately 90 percent of LBP cases (Borenstein, 2013b), and can be self-limiting but has a tendency to recur, and is the LBP being investigated in this study.

4.) Other – This refers to specific conditions that do not fit into any of the other three categories and include prolapsed intervertebral disc (IVD), spondylolisthesis, spinal stenosis, Scheuermann's disease, abdominal aortic aneurysm and osteoporosis. Conditions such as these are sometimes mechanical in nature but stem from a specific cause and do not have a non-specific origin. There is an identifiable cause and treatment is directed to overcoming that cause. They may be serious such as cauda equine syndrome, which is considered a medical emergency where accurate diagnosis, specialist referral and immediate intervention is required (Douraiswami, Muthuswamy, Naidu & Thanigai, 2016).

2.2.3 Diagnosis of mechanical LBP

Mechanical LBP often presents with an acute onset and may occur following bending or lifting and twisting motions. The pain is normally limited to the lumbar spine extending to the sacral and buttock region which does not pass the knee. There may be involvement of the lumbar paraspinal muscles which may spasm, with the pain subsiding following rest (Colledge *et al.,* 2010). Mechanical LBP is multidimensional and may become chronic in duration leading to long-term disability.

Jenkins (2002) separates mechanical LBP into simple mechanical LBP and LBP with radiculopathy, each requiring specific intervention. Prognostic factors should be assessed for regardless of the classification of the diagnosis as early intervention can lead to a better prognosis (Liebenson, 2007).

2.2.3.1 Simple mechanical LBP

This refers to mechanical LBP that involves the joints and soft tissue structures of the spine, and was the type of LBP experienced by the patients in this study.

Common diagnoses for simple mechanical LBP include:

- **Facet Syndrome**

Facet syndrome is a common cause of LBP and presents as localised pain around the zygapophyseal joint. The zygapophysial joints (facet joints) consist of the articular facets of adjacent vertebrae, their cartilage, joint capsule, surrounding ligaments and muscle. They allow for movement between consecutive vertebrae (Mader, 2004). Pain may arise from entrapment of the synovial folds within the joint, leading to increased pressure and pain, which usually occurs in the extended and or laterally flexed position (Souza, 2009).

The pain associated with facet syndrome may refer to the sacroiliac region, posterior thigh or buttocks (Vizniak, 2003; Yun, Kim, Yoo, Kim, Chon, Choi, Hwang & Jung, 2012) not extending past the knee (Haldeman, 2005). Orthopaedic testing such as Kemps Test may aggravate the pain locally (Vizniak, 2003). Pain may present as a pseudoradicular type pain (Yun *et al*., 2012), thus there is an absence of neurological signs (Haldeman, 2005). This condition is usually managed by a combination of spinal manipulative therapy and back exercises (Hestbaek, Kongsted, Jensen & Leboeuf-Yde, 2009) but anaesthetic injections to the facet joint may also be recommended (Yun *et al.,* 2012).

- **Sacroiliac Joint Syndrome**

This syndrome is characterized by dysfunction of the sacroiliac (SI) joint as accompanied with a sprain of the anterior or posterior SI ligaments. The SI joint forms part of the pelvis and consists of the articulating surfaces between the sacrum and the iliac bones. The SI joints function to allow limited movement between the sacrum and the ilia and facilitates force transmission between the trunk and weight-bearing lower limbs. Its strong anterior, posterior and interosseous ligaments assist in providing stability (Moore *et al.*, 2010).

SI joint syndrome, can be unilateral or bilateral, the pain is felt over the SI joint posteriorly and described as a sharp or stabbing pain on movement with possible relief from lying or sitting (Bergmann & Peterson, 2011). It often occurs in young, elderly and pregnant women following sudden incorrect or abnormal postural movements (Krawczyk-Wasielewska, Skorupska, Mojs, Malak, Keczmer, Kalmus & Samborski, 2014).

The diagnosis of SI syndrome is made by history and physical examination, where Gaenslen's and Patrick FABER orthopaedic tests are often positive (Vizniak, 2003). The management includes manipulation of the SI joint, soft tissue therapy for the surrounding structures and exercise therapy for rehabilitation (Liebenson, 2007; Souza, 2009).

- **Myofascial Pain Syndromes**

Myofascial pain is an often overlooked source of musculoskeletal pain and results in either dull discomfort or severe activity limiting pain. It occurs most commonly when there is overuse of a muscle (Simons, Travell & Simons, 1999). An active myofascial trigger point (MFTP) is tender to direct compression by palpation, causes an involuntary local twitch response in the muscle and can refer pain in a specific pattern. It can result in weakness and inhibition of full lengthening in the affected muscle (Fernandez-Carnero, La Touche, Ortega-Santiago, Galan-del-Rio, Pesquera, Ge &

Fernandez-de-las-Penas, 2010). They can occur in any of the muscles of the low back region (Appendix A).

MFTP's are located by palpation by a skilled practitioner and usually occur in common locations within each muscle (Simons *et al.,* 1999). They are treated by targeted trigger point injection, acupuncture, ischaemic compression or dry needling (Ge, Fernandez-de-las-Penas & Yue, 2011).

- **Piriformis Syndrome**

Piriformis syndrome results from the piriformis muscle (as described in Appendix A) becoming spasmodic either through overuse or direct trauma, and presents as pain in the buttock which may radiate down the posterior leg (Souza, 2009). In a high percentage of patients, the sciatic nerve becomes compressed by the piriformis muscle as it runs underneath the muscle, however, a small percentage have the nerve running through the muscle making compression more likely (Colledge *et al.,* 2010).

Pelvic rotation or a congenitally short leg can lead to this syndrome, therefore movements that increase the pain are likely to be resisted hip external rotation and/or passive medial rotation. Under direct palpation the piriformis muscle may refer pain down the posterior leg and thigh. Stretching, dry needling, ischaemic compression and myofascial release techniques are useful in management of this condition (Souza, 2009).

2.2.3.2 LBP with radiculopathy

This type of mechanical LBP involves the IVD and the bony structures around the spine that may impinge on the nerves exiting the lumbar spine.

- **Disc herniation**

When a patient complains of LBP that continues down the leg, past the knee, often related to sudden bending or a bending and twisting movement, the diagnosis of disc herniation must be excluded. The IVD connects each adjacent vertebra and consists of an outer annulus fibrosis and soft inner nucleus pulposus. The IVD functions as a shock absorber, adding strength while maintaining movement of the spine (Moore *et al.,* 2010). The IVD's are vulnerable to compression and twisting and when injured may bulge, herniate or sequestrate (Uribe, Smith, Pimenta, Hartl, Dakwar, Modhia, Pollock, Nagineni, Smith, Christian, Oliveira, Marchi & Deviren, 2012).

Conservative management of lumbar disc herniation includes spinal manipulation (Haldeman, 2005), activator adjusting, blocking and flexion-distraction techniques that do not involve any rotation (Souza, 2009). Spinal decompression and general traction therapy have been found to be effective for treatment of disc herniation and significantly decrease pain and disability (Choi, Lee & Hwangbo, 2015).

- **Canal stenosis**

When a patient has canal stenosis the patient will complain of unilateral or bilateral pain in the back and leg, often occurring in the 50 and older age category (Souza, 2009). Signs and symptoms vary depending on the location of the stenosis. The origin may be acquired or congenital and can be caused by soft tissue or bony intrusion. A trefoil shaped central canal (congenital), anatomically short pedicles, degenerative spondylolisthesis, calcified and/or hypertrophied ligamentum flavum or bony osteophytes from the lamina, pedicles or facets can result in canal stenosis (Haldeman, 2005).

Stenosis can happen at multiple levels, resulting in differing neurological deficits such as loss of sensation or pain in more than one dermatome. The patient may complain of pain during or after walking which eases after a brief period of rest or prolonged flexed posture (Haldeman, 2005). The flexed position theoretically expands the space in the canal, leading to increased activity tolerance. This can be used to aid diagnosis

by having the patient perform the bicycle test, if activity improves with flexion, this strongly suggests canal stenosis (Souza, 2009).

The use of spinal manipulative therapy for the conservative treatment of canal stenosis must be utilised cautiously as there is a possible risk of further compression and deterioration of symptoms. Surgery for patients presenting with severe neurological deficits and a severe change in functional status have shown decreased disability, back and leg pain (Souza, 2009).

2.3 Management and prognosis of mechanical LBP

2.3.1 Management of mechanical LBP

LBP is a complex condition with over 100 different treatments, both surgical and non-surgical available to assist patients (Haldeman & Dagenais, 2008b). The management of the patient is determined by the practitioner that the patient chooses to consult (Leboeuf-Yde, Gronstvedt, Arve Borge, Lothe, Magnesen, Nilsson, Rosok, Stig & Larsen, 2005). Haldeman and Dagenais (2008a) in a special Spine Journal issue had 25 authors present the most common management strategies they used in treating non-specific LBP. There was a wide range of treatments including back schools, education, fear avoidance; herbal, vitamin, mineral and homeopathic supplements; lumbar extensor strengthening exercises; lumbar stabilization exercises, massage, McKenzie method, medicine-assisted manipulation; needle acupuncture; non-steroidal anti-inflammatories, muscle relaxants, simple analgesics; prolotherapy; spinal manipulation and mobilization; Transcutaneous Electrical Nerve Stimulation, interferential current, Ultrasound and thermotherapy; traction therapy; trigger point injections and watchful waiting (Haldeman & Dagenais, 2008a). Each contributing author wrote about the treatment modality that they used and supported its use in the treatment of LBP. Treatment strategies for LBP are extensive with no one treatment showing superiority but indicating that a multidisciplinary approach including a psychological aspect may be more appropriate to manage non-specific LBP (Pincus & McCracken, 2013). This multidisciplinary approach to LBP treatment has been shown to be effective (Westrom *et al.*, 2010).

The latest clinical practice guidelines (CPG) for the management of LBP by Koes *et al.* (2010), Dagenais, Tricco and Haldeman, (2010) and Pillastrini, Gardenghi, Bonetti, Capra, Guccione, Mugnai and Violante (2012) validate a variety of modalities to manage LBP. Koes *et al.*'s (2010) recommendations are summarized in table 2.2 and present guidelines from a wide variety of countries and two international clinics.

Table 2.2 Summary of recommendations for treatment of non-specific low back pain (Koes *et al.*, 2010).

Acute or Subacute Pain

- Reassure patients (favourable prognosis).
- Advise to stay active.
- Prescribe medication if necessary (preferably time-contingent): first line is paracetamol; second line is nonsteroidal anti-inflammatory drugs, consider muscle relaxants, opioids or antidepressant and anticonvulsive medication (as co-medication for pain relief).
- Discourage bed rest.
- Do not advise a supervised exercise programme.

Chronic Pain

- Discourage use of modalities (such as ultrasound, electrotherapy).
- Short-term use of medication/manipulation.
- Supervised exercise therapy.
- Cognitive behavioural therapy.
- Multidisciplinary treatment.

When managing acute non-specific LBP, a minimalist approach should be favoured including reassurance, education and reactivation, avoiding overmedication, unnecessary surgery and diagnostic imaging to decrease the cost and invasiveness to the patient. If necessary, pain relief treatments such as medication, may be provided but in a laddered approach that does not overmedicate the patient (Liebenson, 2009; Koneti & Jones, 2016). Emphasis should be placed on avoiding the development of chronic pain. Thus in the subacute phase, more aggressive management is needed

which should include screening for '*yellow flags*' or fear-avoidance behaviours, psychosocial evaluation and functional testing (Liebenson, 2009).

2.3.2 Chiropractic management of mechanical LBP

Chiropractors use conservative therapy in the form of spinal manipulative therapy (SMT) in their treatment protocols combined with exercise therapy, soft tissue therapy, muscle energy techniques and ergonomic and dietary advice (Leboeuf-Yde, Gronstvedt, Arve Borge, Lothe, Magnesen, Nilsson, Rosok, Stig & Larsen, 2005). Patients are seeking out complementary and alternative medicine (CAM), such as chiropractic care, because of its non-invasive techniques (Murthy, Sibbritt, Broom, Kirby, Frawley, Refshauge & Adams, 2015) and also due to its often rapid results.

SMT consists of different techniques used to improve joint range of motion (ROM). The most common modality used is the high velocity, low amplitude (HVLA) thrust applied to the joint in order to take it through its available ROM. This technique is often termed an 'adjustment' or 'manipulation' (Globe *et al.*, 2016*)*.

Bishop, Quon, Fisher and Dvorak (2010) compared chiropractic care which included a combination of acetaminophen, reassurance and avoidance of passive treatments and SMT, applied according to CPG, to traditional usual care by family physicians (N=71). Treatments were administered two-three times a week for a maximum of four weeks, and up to the individual chiropractor's discretion. The group receiving the CPG chiropractic treatment showed significant improvements in disability scores compared to the usual care group (p=0.003).

Recent clinical practice guidelines for chiropractic care of LBP (Globe *et al.*, 2016), indicated that for acute and subacute cases a trial of two-three treatments per week for two to four weeks is recommended. When treating chronic conditions, it was recommended that patients be seen one to three times a week for two to four weeks. In a situation where the patient had an acute flare-up of a chronic condition or a

recurrent attack it was recommended that one to three treatments per week for one to two weeks is needed. Failing resolution of the painful condition, help from a multidisciplinary team should be sought along with a re-evaluation for *yellow flags* (Globe *et al.*, 2016). Cedraschi and Allaz (2005) also mention re-evaluating for *yellow flags* at four and six weeks if unsatisfactory progress is being made in pain patients.

Chiropractic may be seen as an adjunct to therapy from physiotherapists (Costa *et al.,* 2009) and other CAM therapists (Murthy, Sibbritt, Broom, Kirby, Frawley, Refshauge & Adams, 2015). A multidisciplinary approach to LBP has been effective (Westrom, Majers, Evans and Bronfort, 2010) and as one practitioner might not completely relieve a patient from their pain, seeking alternative help may be on the increase (Haldeman & Dagenais, 2008b).

2.3.3 Prognosis of mechanical LBP

Jenkins (2002) reported that mechanical LBP will resolve in two to eight weeks with minimal treatment. This was supported by Pengel, Herbert, Maher and Refshauge (2003) in a systematic review in which they report that a large percentage of acute LBP patients resolve quickly, however, low levels of pain and disability were found to persist for up to 12 months. Kachanathu, Alenazi, Seif, Hafez and Alroumim (2014) report low back pain to be a very common but largely self-limiting condition and up to 90% of acute LBP patients will recover within six weeks.

Leboeuf-Yde *et al.* (2005) and Pengel *et al.* (2003) suggest that LBP may not be the self-limiting condition that it was previously thought to be. Rather it has a cyclical nature and often recurs, as a high percentage of sufferers continue to complain of LBP well after the ‘six weeks’ in which it has been postulated to resolve. Pengel *et al.* (2003) found that LBP has an acute on chronic presentation, meaning that an episode of LBP may return after a certain time period rather than having been completely eliminated. These recurrent episodes may also happen more frequently unless the proper treatment is received (Croft *et al.,* 1998). This leads to chronicity and increased economic burden (Cedraschi & Allaz, 2005; Hansson & Hansson, 2005).

2.4 Prognostic factors for mechanical LBP

The recurring nature and the multidimensional nature of LBP, has stimulated a move to identify subgroups of patients that would respond better to treatment (Bolton & Hurst, 2011). In order to identify these subgroups research efforts focused on factors that may influence the prognosis of the patient. This took on a multitude of facets as researchers separated patients into subgroups to try and identify prognostic factors (Bolton & Hurst, 2011). These prognostic factors, referred to as *moderators* by Nicholas, Linton, Watson and Main (2011), comprise factors that are baseline characteristics which a patient would present with at the initial visit that may influence the outcome of the treatment. Several studies have investigated prognostic factors, as seen in table 2.3.

Table 2.3 Findings of studies investigating prognostic factors for low back pain

Author	**Population and sample**	**Outcome**	**Findings**
Skargren and Öberg (1998)	Sweden. GP in primary care facility. Back and neck pain. n=323.	Oswestry low back pain disability questionnaire, VAS, pain drawing, six-point well-being scale.	Duration of current episode, higher Oswestry score, number of localisations of pain, treatment expectations and well-being at entry.
Poiraudeau *et al.* (2006)	France. Rheumatology practices. Subacute LBP. n=286.	FABQ, Quebec Back Pain Disability Scale, HADS.	FAB about back pain and disability. Low level of education and the physicians FAB about physical

			activity and back pain.
Langworthy and Breen (2007)	UK chiropractic clinic. Non-specific LBP. n=130.	Deyo's 'Core Set', FABQ and Back Beliefs Questionnaire, Coping Strategies Questionnaire and GHQ-12.	Co-morbidity, episode duration of >4 weeks, negative outlook, low general health.
Costa *et al.* (2009)	Australia. Primary care clinics. Chronic low back pain. n=973.	SF-36 and single items from validated questionnaires to assess predictors and outcomes. Three outcomes measured: intensity of pain, disability and work status.	High disability levels or high pain intensity at onset of chronicity, low levels of education, greater perceived risk of persistent pain and previous sick leave due to LBP
Gurcay *et al.* (2009)	Turkey. Hospital. Acute LBP. n=91.	VAS, RMDQ, Nottingham Health Profile, Back Depression Inventory.	High pain rating, decreased finger-floor stretch distance, disability, depression and general health perception.
Bolton and Hurst (2011)	UK chiropractic clinic. Acute and chronic patients	BQ, Global Impression of	High levels of pain, anxiety, depression,

	with all musculoskeletal complaints. n=2422.	Change, pain diagram.	disability and work fear-avoidance behaviour, consumption of alcohol, marking a greater area on the pain drawing, low expectations of recovery.
Dunn *et al.* (2011)	UK. GP at general practices. n=389.	RMDQ, HADS, baseline questionnaire.	High pain intensity at the time of seeking treatment and unemployment. Poor self-rated health and high functional disability.

(BQ = Bournemouth Questionnaire; FAB = fear avoidance beliefs; FABQ = Fear-Avoidance Beliefs Questionnaire; GHQ = General Health Questionnaire; GP = general practitioner; HADS = Hospital Anxiety and Depression Score; LBP = low back pain; RMDQ = Roland Morris Disability Questionnaire; SF = Short-form; UK = United Kingdom; VAS = visual analogue pain scale)

In order to curb the impact of chronic LBP, the studies in table 2.3 sought to find prognostic factors which could predict which patients were more likely to develop chronicity. A common finding was that a high level of disability either physical, psychological, or both, affect patient's functionality and daily living and were associated with a poorer prognosis. Similarly, a high pain rating or intensity at initial consultation may negatively influence the ability of the patient to improve. Verkerk *et al.* (2012) note that the prognostic factors for chronic LBP are not well understood and that more studies of high methodological quality are needed. The results of the above studies will be discussed under the relevant prognostic factor.

2.4.1 Pain and disability

There are many aspects to pain that may influence the prognosis of a patient, such as the intensity, location, previous episode or pain in other parts of the body. Pain severity and intensity (Cedraschi & Allaz, 2005; Dunn *et al*., 2011) has been linked with poor prognosis for improvement in patients with musculoskeletal pain (Bolton & Hurst, 2011) and for those with LBP (Skagren & Öberg, 1998; Gurcay *et al.*, 2009). indicating that patients who report severe pain at the start of treatment may be less likely to respond to treatment. When LBP extends into other regions like the leg, a delayed improvement has been found (Dunn *et al*., 2011). This type of presentation is often indicative of a more complex mechanical LBP that may have intervertebral disc involvement (Haldeman, 2005) and thus may require a longer duration of intervention.

Patients reporting pain in the upper body or pain concomitantly in other areas have been found to have an increased likelihood of developing chronicity (Bolton & Hurst, 2011; Dunn *et al.*, 2011). Similarly, when patients at the initial visit complained of neck and LBP simultaneously, a poorer prognosis was found (Mallen *et al.,* 2007). Findings such as these support a holistic approach, using the biopsychosocial model, to manage and treat patients with LBP (Bolton & Hurst, 2011; O'Sullivan, 2011). Patients with comorbidities are more likely to have increased costs related to the management of their condition, and as such this may impact negatively on their coping strategies (Gore *et al.*, 2012) and lead to chronicity.

Longer pain durations, previous pain episodes (Mallen *et al.,* 2007) and previous reported back injury (Hepple & Robertson, 2006; Ogunbode *et al.,* 2013) have been linked to the development of chronic pain and are common factors associated with delaying improvement. The cyclical and reoccurring nature of LBP (Jenkins, 2002) may lead patients to not realise that their recent onset of LBP may be a reoccurrence of a previous episode rather than a new episode. On initial presentation many patients report a history of LBP or a similar complaint being felt in the past (Mallen *et al.,* 2007; Dunn *et al.,* 2011). Pain perception in chronic patients differ from acute patients by the upregulation of specific pain pathways in the body in response to chronic pain. A heightened reaction to pain and over sensitization may mean that other areas may

experience pain in addition to the low back (Campbell & Edwards, 2009). This reaction leads to the triggering of the pain neuro-matrix in the brain and results in tissue hyperalgesia. This may lead to psychological manifestations of altered cognition and catastrophizing and may delay the response of the patient to treatment. The chronic patient then may incorrectly describe their pain as constant due to the negative cognitive thoughts developing (O'Sullivan, 2011).

Disability associated with activities of daily living (ADL) is another factor that has been found in chronic LBP patients (Verbunt, Westerterp, van der Heijden, Seelen, Vlaeyen & Knottnerus, 2001; Perruchoud, Buchser, Johanek, Aminian, Paraschiv-Ionescu & Taylor, 2014). A high reporting of disability at the initial visit has been shown to be associated with a poor prognosis (Cedraschi & Allaz, 2005; Bolton and Hurst, 2011; Dunn *et al.,* 2011). When a patient's ADL are affected due to pain they put all their energy into their ADL at the expense of their social and leisure activities (Spenkelink, Hutten, Hermens & Greitemann, 2002). This leads to chronic LBP patients frequently being prescribed medication more than control individuals in order for them to cope with the chronic pain (Gore *et al.*, 2012). This then impacts the cost of managing the condition (Redwood, 2011).

2.4.2 Psychosocial factors

The role of psychosocial factors in recovery is supported by Ramond, Bouton, Richard, Roquelaure, Baufreton, Legrand and Huez (2011) who reported that patients' expectations of recovery at the initial visit are strongly associated with the outcome of treatment linking psychological wellbeing of the patient to treatment effects. Nicholas *et al.* (2011) highlighted that targeting psychological risk factors, otherwise known as *yellow flags*, early on and when they are the highest, may improve the prognosis of patients with LBP and thus as can go a long way to improving the prognosis of patients with LBP thus an assessment of the patients' psychological state may be necessary (Globe, Farabaugh, Hawk, Morris, Baker, Whalen, Walters, Kaeser, Dehen & Augat, 2016).

A *yellow flag* assessment involves identifying signs or symptoms that the patient is under psychosocial stress. If *yellow flags* are present the likelihood of recovery is lowered leading to an increased chance of LBP becoming chronic (Jenkins, 2002; Liebenson, 2009). In a patient where orthopaedic testing and patient responses are inconsistent a *yellow flag* assessment should be conducted (Jenkins, 2002). Table 2.4 highlights the *yellow flags* associated with acute LBP becoming chronic.

Table 2.4 *Yellow flag* risk factors for acute LBP becoming chronic (Liebenson, 2009)

Component	Yellow flag
History and Symptoms	• Duration of symptoms 4-12 weeks • Sciatica • History of previous episodes of back pain requiring treatment • Severe pain intensity at 3, 4, 6 and 8 weeks • Delaying treatment at least 7 days • Widespread pain
Examination	• Positive straight leg raise test • Positive neurological examination (motor, sensory, reflex) • Positive ROM or orthopaedic findings • Lack of centralization of peripheral symptoms with repetitive ROM testing
Psychological	• 3 or more Waddell signs of illness behaviour • Self-rated health as poor • Symptom satisfaction • Fear-avoidance beliefs (3 questions) • Belief that physical activity makes pain worse • Belief that if person has pain with activity they should cease the activity • Belief that person with pain should not perform normal activities with pain • Anxiety • Coping (praying, hoping, catastrophizing) • Distress/depression • Poor locus of control • Low expectation of recovery • Blaming others • Negative family or workplace social situation • Increased number of children being cared for • Anticipation of future disability or ability to return to work
Work-related	• Receiving compensation • Litigation • Physically demanding job (or perception of) • Job dissatisfaction • Subjective work-related ability • Prior disability in the prior 12 months • A workplace unable to provide light duties on return to work • Low job control or low supervisor support
Functional	• Light work tolerance • Sleep • At least moderate physical disability (score of 20/100 or higher with the Oswestry)

ROM = range of motion

Depression was found to be associated with LBP patients in many studies that have investigated risk factors for LBP (Hepple & Robertson, 2006; Ramond *et al.* 2011; Ramond-Roquin, Bouton, Begue, Petit, Roquelaure & Huez, 2015) and may contribute to the development of chronicity. It has been found that patients who were depressed, had high fear avoidance beliefs (FAB) and catastrophized easily were more likely to develop chronic pain (Nicholas *et al.*, 2011). Other psychological manifestations associated with depression including sleep disturbances or disorders, which have been linked with chronic pain syndromes and increase the possible costs related to treatment (Gore *et al.*, 2012).

The literature is ambiguous about the role of anxiety as a risk factor for LBP (Hoy *et al.*, 2010). Epidemiological studies from South Africa found no significant relationship between anxiety reporting and the prevalence of LBP (van der Meulen, 1997; Docrat, 1999; Ogunbode *et al.,* 2013). Yet studies assessing anxiety as a prognostic factor in developed countries show that reporting of anxiety was associated with the development of chronic pain (Mallen *et al.,* 2007; Dunn *et al.,* 2011). Feelings of anxiety about LBP could lead a patient to feel that they are at risk of developing persistent pain that may then make them vulnerable to developing chronicity (Leeuw, Goossens, Linton, Crombez, Boersma & Vlaeyen, 2007), as was found by Costa *et al.* (2009) in patients seeking care at a primary clinic in Australia for chronic LBP.

Bolton and Hurst (2011) found that patients presenting with acute LBP at a primary chiropractic care facility reported greater pain, anxiety, depression, disability and work fear-avoidance behaviour than those with chronic LBP. However, by the $4^{th}/5^{th}$ visit they had a greater response to treatment and a greater percentage were no longer receiving treatment. Initially the acute group appeared to be worse off than the chronic group, but their conditions improved earlier and to a greater degree than the chronic group. Indicating that chronic pain sufferers require specific management that may differ from that of acute pain sufferers, especially when *yellow flags* are present. Nicholas *et al.* (2011) alluded to chronic pain sufferers not receiving the correct management at the correct times.

Waddell, Newton, Hendersen, Somerville, and Main (1993) and Liebenson (2007) reported that FAB are a prominent cause for patients developing chronicity with regards to LBP and need to be considered during the treatment of LBP. Incorrect misinterpretation of pain as threatening and fear that certain behaviours may lead to increased pain, may cause a patient suffering with acute LBP to avoid that behavior and be fearful of certain movements (Leeuw *et al.,* 2007). This fear-avoidance behaviour is detrimental to the patient because it instils a cognitive behavioural loop that leads to disability in ADL and altered usual behaviour adding to the development of chronic pain (Leeuw *et al.,* 2007).

Work absence has been found to correlate with prognosis in many studies in primary care (Costa *et al.*, 2009; Gurcay *et al.*, 2009; Dunn *et al.*, 2011). Once a patient is on sick leave and has taken time off from work for chronic LBP the likelihood of them returning to work decreases as time continues and after two years of leave the chance drops to nearly zero (Parish, 2002). Similarly taking of sick leave had been found to lead to chronicity (Costa *et al.,* 2009).

Self-reported general health and well-being by a patient with LBP influences their prognosis as negative cognitive thinking may lead to FAB and catastrophic thinking (Campbell and Edwards, 2009). It is thought that a patient who is physically active and perceives their health status as good is less likely to develop chronicity yet it has been shown that patients with chronic LBP are not good at subjectively estimating their activity levels and either overestimate (14%) or underestimate (30%) 44% of the time (n=32) (van Weering, Vollenbroek-Hutten & Hermens, 2011). Unhealthy habits such as smoking have been linked with chronic inflammatory states and early degenerative processes (Elmasry, Asfour, de Rivero Vaccari & Travascio, 2015) and may also influence prognosis.

In patients that do not feel in control of their conditions this may lead to increased levels of anxiety and misinterpretation of the pain response leading to catastrophic thinking and development of fear avoidance behaviour (Leeuw *et al.,* 2007). This

altered cognitive behavioural pattern emerges as incorrect pain response pathways lead to the avoidance of normally non-harmful stimuli and catastrophizing (Campbell & Edwards, 2009). A negative cycle can then be developed where more avoidance leads to more disability (Leeuw *et al.,* 2007) and results in constant thoughts of a loss of control over their condition.

There are many common findings in prognostic factor studies but not all research uncovers the same results. Differences in the study populations at different locations can account for much of the discrepancies with findings (Gurcay *et al*., 2009). The findings above are from hospitals, primary health care facilities, chiropractic clinics and general practices and are from a range of different countries, which are mostly first world. Therefore, their findings cannot be generalised to other populations, especially third world countries.

2.5 Measuring prognostic outcomes in clinical practice and research

There have been many questionnaires developed for the purpose of measuring prognostic factors in practice. Initially, measures for disability and pain were used to assess patients' outcome. Common disability questionnaires include the Modified Oswestry Low Back Pain Disability Questionnaire (OSW), the Quebec Back Pain Disability Scale (QUE) and the Roland-Morris Disability Questionnaire (RMDQ). The OSW and the RMDQ were developed in the 1980's, followed by the QUE in 1995 (Smeets, Koke, Lin, Ferreira & Demoulin, 2011). When the OSW and the QUE were compared it was found that the OSW was superior (Fritz & Irrgang, 2001). Since then different versions and slight variations in the questionnaires have been made but essentially they remain the same. Different researchers have found varying reliability and validity of these instruments in different clinical or research settings yet they have been utilized as the only recognised options of their time (Smeets *et al.,* 2011).

When research focus shifted to prognostic factors new tools were developed, one being the Keele STarT Back Screening Tool (SBST) which measures disabling back pain, and identifies patients potentially at risk of developing persistent pain or

chronicity. It consists of nine questions with answers for agree or disagree. The overall score distinguishes patients into either the low or medium risk categories and a distress subscale is used to separate medium risk patients into medium and high risk categories (Zimney, Louw & Puentedura, 2014). The tool may be used to identify modifiable risk factors for LBP using a prognostic questionnaire that is also cost-effective.

Bolton and Breen (1999) developed the Bournemouth Questionnaire (BQ) in response to what they described as the "shift towards evidence-based practice and management in line with clinical practice guidelines". Their questionnaire was tested and found to be valid, reliable and responsive in back pain patients. The items of the BQ include pain, disability (social and physical), anxiety, depression, work fear-avoidance and locus of control. It was extensively tested to ensure validity in the biopsychosocial paradigm and encompasses the multidimensional nature of LBP (Bolton & Breen, 1999). It has been used in studies to assess the prognostic values of these items in discerning those at risk of developing chronicity (Bolton & Hurst, 2011). Thus, it was chosen as the measure of choice in this study.

2.6 Conclusion

Both acute and chronic LBP patients receiving chiropractic treatment have been shown to benefit from this treatment (Peterson, Bolton & Humphreys, 2012), however, little is known about whether those patients presenting to the DUT CDC with chronic LBP differ in terms of pain presentation, disability (social and physical), anxiety, depression, work fear-avoidance and locus of control. Therefore, this study aims to determine the role of selected factors in this specific setting in order to provide information about the factors which could influence prognosis of LBP in these patients. This information can be used to inform patient management strategies and the chiropractic curriculum.

Chapter Three

Methodology

3.1 Introduction

This chapter describes the research methodology utilised in this study. It will elaborate on the study design, study population and setting, procedure and measurement tools utilized. Ethical considerations and the statistical analyses specific to the study will be outlined.

3.2 Study design

This study used a quantitative paradigm and a descriptive, longitudinal design. The quantitative paradigm allows researchers to use structured instruments to collect data and then statistical analyses to understand the information. Quantitative research allows for a search for truth and together with the principles of rigour and causality (Brink, van der Walt & van Rensburg, 2012) allow this paradigm to be appropriate for this study.

Descriptive research designs allow for information to be gathered from a representative sample of the population. This information allows for an understanding of a phenomenon in its environment. When combined with a longitudinal design information from participants can be obtained at different points (Kulik, 2011). The manner in which this information was obtained in this study was by using pre-validated measurement tools. A questionnaire was suitable for obtaining this information as the researcher was able to extract the information from the participant as it occured naturally, in a way that was standardized and equal (Brink *et al.*, 2012).

3.3 Study population

Patients that were either currently attending the Durban University of Technology Chiropractic Day Clinic (DUT CDC) for a condition other than low back pain (LBP) or presenting with LBP for the first time were invited to participate in the study. There was no discrimination based on age, gender, race or occupation.

3.4 Study setting

The study took place at the DUT CDC located on the Ritson campus on the Berea, Durban. Permission to conduct the study was obtained from the Head of Department and the Clinic Director (Appendix B). The study was approved by the DUT Faculty of Health Sciences Research and Higher Degrees Committee and the Institutional Research Ethics Committee (IREC 068/15; Appendix C) prior to the start of the data collection.

3.5 Sampling procedure

3.5.1 Sample size

There have been no previous studies that have examined the management of LBP patients over a duration of time at the CDC, so it was uncertain as to how many follow up visits a LBP patient may have on average at this site. Thus the sample size was calculated based on a descriptive study conducted by McDonald (2012) on patients seeking care at the DUT CDC. Table 3.1 shows, over a three-month period in the years 2000, 2006 and 2011, the number of patients seeking care at the DUT CDC and then those who had LBP. It was estimated that the number of new patients seen in the DUT CDC per month was similar to that of 2011.

Table 3.1 Number of new patients seeking care at the DUT CDC for LBP in 2000, 2006 and 2011 (McDonald, 2012)

Year	Number of patients	Percentage with LBP
1994	162	-
2000	629	30.7 (n=193)
2006	391	40.7 (n=159)
2011	291	35.7 (n=103)

DUT CDC = Durban University of Technology Chiropractic Day Clinic; LBP = low back pain

Thus it was estimated that a minimum number of 100 participants, or a study period of four-month duration would suffice for data collection.

3.5.2 Sample characteristics

To be included in the study, participants had to have met the criteria outlined below.

3.5.2.1 Inclusion criteria:

1. The participant had to have mechanical LBP as diagnosed by the student chiropractor and confirmed by the clinician on duty. It had to be the participant's first consultation for the LBP. If the LBP was recurrent they had to not have received treatment within the last 12 weeks (Croft *et al.,* 1998). This time period was selected to ensure that all participants were not receiving on-going treatment or maintenance treatment, and thus all participants would have been receiving treatment for an initial complaint or an acute on chronic presentation.
2. The participant had to sign the informed consent form (Appendix D).
3. Participants must be 18 years of age and older. An age of 18 years was chosen so that the participants could sign their own consent form and a legal guardian would not have to be present during the consultation or treatment.

3.5.2.2 Exclusion criteria:

1. Patients currently receiving treatment for LBP.
2. Patients seeking maintenance treatment for LBP.
3. Patients who were not residing in Kwa-Zulu Natal and would not have been able to have continuous care.
4. Patients with cervical, thoracic or extremity complaints only. The patient may have presented with a complaint that encompassed both the low back and another region, then this was acceptable for entry into the study.

3.6 Measurement Tools

The data for this study was obtained using the measurement tools outlines below.

3.6.1 Sociodemographic and Bournemouth back pain Questionnaire (BQ) (Appendix E)

This questionnaire consisted of two sections, the first section gathered information relating to socio-demographic factors such as work status, lifestyle, behaviour and attitudes and clinical characteristics of the presenting complaint and was completed by the patient. Any data that was not filled out on the sociodemographic questionnaire was sourced from the patients file to complete the data sheet. The patient files are stored in the DUT CDC and access was granted to the researcher to access these files if it was necessary (Appendix B).

The second part of the questionnaire gathered information relating to the LBP, followed by seven questions using an 11-point numerical rating sub-scale related to pain, disability (activities of daily living (ADL) and social activities), anxiety, depression, work fear-avoidance and locus of control. The individual questions could be analysed independently or as a total score out of a maximum of 70. For the purposes of this study the values were used as both individual scores as well as a total score. This instrument has been used in similar research and was found to be “reliable, valid and responsive” (Bolton & Breen, 1999). All measurements are sensitive to clinically

significant change. The seven items covered a wide spectrum and reflected the multidimensional nature of LBP. The questionnaire was homogeneous, meaning that it assessed multiple characteristics of the condition i.e. LBP and also had good construct validity and external longitudinal construct validity (Bolton & Breen, 1999).

3.6.2 The Patients' Global Impression of Change (PGIC) Scale (Appendix F)

This scale is used to determine response to treatment. It allows a clinician to determine if any changes that the participant undergoes are clinically significant. This scale is considered to be the "gold standard' since its development in 1976 and was found to be valid and reliable in a study by Hurst and Bolton (2004). Patients rate their change on a scale from one to seven ranging from 'no change' to 'much better'. This subjective reporting infers that the change made in the patients' condition is clinically significant to them (Hurst & Bolton, 2004). According to Hurst and Bolton (2004) an answer indicating a change from five to seven (i.e. moderately better, better or a great deal better) is considered a clinically significant improvement in the condition of a patient. This scoring system was utilized in this study to separate those who improved verses those who did not.

3.7 Research procedure

3.7.1 Preparation for data collection

After obtaining permission from the IREC (Appendix C) to conduct the study the researcher had to prepare for data collection by using a two stage approach:

Stage one:
This stage related to organizing the necessary paperwork for distribution to the patients presenting with LBP at the DUT CDC. This involved making three sets of paperwork as outlined below.

1. Initial visit paperwork:

A folder was made holding the Letter of Information and Consent (LOIC) for the study (Appendix D) and the BQ (Appendix E). This folder had a covering page indicating the patients file number and the letters C, T and L (indicating cervical, thoracic and lumbar) with a tick box next to them (Appendix G). The tick box was utilized by the students and administration staff to indicate the complaint of the patient and the appropriate box ticked. This system assisted the clinic administration staff to determine which patients were being included in the study. Only the file number was present on the cover sheet to maintain confidentiality at all times.

2. The 4^{th}/5^{th} visit:

This folder contained the BQ (follow up) (Appendix H) and the PGIC (Appendix F).

3. 10^{th} visit:

This folder contained the BQ (follow up) (Appendix H) and the PGIC (Appendix F).

All folders were kept in the clinic reception area for ease of distribution.

Stage two:

In order for the study to be a success, cooperation was required from the clinic reception staff and the student chiropractors.

Phase 1:

A meeting was held with the clinic reception staff informing them about the study and requesting their participation. Their responsibility was twofold: initially they were tasked with distributing the appropriate research questionnaires to the new patients or the student chiropractors.

Secondly, they were responsible for removing the research folders from the patients' files on completion of their visit and placing them in a research box for the researcher to collect. Involvement in the research was voluntary and on agreeing, the staff signed a letter of participation (Appendix I).

Phase 2:

A meeting was then held with the student chiropractors who were currently registered for a Master's degree in Technology of Chiropractic, and that were working in the DUT CDC. At the meeting the aims and objectives of the study and the research procedure were explained. The student chiropractors were then asked to participate in the following manner, if they agreed to participate they were requested to read and sign a Letter of Participation (Appendix J). Their participation involved the following:

1.) Initial visit: The student chiropractors would be given a folder by the clinic staff for each new patient attending the clinic. On the covering page of the folder they would need to record the patient's file number and indicate the region being treated by ticking the corresponding tick box. Those patients presenting with either cervical or thoracic spine pain would not be given the research questionnaires and these folders were then returned to the clinic administrative staff for redistribution.

   For those patients who presented with LBP and failed to meet the study inclusion criteria or who elected not to participate, the student was required to indicate on the cover page that the participant had LBP but could not be included, the folders were then returned to the clinic administrative staff and placed back into a research drop box.

   For those patients with LBP who met the study inclusion criteria, the student informed the patient about the study, and gave them the LOIC (Appendix D) to read and sign. They then allowed the patient a chance to ask questions relating to the study. Once the LOIC was signed the patient was given the questionnaires to complete. Once completed the LOIC and the questionnaires were placed back into the research folder and handed in to the clinic administrative staff with the patient's file.

2.) Protocol for the 4^{th}/5^{th} and 10^{th} visits: The researcher would contact the student chiropractor to determine when the 4^{th}/5^{th} and 10^{th} visits were taking place. The researcher placed the appropriate research folders in the patient's file so when the patient presented for their 4^{th}/5^{th} and 10^{th} visits the student gave the research folder to the patient to complete the questionnaires. Once completed

the questionnaires were placed back into the research folder and handed to the clinic administrative staff with the patient's file.

3.) Treatment approach: The student chiropractors were to treat the participants according to the patients' specific needs and in keeping with the scope of practice for chiropractors in South Africa as laid out in chapter 11 in Act 63 of 1982 (South Africa, 1982). This may have included spinal manipulative therapy (SMT), mobilisation, dry needling, advice on nutrition and exercise, electro-modalities and any other treatment deemed necessary by the student and/or clinician and in keeping with the latest clinical practice guidelines (Globe *et al*., 2016). There was to be no change to the patients 'normal' treatment protocol by them participating in the research.

3.7.2 Data Collection

When the data collection started the researcher was available on the DUT campus in the mornings and in the CDC during the afternoons, should there have been any questions arising from the participants that the students or the clinic administrative staff could not answer. If the researcher was unavailable due to academic constraints, the supervisor was available.

At the end of each day the researcher collected the completed research files from the clinic staff. The researcher contacted the student chiropractors and consulted the daily register to track those patients who were participating in the research in order to ensure that data was collected at the 4^{th}/5^{th} and 10^{th} treatments. The questionnaires were checked for completeness and if necessary the patient's file was accessed or the patient was telephoned to complete the data.

All research questionnaires were stored safely by the researcher for the duration of the study.

3.8 Data synthesis and analysis

3.8.1 Data synthesis

On obtaining the completed questionnaires the data was synthesized, coded and captured on an Excel spreadsheet (Microsoft Office 2010) in specific columns demarcated for each assessed variable. The following synthesis took place:

1.) BQ: The data from the BQ was coded as raw scores, i.e. a score out of ten, for each question as well as a total score out of 70 and a percentage score.
2.) PGIC: if a patient answered with 1-4 then it was coded as '1' indicating no improvement and if they answered 5-7 it was coded as '2' indicating an improvement.
3.) Location of pain (Question 5) was reduced to LBP only or LBP and another location instead of the available responses of low back, headaches, leg, shoulder/arm, neck, other.
4.) Question 9 was reduced from available responses of less than 1 week, between 1 and 4 weeks, between 1 and 3 months and more than 3 months to less than 3 months and more than 3 months to create groups of acute and chronic pain.
5.) If a participant indicated they were currently in paid employment in Question 15, then only the results from these participants were used in Question 16 and were reduced to if the participant had taken time off work or not, due to unemployed participants not being able to take time off work.

3.8.2 Data analysis

The IBM Statistical Package for the Social Sciences (SPSS) version 22 was used for statistical analyses. A *p*-value of <0.05 was considered as statistically significant. Descriptive statistics were used to describe the data in terms of means and standard deviations or frequencies where appropriate. Baseline characteristics were compared between acute and chronic patient populations using chi-squared tests, Fisher's exact tests or independent sample t-tests. Longitudinal continuous outcomes were compared between baseline and follow up visits in the acute and chronic group by using paired t-tests. Where possible odds ratios were calculated. To determine the prognostic factors associated with improvement independent sample t-tests were utilized.

3.9 Ethical considerations

The ethical principle of autonomy was maintained as all participants gave written informed consent after a verbal explanation of the study and were free to withdraw at any time.

The participants were made aware that they should answer honestly and they were informed that their information would be kept confidential and would not be made public.

Those participants that chose not to participate were not negatively affected, nor was their treatment at the DUT CDC jeopardised, in line with the ethical principle of beneficence.

There was no influence on the treatment for any of the participants by the researcher nor was any of the information used to influence the treatment of any participant. All treatments of the participants were in line with standard chiropractic treatment guidelines. There was no pressure on participants to return for the 4^{th}/5^{th} or 10^{th} visits.

During the research process nonmaleficence was upheld as no intentional harm was inflicted upon the patient.

Chapter Four

Results

4.1 Introduction

This chapter presents the results obtained from the data collected in this study. Participant enrolment will be discussed initially, followed by results of the statistical analysis of the data collected.

4.2 Participant enrolment

A total of 103 participants were enrolled in the study, from the end of August 2015 to the beginning of May 2016. Three participants were excluded from the study as one participant failed to complete the questionnaire and the other two were below the age required to enrol in the study.

From the 100 participants that took part in the study only 20 participants were still attending the Durban University of Technology chiropractic day clinic (DUT CDC) for treatment for their low back pain (LBP) at the $4^{th}/5^{th}$ visits. No participants were attending by the 10^{th} visit. The lack of attendance by the 10^{th} visit resulted in the inability for data to be collected and as a result this objective of the study could not be met.

The 80 patients that were no longer attending the DUT CDC by the $4^{th}/5^{th}$ visit had the following reasons for not continuing with care:

- They no longer required treatment.
- The clinic closed over the December holidays leading them to seek alternative care or during this time their pain resolved.
- They sought or were referred to other health care practitioners.
- They decided to discontinue treatment.

The data will be presented separating the sample into those who presented with acute or chronic pain for both the initial visit and for those who were still attending at the

4th/5th visit in order to compare and contrast differences between acute and chronic pain sufferers.

4.3 Characteristics of the participants

4.3.1 Number of participants with acute or chronic LBP

The majority of the participants at the initial and 4th/5th consultation had acute LBP, as seen in table 4.1.

Table 4.1 Number of participants reporting acute or chronic LBP in the initial and 4th/5th visit group

Consultation	N	Acute		Chronic	
		n	%	n	%
Initial visit	100	65	65	35	35
4th/5th visit	20	12	60	8	40

4.3.2 Demographic characteristics

4.3.2.1 Gender

There were more male participants in this study at both the initial (52%, n=52) and 4th/5th (55%, n=11) consultations, as seen in table 4.2. No significant gender differences were found between those who reported acute or chronic pain at either the initial (*p*=0.933; Fishers Exact Test) or the 4th/5th (*p*=0.362; Fishers Exact Test) visit.

Table 4.2 Gender distribution of the participants in the initial and 4th/5th visit group

Group	N	Acute						Chronic					
		Total		Female		Male		Total		Female		Male	
		n	%	n	%	n	%	n	%	n	%	n	%
Total	100	65	65	31	47.7	34	52.3	35	35	17	48.6	18	51.4
4th/5th visit	20	12	60	4	33.3	8	66.7	8	40	5	62.5	3	37.5

4.3.2.2. Age

The mean age of the participants (N=100) at the initial consultation was 36.1 (SD±15.5), with a range from 18 to 79 years of age, whereas for those attending at the 4th/5th visit (n=20) the mean age was 35.0 (SD±15.6), with a range from 18 to 63 years of age. Table 4.3 shows the mean age, standard deviation (±SD) and range of the participants with acute or chronic pain at the initial and 4th/5th visit.

Table 4.3 Mean age and age range of the participants in the initial and 4th/5th visit group

Group	**N**	**Acute**			**Chronic**		
		Mean	**±SD**	**Range**	**Mean**	**±SD**	**Range**
Total	100	35.2	16.1	18-79	37.7	14.7	19-63
4/5 visit	20	36.4	17.3	18-63	32.8	13.5	19-55

No significant differences were found between those with acute or chronic pain and mean age at the initial (p=0.451; Fisher's exact test) or at the 4th/5th (p=0.620; Fisher's exact test) visit.

4.3.3 Characteristics of the LBP

4.3.3.1 Areas of musculoskeletal pain other than low back (Question five)

In addition to LBP some of the participants experienced pain in other regions of the body at the initial consultation as seen in figure 4.1. There was a significant relationship between the acute and chronic groups (p=0.042; chi squared test) with those reporting chronic pain being 2.38 (CI 1.02-5.54) times more likely to report suffering pain in an area in addition to LBP.

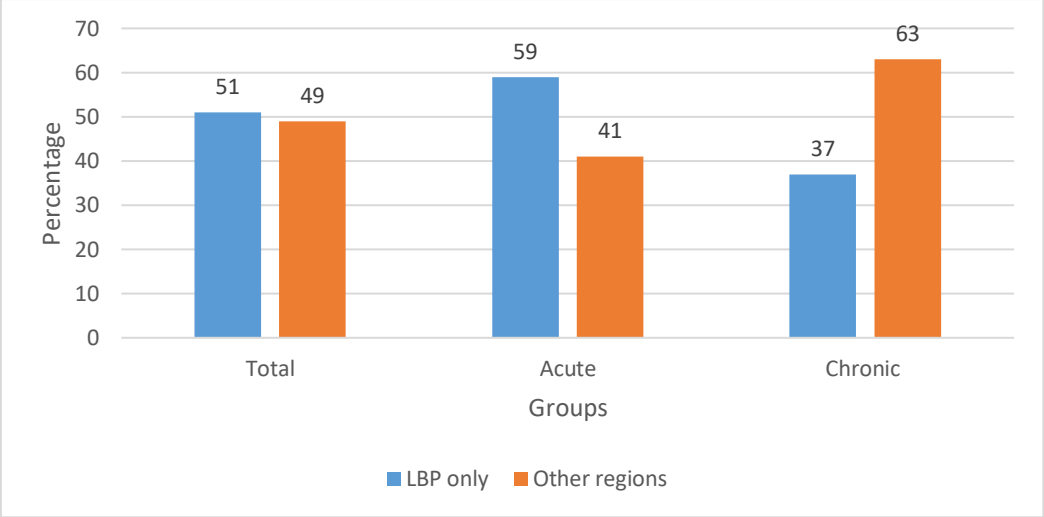

Figure 4.1 Location of pain distribution per group.

The most common concomitant area of pain was the neck irrespective of whether the participant had acute or chronic LBP, as seen in table 4.4.

Table 4.4 Areas other than the low back where participants experienced pain (more than one area could have been indicated)

Area	**Acute (n=65)**		**Chronic (n=35)**	
	n	**%**	**n**	**%**
Headache	5	7.7	9	25.7
Leg	6	9.2	4	11.4
Neck	13	20.0	15	42.9
Shoulder/arm	10	15.4	9	25.7
Other	4	6.2	3	8.6

At the initial visit, those with chronic pain were more likely to suffer from headaches (p=0.013; OR 4.15, CI 1.27-13.60) and neck pain (p=0.015; OR 3, CI 1.22-7.41) than those with acute pain. At the 4^{th}/5^{th} visit no significant relationships (p<0.05; Fishers exact test) were found in relation to additional regions of pain reported in either the acute or chronic group.

4.3.3.2 Pain going down the leg/s (Question six)

The majority of the participants, irrespective of whether they suffered acute or chronic pain, at the initial or at the 4th/5th visit, did not report pain going down their leg/s, as seen in table 4.5.

Table 4.5. Participants reporting pain down their leg/s

Pain down leg	Total sample (N=100)						4th/5th visit group					
	Total		Acute		Chronic		Total		Acute		Chronic	
	n	%	n	%	n	%	n	%	n	%	n	%
No	66	66	49	75.4	17	48.6	12	60	9	75	3	37.5
Yes	34	34	16	24.6	18	51.4	8	40	3	25	5	62.5

At the initial visit those participants who suffered chronic pain were three times more likely to report pain down their leg/s (p=0.007; OR 3.24, CI 1.36-7.74), in contrast to those attending at the 4th/5th visit where no difference was found between acute and chronic group with regards to reporting pain down the leg (p=0.167) as seen in table 4.5.

4.3.3.3 Previous occurrence of complaint (Question seven)

Table 4.6 shows that irrespective of group, the reporting of previous LBP was high. There was no significant difference found between those with acute or chronic LBP in the total population (p=0.247; chi squared test) or for those who came for the 4th/5th visit (p=1.000; Fisher's exact test) with regards to reporting of previous occurrence of LBP.

Table 4.6 Reporting of previous occurrence of the LBP per group for each visit

Previous episode of pain	Total sample (N=100)						4th/5th visit group					
	Total		Acute		Chronic		Total		Acute		Chronic	
	n	%	n	%	n	%	n	%	n	%	n	%
No	27	27	20	30.8	7	20	5	25	3	25	2	25
Yes	73	73	45	69.2	28	80	15	75	9	75	6	75

4.3.3.4 At least one month in the last six months without pain (Question eight)

Table 4.7 shows the number of participants who had experienced a pain free month within the last six months. Those respondents who had acute LBP were more likely to have had one month in the last six months where they were pain free, irrespective of if they came for the first visit (p<0.001; chi squared test; OR 0.10, CI 0.03-0.29) or 4th/5th visit (p=0.042 Fisher's exact test; OR 0.43, CI 0.23-0.79).

Table 4.7 Participants experiencing one pain free month in the last six months per group for each group

One-month pain free	Total sample (N=100)						4th/5th visit group					
	Total		Acute		Chronic		Total		Acute		Chronic	
	n	%	n	%	n	%	n	%	n	%	n	%
No	54	54	24	36.9	30	85.7	14	70	6	50	8	100
Yes	46	46	41	63.1	5	14.3	6	30	6	50	0	0

4.3.3.5 Pain description (Question ten)

Table 4.8 shows how the participants described their pain as being either "coming and going" or "constant" in nature. There was no significant difference found between the acute and chronic groups with regards to how the participants described their pain for either the total sample (p=0.179; chi squared test) or the follow-up group (p=0.642; Fisher's exact test).

Table 4.8 Pain description

Pain description	Total sample (N=100)						4th/5th visit group					
	Total		Acute		Chronic		Total		Acute		Chronic	
	n	%	n	%	n	%	n	%	n	%	n	%
Comes and goes	52	52	37	56.9	15	42.9	14	70	9	75	5	62.5
Constant	48	48	28	43.1	20	57.1	6	30	3	25	3	37.5

4.3.3.6 Limiting of usual activities (Question 11)

When asked about whether their pain limited their usual activities those at the first visit were equally divided in their response, compared to those in the 4th/5th visit group where the majority indicated that it did not interfere with their usual activities as seen in table 4.9. No significant differences were found between those reporting limitation of usual activities and acute or chronic pain presentation at either the initial (*p*=0.834; chi squared test) or the follow-up visit group (*p=0.*325; Fisher's exact test).

Table 4.9 Limiting of usual activities

Usual activities limited	**Total sample (N=100)**						**4th/5th visit group**					
	Total		**Acute**		**Chronic**		**Total**		**Acute**		**Chronic**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
No	50	50	32	49.2	18	51.4	14	70	7	58.3	7	87.5
Yes	50	50	33	50.8	17	48.6	6	30	5	41.7	1	12.5

4.3.3.7 Use of medication on a daily basis (Question 12)

The majority of participants, irrespective of whether they suffered acute or chronic pain, were not taking medication, over-the-counter or prescription, in either the initial or 4th/5th visit group, as seen in figure 4.2. Interestingly, medication use was found to differ significantly (*p*=0.012; Fisher's Exact Test) between those who were still attending at the 4th/5th visit, with those who came for their 4th/5th visit reporting no to medication usage.

When the acute and chronic groups were compared for medication use there were no significant differences at either the initial (*p*=0.229; chi squared test) or for those in the 4th/5th visit group (*p*=1.000; Fisher's exact test).

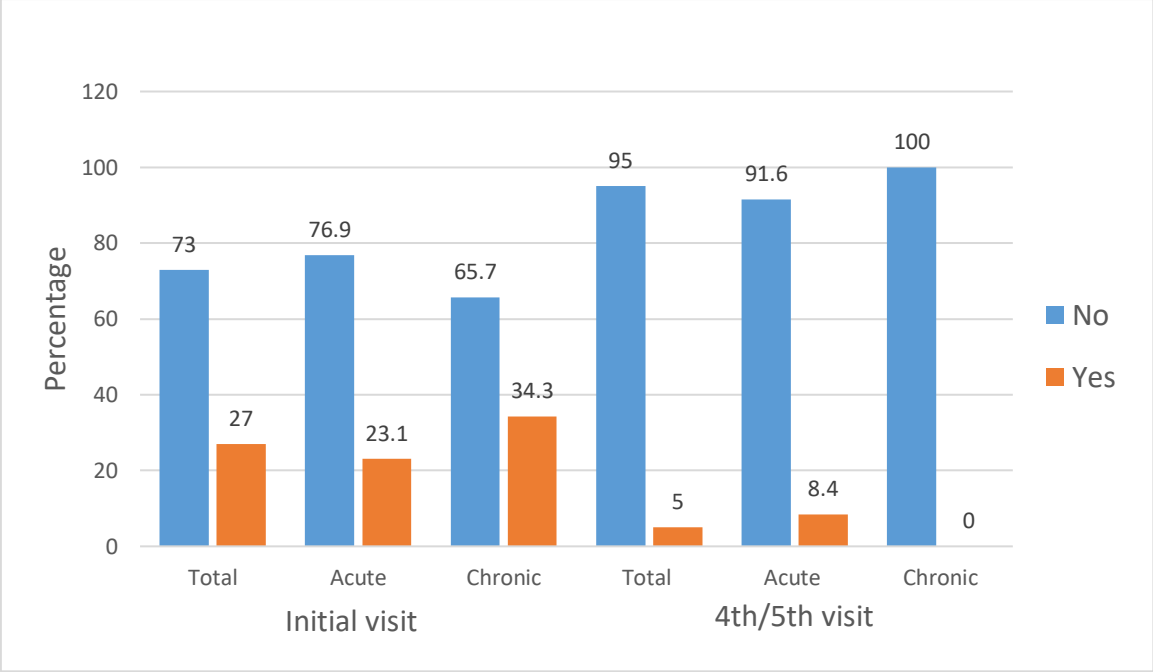

Figure 4.2 Percentage of participants on medication per group at each visit.

4.3.3.8 Participant received previous treatment (Question 13)

The majority of respondents had not sought previous treatment for their LBP as seen in table 4.10. Those suffering chronic pain at the initial visit were 4.08 times (CI 1.70-9.80; *p*=0.001; chi squared test) more likely to have sought help from another health care practitioner for their pain than those suffering acute pain. No significant difference was found between those with acute or chronic pain and seeking previous treatment for those in the 4th/5th visit group (*p*=0.362; Fisher's exact test).

Table 4.10 Number of participants that had previous treatment

Previous treatment	**Total sample (N=100)**						**4th/5th visit group**					
	Total		**Acute**		**Chronic**		**Total**		**Acute**		**Chronic**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
No	64	64	49	75.4	15	42.9	11	55	8	66.6	3	37.5
Yes	36	36	16	24.6	20	57.1	9	45	4	33.4	5	62.5

4.3.4 Psychosocial aspects of LBP

4.3.4.1 Condition expectation (Question 14)

All participants, except one, expected their condition to improve. The participant that expected their condition to stay the same was an acute pain sufferer and was still receiving treatment at the 4th/5th visit, as seen in table 4.11.

Table 4.11 Condition expectation per group

Condition expectation	Total sample (N=100)						4th/5th visit group					
	Total		Acute		Chronic		Total		Acute		Chronic	
	n	%	n	%	n	%	n	%	n	%	n	%
Get better	99	99	64	98.5	35	100	19	95	11	91.7	8	100
Stay the same	1	1	1	1.5	0	0	1	5	1	8.3	0	0
Worse	0	0	0	0	0	0	0	0	0	0	0	0

No significant differences were found between the acute and chronic groups when it came to condition expectations at the initial (*p*=1.000; chi squared test) visit or in those at the 4th/5th visit group (*p*=1.000; Fisher's exact test).

4.3.4.2 Employment (Question 15)

More than half of the participants were in paid employment as seen in table 4.12. No significant differences between those with acute and chronic pain and employment were found in either the initial group (*p*=0.377; chi squared test) or the 4th/5th follow up group (*p*=0.670; Fisher's exact test).

Table 4.12 Paid employment between acute and chronic groups

Paid employment	Total sample (N=100)						4th/5th visit group					
	Total		Acute		Chronic		Total		Acute		Chronic	
	n	%	n	%	n	%	n	%	n	%	n	%
No	46	46	32	49.2	14	40.0	9	45	6	50.0	3	37.5
Yes	54	54	33	50.8	21	60.0	11	55	6	50.0	5	62.5

4.3.4.3 Time taken off work (Question 16)

Those respondents who were employed mostly had not taken time off work for their LBP, as seen in table 4.13. No significant differences were found between those with acute or chronic pain and time taken off from work at either the initial (n=54; *p*=0.653; chi squared test) or the 4th/5th visit group (*p*=1.000; Fisher's exact test).

Table 4.13 Time taken off work

Taken off work	Total sample (n=54)						4th/5th visit (n=11)					
	Total		Acute		Chronic		Total		Acute		Chronic	
	n	%	n	%	n	%	n	%	n	%	n	%
No	34	63	20	60.6	14	66.7	7	63.6	4	66.7	3	60.0
Yes	20	37	13	39.4	7	33.3	4	36.4	2	33.3	2	40.0

4.3.4.4 Smoking (Question 17)

Interestingly, there was a higher percentage of chronic participants that were also smokers when compared to the acute participants at both the initial visit and the 4th/5th visit as represented in figure 4.3. Yet there was no significant difference found between those with acute or chronic pain and smoking status in either the initial visit group (*p*=0.142; chi squared test) or the 4th/5th visit group (*p*=0.347; Fisher's exact test).

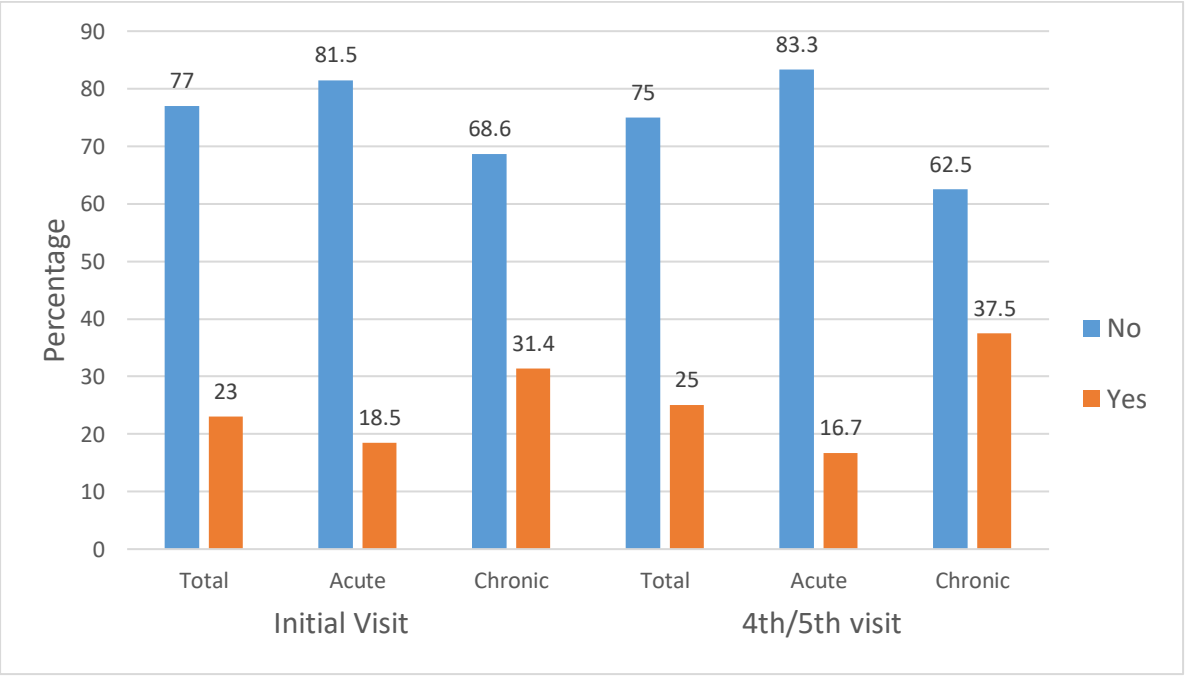

Figure 4.3 Percentage of smokers per group at each visit.

4.3.4.5 Physical activity (Question 18)

The participants were asked about whether their physical activity was 'more/same' or 'less' than before they suffered LBP. Table 4.14 shows that most participants still engaged in 'more/same' amount of physical activity. When the acute and chronic pain sufferers were assessed to see if their physical activity level differed at the initial visit and in the 4th/5th visit group, no significant differences were observed (p=0.702; chi squared test and p=1.000; Fisher's exact test, respectively).

Table 4.14 Overall physical activity

Physical activity	**Total sample (N=100)**						**4th/5th visit group**					
	Total		**Acute**		**Chronic**		**Total**		**Acute**		**Chronic**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
More/same	82	82	54	83.1	28	80.0	18	90	11	91.7	7	87.5
Less	18	18	11	16.9	7	20.0	2	10	1	8.3	1	12.5

4.3.4.6 General health and well-being (Question 19)

The majority of the participants rated their general health and well-being as 'excellent/good' as seen in table 4.15.

Table 4.15 Participants reporting general health

General health	**Total sample (N=100)**						**4th/5th visit group**					
	Total		**Acute**		**Chronic**		**Total**		**Acute**		**Chronic**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Excellent/ good	82	82	55	84.6	27	77.1	19	95	12	100	7	87.5
Fair/poor	18	18	10	15.4	8	22.9	1	5	0	0	1	12.5

No significant differences were found between those with acute or chronic pain and the rating of general health and well-being at the initial visit (p=0.354; chi squared test) or in the 4th/5th visit group (p=0.400; Fisher's exact test).

4.4 Objective One: To describe and compare the selected prognostic factors at the initial consultation, 4th/5th visit and 10th visit in patients with acute and chronic LBP.

4.4.1 Prognostic factors from the Bournemouth Questionnaire (BQ)

4.4.1.1 Initial visit (N=100)

The prognostic factors assessed at the initial visit for all the participants that were enrolled in the study are presented in table 4.16. No significant differences (p<0.05; independent t-test) were found between those with acute or chronic pain at the initial visit for any of the prognostic factors.

Table 4.16 The mean and standard deviation of the prognostic factors for the whole sample and the acute and chronic pain sufferers at the initial visit

Prognostic factor	**Total sample (N=100)**	**Acute group (n=65)**	**Chronic group (n=35)**	***p* value**	**Confidence interval**	
	Mean (±SD)	**Mean (±SD)**	**Mean (±SD)**		**Lower**	**Upper**
Pain	6.0 (2.2)	5.9 (2.3)	6.2 (2.1)	0.443	-1.26	0.56
Disability in ADL	4.4 (2.8)	4.5 (2.8)	4.1 (2.9)	0.507	-0.79	1.58
Social activity interference	3.9 (2.9)	3.7 (2.9)	4.1 (3.0)	0.481	-1.66	0.79
Anxiety	4.9 (2.9)	4.7 (2.8)	5.3 (3.0)	0.337	-1.77	0.61
Depression	3.4 (3.2)	3.1 (2.9)	3.9 (3.8)	0.292	-2.25	0.69
Fear-avoidance beliefs	4.1 (3.0)	4.0 (2.9)	4.4 (3.2)	0.476	-1.68	0.79
Locus of control	4.4 (2.8)	4.2 (2.8)	4.9 (2.7)	0.176	-1.94	0.36
Total score	44.4 (21.8)	42.9 (21.7)	47.1 (22.2)	0.355	-13.37	4.84

ADL = Activities of daily living

4.4.1.2 4th/5th visit group (n=20)

The prognostic factors of only those participants (n=20) that were still attending at the 4th/5th visit are shown in table 4.17.

- Comparison of acute and chronic pain sufferers at the initial and 4th/5th visit

No statistically significant differences were found between those with acute or chronic pain at their initial visit. When comparing those with acute and chronic pain at the 4th/5th visit the only prognostic factor that was significantly different between the acute and chronic pain sufferers was anxiety rating, as seen in table 4.17, which was significantly higher in the chronic pain sufferers (*p*=0.031).

Table 4.17 The mean and standard deviation of the prognostic factors for the participants that were still attending at their 4th/5th visit

Prognostic factor	**Initial visit**		***p*-value***	**4th/5th visit**		***p*-value***
	Acute Mean (±SD)	**Chronic Mean (±SD)**		**Acute Mean (±SD)**	**Chronic Mean (±SD)**	
Pain	5.6 (2.2)	5.8 (1.8)	0.858	3.0 (2.2)	3.6 (2.8)	0.583
Disability in ADL	4.2 (2.7)	2.6 (2.6)	0.224	2.7 (2.4)	3.6 (2.7)	0.412
Social activity interference	3.2 (2.9)	2.3 (2.3)	0.463	2.3 (1.9)	3.0 (3.1)	0.507
Anxiety	4.8 (2.7)	3.1 (2.5)	0.165	2.7 (2.8)	5.6 (2.7)	**0.031**
Depression	2.2 (2.6)	1.3 (1.8)	0.394	2.5 (3.1)	3.8 (2.3)	0.343
Fear-avoidance beliefs	3.8 (2.8)	2.6 (2.4)	0.333	3.2 (2.5)	3.4 (2.6)	0.859
Locus of control	3.0 (2.5)	3.8 (2.3)	0.510	2.3 (1.8)	3.0 (2.8)	0.523
Total score	38.2 (20.7)	30.5 (14.6)	0.377	26.5 (18.1)	37.1 (17.8)	0.213

*Independent samples t-test; ADL = Activities of daily living

- Comparison of the prognostic factors for those with acute pain from the initial to the 4th/5th visit.

Using a paired sample t-test, only pain and disability in activities of daily living showed a significant decrease over the treatment duration as seen in table 4.18.

Table 4.18 Change in prognostic factors from the initial to the 4th/5th visit in the acute pain sufferers

Prognostic factor	**Acute**		***p*-value**
	Initial visit Mean (±SD)	**4th/5th visit Mean (±SD)**	
Pain	5.6 (2.2)	3.0 (2.2)	**0.002**
Disability in ADL	4.2 (2.7)	2.7 (2.4)	**0.032**
Social activity interference	3.2 (2.9)	2.3 (1.9)	0.261
Anxiety	4.8 (2.7)	2.7 (2.8)	0.090
Depression	2.2 (2.6)	2.5 (3.1)	0.685
Fear-avoidance beliefs	3.8 (2.8)	3.2 (2.5)	0.474
Locus of control	3.0 (2.5)	2.3 (1.8)	0.428
Total score	38.2 (20.7)	26.5 (18.1)	0.099

ADL = Activities of daily living

- Comparison of the prognostic factors for the chronic pain group from the initial to the 4th/5th visit.

Using paired sample t-tests those reporting chronic pain showed a significant decrease over the treatment period for pain rating, with the participants reporting an increase in their depression scores from the initial to the 4th/5th visit, as seen in table 4.19.

Table 4.19 Change in prognostic factors from the initial to the $4^{th}/5^{th}$ visit in the chronic pain sufferers

Prognostic factor	**Chronic**		***p*-value**
	Initial visit Mean (±SD)	**$4^{th}/5^{th}$ visit Mean (±SD)**	
Pain	5.8 (1.8)	3.6 (2.8)	**0.038**
Disability in ADL	2.6 (2.6)	3.6 (2.7)	0.456
Social activity interference	2.3 (2.3)	3.0 (3.1)	0.490
Anxiety	3.1 (2.5)	5.6 (2.7)	0.101
Depression	1.3 (1.8)	3.8 (2.3)	**0.015**
Fear-avoidance beliefs	2.6 (2.4)	3.4 (2.6)	0.634
Locus of control	3.8 (2.3)	3.0 (2.8)	0.378
Total score	30.5 (14.6)	37.1 (17.8)	0.410

ADL = Activities of daily living

4.5 Objective two: To determine which factors, if any, were associated with improvement, as determined by a meaningful change in the global impression of change scale (PGIC), in acute and chronic LBP patients at the $4^{th}/5^{th}$ visit.

The majority of the respondents irrespective of whether they suffered acute or chronic pain reported an improvement according to the PGIC scale, as seen in figure 4.4.

- Comparison between acute and chronic pain sufferers and their reporting of improvement over the treatment duration.

There was no significant difference found between those with acute or chronic pain and their rating of improvement over the duration of the treatment (p=0.537; Fisher's Exact Test).

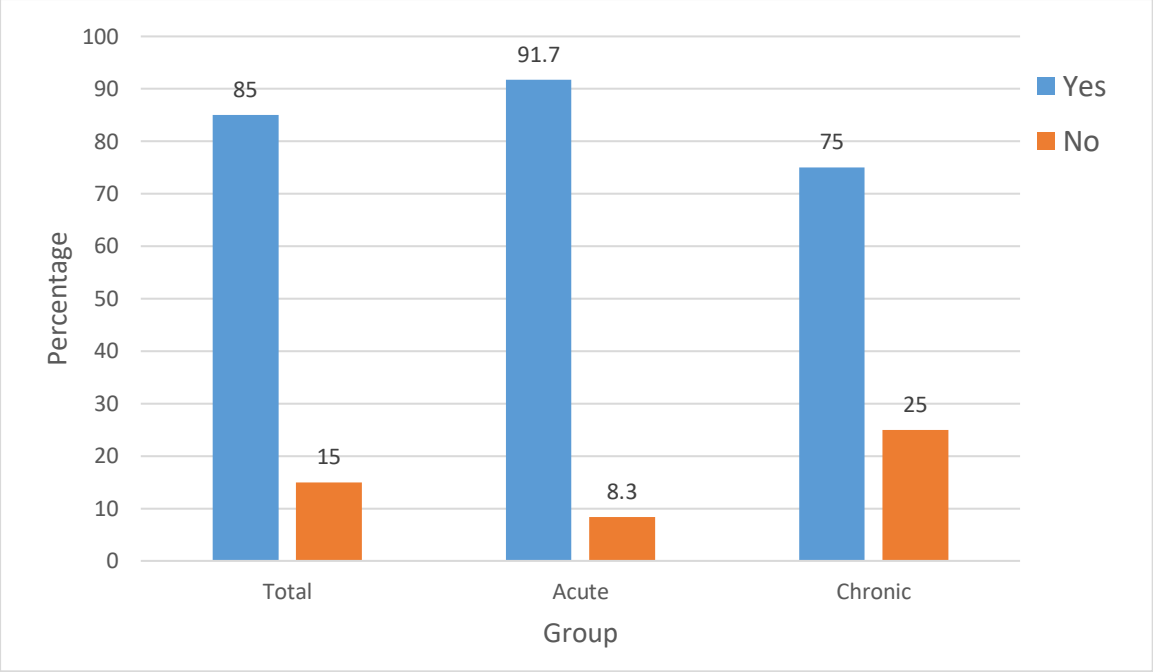

Figure 4.4 Percentage of participants reporting a significant change in their LBP from the initial to the 4th/5th visit.

- Comparison of the participant characteristics and rating of PGIC of the LBP at the 4th/5th visit

Table 4.20 shows the number of participants at the 4th/5th visit who answered yes or no to the investigated characteristics. It also presents the number of participants that indicated a clinically significantly improvement of pain by the 4th/5th visit (n=17) relative to each characteristic. No characteristics were found to be significantly related to improvement in the participants that were still attending at the 4th/5th visit.

Table 4.20 Characteristics of the participants compared to PGIC (N=20)

Characteristic	Yes n (%)	Significant change reported n (%)	No n (%)	Significant change reported n (%)	*p*-value*
Gender (Female)	9 (45)	7 (77.8)	11 (55)	10 (90.9)	0.566
Headache	2 (10)	2 (85.0)	18 (90)	15 (83.3)	1.000
Leg	2 (10)	1 (50.0)	18 (90)	16 (88.9)	0.284
Shoulder/arm	4 (20)	3 (75.0)	16 (80)	14 (87.5)	0.509
Neck	6 (30)	6 (100)	14 (70)	11 (78.6)	0.521
LBP and other location	9 (45)	8 (88.9)	11 (55)	9 (81.8)	1.000
Pain down leg	8 (40)	7 (87.5)	12 (60)	10 (83.3)	1.000
Past similar complaint	15 (75)	14 (93.3)	5 (25)	3 (60.0)	0.140
Month without pain	6 (30)	5 (83.3)	14 (70)	12 (85.7)	1.000
Describe pain (constant)	6 (30)	5 (83.3)	14 (70)	12 (85.7)	1.000
Acute presentation	12 (60)	11 (97.7)	8 (40)	6 (75.0)	0.537
Pain limiting	6 (30)	4 (66.7)	14 (70)	13 (92.9)	0.202
Medication	1 (5)	1 (100)	19 (95)	16 (84.2)	1.000
Other practitioners	9 (45)	8 (88.9)	11 (45)	9 (81.8)	1.000
Condition expectation (improve)	19 (95)	16 (84.2)	1 (5)	1 (100)	1.000
Employed	11 (55)	10 (90.9)	9 (45)	7 (77.8)	0.566
Smoker	5 (55)	4 (80.0)	15 (75)	13 (86.7)	1.000
Physically active	18 (90)	16 (88.9)	2 (10)	1 (50.0)	0.284
In good general health	19 (95)	17 (89.5)	1 (5)	0 (0)	0.150

*Fisher's Exact; ADL = Activities of daily living

- Comparison of the prognostic factors and rating of PGIC of LBP at the 4^{th}/5^{th} visit

In the acute group, all except one participant reported an improvement, thus it was not possible to use the PGIC to determine which factors may have affected prognosis. In the chronic group, there were no significant differences found between the prognostic factors and reported improvement as seen in table 4.21.

Table 4.21 Comparison of BQ scores and clinically significant change in LBP at the $4^{th}/5^{th}$ visit

Prognostic factor	**PGIC**	**Acute**			**Chronic**		
		n	**Mean change (±SD)**	***p*-value**	**n**	**Mean change (±SD)**	***p*-value**
Pain	No	1	-1 (-)	-	2	-1 (1.41)	0.479
	Yes	11	-2.73 (2.28)		6	-2.50 (2.59)	
Disability in ADL	No	1	2 (-)	-	2	-3 (2.83)	0.456
	Yes	11	-1.82 (1.89)		6	-0.67 (3.72)	
Social activity interference	No	1	2 (-)	-	2	3 (1.41)	0.233
	Yes	11	-0.45 (2.88)		6	0.00 (2.97)	
Anxiety	No	1	2.0 (-)	-	2	4.50 (3.54)	0.540
	Yes	11	-2.55 (4.01)		6	2.83 (3.06)	
Depression	No	1	1 (-)	-	2	2.50 (2.12)	1.000
	Yes	11	0.27 (2.90)		6	2.50 (2.43)	
Fear-avoidance beliefs	No	1	2 (-)	-	2	1.50 (0.71)	0.761
	Yes	11	-0.36 (3.26)		6	0.83 (4.96)	
Locus of control	No	1	1 (-)	-	2	-0.50 (2.12)	0.872
	Yes	11	-0.82 (2.89)		6	-0.83 (2.48)	

ADL = Activities of daily living

Chapter Five

Discussion

5.1 Introduction

This chapter will discuss the results of this study in relation to the available literature in order to compare and contrast the results. The participant enrolment and characteristics will be discussed first, followed by a combined discussion of objectives one and two to avoid repetition.

5.2 Participant enrolment

It was anticipated that the majority of the 100 participants required for the study would still be attending treatment by the $4^{th}/5^{th}$ visit. This was in line with the latest clinical practice guidelines (CPG) for chiropractic care which recommended a range of four to twelve treatments for acute non-specific low back pain (LBP) and six to twelve treatments for chronic non-specific LBP (Globe *et al.*, 2016). The low number of patients returning for their $4^{th}/5^{th}$ visit may have been influenced by the Durban University of Technology Chiropractic Day Clinic (DUT CDC) being a teaching clinic in which the chiropractic students master the skills needed to practice. These skills include fine tuning their clinical skills together with learning effective communication with patients and correct patient education with regards to treatment requirements. As novice practitioners, the consultations take a long time and thus may have deterred return visits. In addition, the student's skills of articulating diagnosis and management plans to patients may have influenced the return rate.

Although the clinic provides treatment at a reduced rate to patients of all socio-economic brackets, there are a large number of patients who are from the low-income populace, where the cost of multiple treatments may influence their ability to return for follow-up treatments. The clinic is also located on the DUT campus and like the University, it closes over the December holiday period resulting in some participants, who were receiving treatment for LBP, either seeking care elsewhere, or their

problems resolved during the vacation period. The lack of patients returning for treatment negatively affected the ability to generalize the findings of this study and made the use of logistic regression testing not possible due to low sample numbers.

5.3 Number of participants presenting with acute or chronic LBP

Acute pain patients made up the majority of the sample in this study which is similar to the studies of Bolton and Hurst (2011) and Dunn *et al.* (2011) which were conducted in primary care settings in the United Kingdom (UK). Supporting that only 10-15% of LBP cases progress to a chronic state (Gore *et al.,* 2012). In contrast Licciardone (2008) found more chronic pain patients attending a variety of clinics (primary general health care, osteopathic, neurology and orthopaedic) in the United States of America (USA). In Licciardone's (2008) study, flare ups of chronic pain were incorporated into the chronic classification, which may have increased the reporting of chronic cases to a higher value than the acute cases over the time period studied. McDonald (2012) found that the DUT CDC has a high percentage of chronic pain patients, but failed to differentiate for those with LBP if they were acute or chronic. He rationalised that the CDC caters to a lower socioeconomic class which may only seek treatment when their condition remains over time.

5.4 Characteristics of the participants

5.4.1 Demographic characteristics

5.4.1.1 Gender

In populations seeking care for LBP there was a slightly higher percentage of females attending various clinics (Dunn *et al.,* 2011). In the current study there was a marginally higher percentage of male participants in contrast to previous studies done on populations seeking care at the DUT CDC where females were in the majority (McDonald, 2012). It has also been reported that women are more likely to seek health care earlier than men and that they are more likely to adhere to their treatment programme than their male counter parts (Hoy *et al.* 2010). No significant differences

were found between those with acute or chronic pain and gender, despite previous reports that males are more likely to suffer chronic pain (Valat *et al.,* 1997).

5.4.1.2 Age

The incidence of LBP is said to peak between the third and fourth decade (Licciardone, 2008), which is consistent with the mean age found in this study. This is the age group which is most economically productive and any condition which could affect their health and well-being would negatively impact on the country's Gross Domestic Product (GDP) and result in indirect costs at the work place (Hansson and Hansson, 2005).

There was no limit placed on age of the participants in this study, with the oldest participant being 79 years of age. The prevalence of LBP has been reported to drop after the sixth decade (Hoy *et al.* 2010), however, studies rarely include institutions such as old age homes and care facilities resulting in LBP prevalence in elderly populations possibly being under-reported (D'Astolfo & Humphreys, 2006). With increasing age recovery expectations decrease (Mallen *et al.*, 2007; Hoy *et al.*, 2012; Kent & Keating, 2005) and may lead to chronicity. In this study, no significant difference was found between the acute and chronic pain sufferers and age at either the initial or $4^{th}/5^{th}$ visit. The results do show a lower mean age in the $4^{th}/5^{th}$ follow-up group even with a small participant size. The treatment of LBP is not age specific but more patient specific. As each patient presents with different characteristics so the appropriate treatment and management strategies are chosen to best suit their individual needs.

5.4.2 Characteristics of the participants LBP

5.4.2.1 Musculoskeletal pain other than the low back

Suffering pain in multiple areas of the body has been associated with a delayed favourable outcome in chiropractic LBP patients (Langworthy & Breen, 2007). It has been theorized that LBP cannot be addressed as a regional syndrome but rather with

a holistic and multifactorial approach (O'Sullivan, 2011; Bolton & Hurst, 2011). Many studies on musculoskeletal pain have focused on one region in order to control the variables but, musculoskeletal conditions often overlap areas, thus research should take into account the biomechanical link between these different regions (Mallen *et al*., 2007; Bolton & Hurst, 2011). Gore *et al.* (2012) found that suffering from chronic LBP was significantly associated with musculoskeletal pain in other areas, which was supported in this study. Physiologically when suffering chronic pain there is facilitation of the pain response of the body, which may influence the connection to other areas of the body, resulting in pain being experienced in another area (Campbell & Edwards, 2009).

The most common musculoskeletal area where the participants experienced concomitant musculoskeletal pain was in the neck. Neck pain is the second most common musculoskeletal complaint (Storheim & Zwart, 2014). Neck pain has been found to be associated with a poor prognosis in patients reporting high levels of pain and disability at the initial visit (Mallen *et al.,* 2007). This suffering of musculoskeletal pain in multiple areas may affect prognosis.

5.4.2.2 Pain going down the leg/s

LBP associated with pain travelling down the leg has been associated with delayed improvement (Dunn *et al.,* 2011), this widespread involvement, may result in an increased functional deficit for the patient and points to the multidimensional nature of LBP (O'Sullivan, 2011). A significantly higher number of participants, that were in the chronic group at the initial visit, reported that the pain referred down the leg/s, which may be due to the abnormally upregulated pain pathway and response to pain experienced by the body during chronicity (Campbell & Edwards, 2009).

This significant difference was not found in the group that attended the $4^{th}/5^{th}$ visit yet the percentage totals showed a similar trend with the chronic group reporting a higher percentage of cases where the pain travelled down the leg/s. This symptom can be associated with lumbar radiculopathy specifically if it goes past the knee to the ankle

and/or foot (Vizniak, 2003). This may indicate a more serious form of LBP for example disc herniation, and not simple non-specific LBP. Patients with disc herniation were excluded from the study. Myofascial pain syndrome may 'mimic' radiculopathy by its pain referral (Giamberardino *et al.,* 2011). It is possible that due to the complexity of LBP (Haldeman & Dagenais, 2008b) and the numerous pain producing structures in the area, specific diagnosis may be difficult (Jenkins, 2002), which may have resulted in some participants being recruited with disc disease as opposed to pure non-specific LBP.

5.4.2.3 Previous occurrence of complaint and at least one month in the last six months without pain

This study found no significant difference between the acute and chronic groups in terms of reporting previous occurrences of LBP. Similarly, Dunn *et al.* (2011) found that 87% of the participants in their study had a previous complaint of LBP with 40% having experienced their pain for three or more years. This finding adds value to the notion that LBP has an acute on chronic presentation and is cyclical in nature, remitting and recurring over time (Jenkins, 2002). Reporting previous LBP was not associated with improvement in either the acute or chronic pain sufferers. This is in contrast to Mallen *et al.* (2007) who found that reporting a previous episode of pain was an indicator at baseline for poor prognosis in musculoskeletal injury. Studies investigating LBP should relook at how they classify LBP when asking about duration, as a simple question of how long the participant has had the pain is not sufficient to encompass the category of acute on chronic or an acute exacerbation of a chronic complaint. The classification of subacute does not solve this as it is a further simplified category of duration and not an explanation on the nature of the complaint.

When asked about whether they had experienced one pain free month in the last six months those suffering chronic pain had not, but the acute pain group had. This is to be expected as patients reporting chronic pain would have had the complaint for a minimum of 12 weeks (Costa *et al.,* 2009; Gurcay *et al.*, 2009), and due to the findings of LBP being a recurring problem (Jenkins, 2002) it is likely that the participants had been suffering with this condition over extended periods.

Leboeuf-Yde *et al.* (2004) found that having continuous pain for at least six months when presenting for the initial consultation was a negative predictor of outcome in LBP patients. Experiencing a painful episode that lasts for an extended period of time may impact on the emotional and psychological state of a patient and reinforce fear-avoidance behaviour (O'Sullivan, 2011). When the body is put under a painful stressor it tries to compensate by adapting to it but when this mechanism goes awry, negative behavioural and cognitive habits begin to form which, if they persist, may be more influential on the development of chronicity than sociodemographic factors (Smith, Elliot, Hannaford, Chambers & Smith, 2004; Poiraudeau *et al.,* 2006). These undesirable behaviour patterns initiate a cycle of chronicity that reinforces both the physical side and cognitive aspect of the pain and may delay the response to treatment (O'Sullivan, 2011). Yet in this study, irrespective of suffering acute or chronic pain, the participants reported an improvement with treatment.

5.4.2.4 Pain description

Although no significant difference was found between the acute and chronic pain sufferers and the way they described their pain in this study, the trend showed that those with chronic pain were more likely to report it as 'constant'. Stress related to chronic pain may trigger the pain neuro-matrix in the brain leading to tissue hyperalgesia and an altered pain response (Campbell & Edwards, 2009). Higher levels of fear-avoidance beliefs, influenced by altered cognitive behaviour and physical and lifestyle aspects, may lead the chronic pain sufferer to constantly catastrophize their pain and their thinking may become obsessive (O'Sullivan, 2011). Reporter bias of chronic patients can be influenced by their mood or imprecise recall of previous pain behaviour (Perruchoud *et al.* 2014) and lead them to over-reporting of their condition.

5.4.2.5 Limiting of usual activities

It has been reported that quality of life in individuals with chronic LBP is negatively affected due to the limiting of ADL (Verbunt *et al.*, 2001; Perruchoud *et al.*, 2014). Patients with chronic LBP have shown decreased activity pattern in the evenings, compared to controls, which is the time that patients usually reserve for leisure and

social activities (Spenkelink *et al.*, 2002). Prolonged time spent resting or not doing usual activities can have an impact physically and physiologically on the body, increasing body weight and body fat percentage and decreasing muscle mass (Verbunt *et al.*, 2001). These influences may impact coping strategies and play a role in the development of a chronic pain syndrome (Perruchoud *et al.*, 2013).

Interestingly, limiting of usual activities by the participants in this study was not significantly different between the acute and chronic groups in either the initial visit or the 4th/5th follow-up group. Langworthy and Breen (2007) found similar results in their study, reporting moderate to severe interference with normal work due to LBP. Yet this was not extreme enough to actually stop the majority from working. Acute pain sufferers may develop fear-avoidance behaviour that cause them to limit their usual daily activities in fear of potentially causing more harm and disability (Leeuw *et al.,* 2007). Acute pain is often more severe in nature, whereas chronic patients may develop a coping strategy or compensatory mechanisms to try to deal with the chronicity of their condition.

5.4.2.6 Use of medication on a daily basis

Medication use on a daily basis between the acute and chronic patients in both the total sample and the 4th/5th visit group was not significantly different. The continued use of medication by patients, whether it was over-the-counter (OTC) or prescribed, showed that patients may not feel they have control over their pain and that they require outside assistance (Zaman & Kumar, 2013). It has been found that chronic LBP sufferers are prescribed medication such as opioids, non-steroidal anti-inflammatories, muscle relaxants and antiepileptic medication more than control groups (Gore *et al.,* 2012). In this study medication use was low (23%) irrespective of being in either acute or chronic pain. Patients seeking chiropractic care may do so for its non-invasive, holistic management approach (Murthy *et al.,* 2015) and may be less inclined to use medicine. Besides being considerably cheaper than usual medical care and surgery (Redwood, 2011; Lin, Haas, Maher, Machado & van Tulder, 2011) chiropractic care and manual therapy is less invasive and damaging to the body due to side effects and unwanted drug interactions.

5.4.2.7 Patient seeing other practitioners for the complaint

In this study, chronic pain participants were four times more likely to have sought treatment from other practitioners before presenting to the DUT CDC than the acute pain participants. Chiropractic treatment is seen as a conservative approach to LBP treatment (Globe *et al.,* 2016) that is often used by patients in conjunction with other practitioners such as general practitioners and physiotherapists (Costa *et al.,* 2009), which may account for the high percentage of patients that have attended other practitioners. CAM attendance is on the rise in developed countries which may explain why more patients are seeking chiropractic care (Murthy *et al.,* 2015) and similar trends might be occurring in developing countries. Chiropractic is often perceived as a 'last resort treatment' for many patients and as such, chronic patients, who have experienced their complaint for an extended period, might seek CAM practitioners when conventional treatments do not provide relief (Haldeman & Dagenais, 2008a; Haldeman & Dagenais, 2008b).

5.4.3 Psychosocial aspects of LBP

5.4.3.1 Condition expectation

Believing that a management plan is going to work before undertaking treatment influences a patient's perceptions of the treatment (Poiraudeau *et al.*, 2006) and can significantly influence short-term improvement in patients with musculoskeletal pain (Ramond *et al.*, 2011). Bolton and Hurst (2007) found that a significantly lower number of chronic pain patients expected to make a good recovery which is in contrast to this study where all but one participant believed they would recover (p=1.000). Langworthy and Breen (2007) similarly noted that a negative outlook on the patient's management was associated with chronicity. The expectation of recovery by the patient impacts the prognosis as it has been associated with anxiety levels (Holm, Carroll, Cassidy, Skillgate & Ahlbom, 2008). Having only one participant believing that their condition was not going to resolve quickly, and then having 20 people returning for their 4^{th}/5^{th} treatment, may have influenced the significant finding of a higher anxiety level seen in the chronic participants at the 4^{th}/5^{th} visit. Although there was no significant difference found between the groups, this result is noteworthy due to it telling us that 99% of participants were expecting to get better.

5.4.3.2 Employment

Just under half of the participants in this study were unemployed. This study took place at a university teaching clinic that caters to students on the campus and offers treatment at a lower rate than private practice, which may attract patients unable to afford private health care for example retired or unemployed patients. Employment status can influence access to private health care and improved nutrition which may influence overall health in many diseases and conditions (Stanski & Palmer, 2015). Docrat (1999) found health care service availability was significantly associated with LBP, where those with lower income had a higher prevalence of LBP and did not have access to private health care due to financial constraints. It is possible that due to limited resources money was rather spent on co-morbidities such as diabetes mellitus or hypertension than LBP care. Private health care access is thought to mean that patients would usually have a higher income and fit into a higher socioeconomic bracket leading to the affordability of better health care services and better nutrition which would lead to better healing in general. Both Bolton and Hurst (2011) and Dunn *et al.* (2011) found that being in paid employment was positively associated with improvement in acute patients. In the current study employment status was not associated with improvement.

5.4.3.3 Time taken off work

Although no significant difference was found between the acute and chronic groups, in the total sample and the follow up group, for time taken off work due to LBP, many studies have reported this as an associated factor for delayed recovery in LBP (Costa *et al.*, 2009; Gurcay *et al.*, 2009; Dunn *et al.*, 2011). The longer a person is off work due to severe LBP pain the less likely they are to return to work. It has been reported that LBP patients that are absent from work for longer than two years, rarely returned to the working environment (Parish, 2002), resulting in economic costs for the country and the individual.

5.4.3.4 Smoking

Ogunbode *et al.* (2013) found smoking to be a risk factor associated with LBP in the Nigerian population of hospital attendees. Smoking has been implicated in the degeneration of lumbar intervertebral disk health and a contributing factor for degeneration due to decreased healing ability and chronic inflammatory state (Elmasry *et al.*, 2015). Interestingly Bolton and Hurst (2011) found smoking to be positively associated with early improvement in acute patients with musculoskeletal pain. In the current study no association was found between smoking and improvement in LBP.

5.4.3.5 Physical activity

The reported levels of physical activity from both the acute and chronic groups were found to be higher in this study than other studies (Costa *et al.,* 2009; Bolton & Hurst, 2011). This may be due to social desirability bias whereby participants over stating their perceived levels of physical activity due to them wanting to rate themselves as more active than they actually are when asked by a medical practitioner (Chung & Monroe, 2003). The high level of activity and a relatively low rating of disability in ADL indicated that although the participants in this study suffered LBP the LBP was not that severe to affect their ADL. Heneweer, Staes, Aufdemkampe, van Rijn and Vanhees (2011) found that increased time spent doing everyday physical activities were found to be moderately to strongly associated with decreased risks for LBP and may add to the explanation as to why some of the participants did not need to return for a 4^{th}/5^{th} or 10^{th} treatment.

5.4.3.6 General health and well-being

The majority of patients in this study irrespective of suffering acute or chronic pain reported excellent/good general health (85% and 77% respectively). These percentages were lower than those reported by Costa *et al.* (2009) and Bolton and Hurst (2011). Negative self-reporting of general health may influence treatment outcome of the patient as both emotionally and psychologically the patient already displays catastrophizing thinking which may lead to fear-avoidance behaviour (Campbell & Edwards, 2009).

5.5 Discussion of Objective one and Two

Objective one: To describe and compare the selected prognostic factors, as identified using the Bournemouth Questionnaire (BQ), at the initial consultation, 4th/5th visit and 10th visit in patients with acute and chronic LBP and objective two: To determine which selected prognostic factors, if any, are significantly associated with improvement, as determined by a self-reported improvement using the Patient's Global Impression of Change (PGIC) scale, in acute and chronic LBP patients at the $4^{th}/5^{th}$ and 10^{th} visits.

5.5.1 Pain and disability

In this study the mean pain rating for both the acute and chronic pain patients at the initial visit was moderate in nature, dropping significantly by the $4^{th}/5^{th}$ visit indicating that for the majority of the respondents their LBP improved. Pain as a prognostic factor for improvement could not be determined in the acute group due to the low numbers, but in the chronic group no significant relationship with improvement was found. This contrasts with Skagren and Öberg (1998), Costa *et al.* (2009), Gurcay *et al.* (2009), Bolton and Hurst (2011) and Dunn *et al.* (2011) who reported that high pain intensity at the initial consultation was associated with the development of chronicity in patients with both LBP and musculoskeletal complaints.

Reported disability in ADL was higher for the acute pain sufferers and reduced significantly by the $4^{th}/5^{th}$ visit. This is in contrast to previous studies where they reported high disability levels as poor prognoses for treatment outcome (Skagren & Öberg, 1998; Costa *et al.,* 2009; Gurcay *et al.,* 2009; Bolton & Hurst, 2011 and Dunn *et al.*, 2011). In the chronic pain group levels of disability at the initial visit were low and increased marginally by the $4^{th}/5^{th}$ visit. Chronic LBP sufferers have been found to spend more time lying down, less time standing than their healthy counterparts (Perruchoud *et al.*, 2014) as well as being less active in the evenings, thus affecting their social activity and leisure time (Spenkelink *et al.*, 2002). When receiving treatment, the attitude and beliefs of the practitioner may influence the patients' perception of their disability (Poiraudeau *et al.*, 2006). A negative attitude by the patient may be reinforced by the practitioner if their own beliefs are that of a negative

outlook on the condition. This initiation of negative feedback can lead to fear-avoidance behaviour in acute patients that mirror those of chronic patients (Campbell & Edwards, 2009).

5.5.2 Psychosocial factors

5.5.2.1 Depression

Cedraschi and Allaz (2005) stated that altered interpretation of pain and the painful experience can lead to emotional responses such as depression. Gurcay *et al.* (2009) found an association between high levels of depression and LBP, but it was not clear if the LBP caused the depression or if the depression caused the LBP. In the current study, there was no significant difference in depression rating between the acute and chronic pain patients at the initial visit. In contrast to Gore *et al*. (2012) who found higher levels of depression in participants with chronic LBP, when compared to control participants, attributed to the consequences of a prolonged painful condition. Interestingly, the chronic pain sufferers in the current study had a significant increase in the depression rating reported at the $4^{th}/5^{th}$ visit indicating that despite receiving treatment for their LBP, for which the majority reported improvement in symptoms, their feelings of depression increased. Depression rating was not found to be associated with improvement in this study but other studies have reported its prognostic value (Cedraschi & Allaz, 2005; Gurcay *et al.,* 2009; Bolton & Hurst, 2011; Gore *et al.,* 2012).

5.5.2.2 Anxiety

Trends in this study suggest that the acute pain group had decreased levels of anxiety reporting when compared to the chronic pain group who had increased levels of anxiety reporting from the initial to the $4^{th}/5^{th}$ visit. A significant difference was found between reported anxiety levels at the $4^{th}/5^{th}$ visit between the groups. This could be due to the chronic participant's anxiety increasing with the length of time spent in treatment as their condition was not improving with the treatment. Gore *et al.* (2012) also found high levels of anxiety reporting in chronic pain patients compared to controls. When anxiety was assessed to see if it was related to improvement no

significant relationship was found in the chronic group. Yet anxiety has been documented as a risk factor for the development of chronicity in studies done in private clinics or first world settings (Mallen *et al.,* 2007; Dunn *et al.,* 2011).

Ogunbode *et al.* (2013), van der Meulen (1997) and Docrat (1999) found anxiety to not be a risk factor for the development of LBP in different African populations leading to the assumption that there may be other factors that influence the psychosocial aspect of LBP in African populations when compared to first world countries. Ogunbode *et al.* (2013) found that factors such as social class of the patient and financial support status were risk factors for LBP. These factors may be of more practical use to researchers in developing world settings, thus it may be necessary to adapt the available questionnaires for determining prognostic factors for LBP into a tool more appropriate for developing country settings.

5.5.2.3 Social activity, FAB and locus of control

At the initial and 4th/5th visit there was no significant difference observed between the acute and chronic pain sufferers and their rating of LBP affecting their social activity, FAB and locus of control. Yet trends suggest that where the acute pain sufferers reported decreased levels of LBP affecting their social activity, FAB and locus of control, the chronic group had increased levels of reporting for all factors except locus of control which decreased. O'Sullivan (2011) and Campbell and Edwards (2009) reported that constant pain may lead a patient to think catastrophically, altering the physiological pain matrix and response to pain. When suffering a condition and the pain is not relived it may lead to adverse outcomes (Koneti & Jones, 2016).

When fear-avoidance behaviour is already developed in a patient who then seeks care and the practitioner also has high fear-avoidance beliefs the prognosis for the patient with LBP has been found to be poor (Poiraudeau *et al.,* 2006). In this study the FAB of the student chiropractors were not assessed. Functional disability and activity avoidance impact treatment success and should be addressed early on to return patients to functional activities (Dunn *et al.,* 2011). It is possible that the student

chiropractors in their ‘learning role’ in the DUT CDC were still mastering their skills in patient management and treatment and may not have adequately addressed the participants FAB.

Interestingly, locus of control for both the acute and chronic pain sufferers decreased showing that the ability of the participant to have control of their pain improved, this decrease was not statistically significant however. This would be in line with the vast majority of patients irrespective of them having acute or chronic pain. However, none of these factors were found to be associated with improvement in the chronic pain sufferers in this study yet in Bolton and Hurst’s (2011) study high baseline scores were associated with improvement.

Chapter Six

Conclusion & Recommendations

6.1 Conclusion

This study aimed to determine selected prognostic factors for short-term improvement in acute and chronic low back pain (LBP) patients attending the Durban University of Technology Chiropractic Day Clinic (DUT CDC). From the 100 participants enrolled only 20 were still attending at the 4th/5th visit with no participants attending by the 10th visit.

Interesting findings in the acute group where at the initial consultation, they were less likely to have seen other practitioners due to their complaint and were more likely to be non-smokers. The chronic group, however, were more likely to have had pain in the low back as well as other areas; suffered with pain going down the leg/s; not had one pain free month in the last six months and had sought other practitioner's advice regarding the complaint. The chronic patient attending a consultation with a chiropractor is more likely to have tried other avenues of health care and so this group, having seen other practitioners, may have a psychological overlay of a negative attitude towards health care professionals because of not being adequately treated previously. The pain of a patient suffering from chronic LBP was often not confined only to the low back. They also reported a significant improvement in their ability to perform ADL which has been supported in the literature (Bolton & Hurst, 2011).

Interestingly, acute LBP patients presenting to the DUT CDC reported more severe pain than chronic pain patients but they responded better to treatment by 4th/5th visit. With the mean depression scores of both the acute and chronic patients increased from initial visit to the 4th/5th visit. This increase may be explained by the psychological impact of experiencing pain over a longer period, playing upon the mind of the patient and increasing their worrying about getting better.

In the chronic group, there was also a significant decrease in the reported pain scores from the initial visit to the $4^{th}/5^{th}$ visit as seen with the acute group. However, their reported depression levels increased significantly. Of the seven factors studied, the chronic participants rated five of them higher at the $4^{th}/5^{th}$ visit than at the initial visit. Indicating that chronic pain patients respond to treatment differently than acute pain patients.

The first research hypothesis stated that a statistically significant ($p<0.05$) difference would be found between the prognostic factors when comparing the acute and chronic LBP patients at the initial, $4^{th}/5^{th}$ and 10^{th} visits. The study failed to produce sufficient evidence to reject this hypothesis, or all prognostic factors, except for anxiety where there was a significant difference observed between the acute and chronic pain sufferers at the $4^{th}/5^{th}$ visit. The study also failed to produce sufficient evidence to reject the second research hypothesis, which stated that there would be a statistically significant ($p<0.05$) difference between the prognostic factors and the self-reported improvement in patients with acute and chronic LBP amongst the initial, $4^{th}/5^{th}$ and 10^{th} treatment.

In terms of the predictive ability of the investigated prognostic factors in the acute and chronic pain participants there was an insufficient number of participants to adequately investigate the tested hypothesis. The small sample size that returned for $4^{th}/5^{th}$ treatments may have skewed the data and made true associations not possible. Yet trends suggest that although both the acute and chronic pain participants reported clinical improvement. The chronic pain patients showed increased psychological efforts such as depression and as such may require additional treatment intervention.

Although the outcomes of the study do not allow the research hypotheses to be rejected due to the low follow-up rate, trends showed that chronic low back pain participants' anxiety levels increased as treatment time progressed even though their average pain scores decreased. Indicating the role of psychosocial factors in chronic pain and the need for them to be assessed. The acute low back pain participants had

significant decreases in pain and disability in ADL as treatment progressed, which is supported by other studies (Costa *et al,* 2009; Gurcay *et al,* 2009; Bolton & Hurst, 2011; Dunn *et al*, 2011).

6.2 Limitations

The following limitations were noted during the course of this study:

- The data collection period occurred over a period of time when the CDC was closed for the December holiday. This resulted in a portion of participants being lost due to them seeking alternate care or a resolution of their symptoms occurred. In order to overcome this the data collection period was extended, however, the follow up numbers were still low.

- There was a period during the data collection where a senior member of the reception staff who was assisting with data collection was on medical leave. Due to this the correct follow-up dates for two patients were missed and their data had to be excluded.

- This study required the student chiropractors to recruit the patients to partake in the study. It was possible that some patients were not offered an opportunity to partake, despite the researcher making every attempt to encourage and remind them.

- The questionnaires used in this study were developed in a private clinic setting in a developed country. Some of the items may not have related to the study population used in this study and as such a more relevant measurement tool should be created in order to address this.

- Due to this being an observational study and not an intervention study set intervals between treatments were not given for the student chiropractors to follow, and as a result may have interfered with the self-reported information obtained from the participants.

6.3 Recommendations

6.3.1 Recommendations to improve the study

1. A large sample size would be needed to further understand the role of the prognostic factors in LBP in this setting.
2. The initial recruitment of the participants into the study and the data collection should be done by the researcher to ensure that each patient attending the facility had the opportunity to participate and to answer any question the participant may have had.
3. Instead of using a measurement tool designed for a first world setting, an appropriate measurement tool, specific to the population attending the DUT CDC should be used.
4. A control group can be added into future studies of this type to add to the reliability and validity of the study.

6.3.2 Future research

1. Current research detailing the number of patients being seen at different times of the year for each condition and determining how many visits the patients come for.
2. A study determining the reasons for non-return of patients for follow up visits could be helpful in informing patient management at the DUT CDC.
3. Determining a classification for LBP to account for the cyclical nature of LBP.
4. Simultaneously assessing the student chiropractors FAB and determining if they affect patient outcomes.

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Appendix A

Muscles of the lower back (Moore *et al.,* 2010)

Name	Proximal Attachment	Distal Attachment	Function
External Oblique	External surfaces of 5th-12th ribs	Linea alba, pubic tubercle and anterior half of iliac crest	Compress and supports abdominal viscera
Internal Oblique	Thoracolumbar fascia, anterior two thirds of iliac crest and connective tissue deep to inguinal ligament	Inferior border of 10th-12th ribs, linea alba	Compress and supports abdominal viscera
Transverse Abdominus	Internal surface of 7th-12th costal cartilages, thoracolumbar fascia, iliac crest	Linea alba with aponeurosis of internal oblique, pubic crest	Compress and supports abdominal viscera
Quadratus Lumborum	Medial half of inferior border of 12th ribs and tips of lumbar transverse processes	Iliolumbar ligament and iliac crest	Extends and laterally flexes the vertebral column
Paraspinal muscles: Iliocostalis, Longissimus, Spinalis	Tendon on posterior aspect of iliac crest, sacrum, sacroiliac ligaments, sacral and inferior lumbar spinous processes and supraspinous ligament	Angles of lower ribs and cervical transverse processes	Bilaterally: extend vertebral column and head, control movement via eccentric contraction Unilaterally: laterally flex vertebral column
Deep Muscles: Multifidus Rotatores Intertransversarii	*Multifidus:* Posterior sacrum, PSIS, sacroiliac ligaments, lumbar vertebrae, T1-T3, C4-C7. *Rotatores:* TVP's of vertebrae *Intertransversarii:* TVP's of vertebrae	*M*: 2-4 segments superior to proximal attachment on the SP *R*: Junction of lamina and TVP of vertebra above or two segments above *I:* TVP of adjacent vertebra	*M:* Stabilize vertebrae during local movements of vertebral column *R:* Assist with local extension and rotatory movements *I:* Lateral flexion of vertebral column and stability
Gluteal muscles: Gluteus maximus Gluteus medius Gluteus minimus	*Max:* Ilium posterior to posterior gluteal line, sacrum and coccyx, sacrotuberous ligament. *Med:* External surface of ilium *Min:* External surface of ilium	*Max:* Iliotibial tract, some fibres insert on gluteal tuberosity *Med:* Lateral surface of greater trochanter of femur *Min:* Anterior surface of greater trochanter of femur	*Max:* Extends thigh and assists in lateral flexion. *Med and Min:* Abduct and medially rotate thigh, keeps pelvis level during ipsilateral limb is weight-bearing
Piriformis	Anterior surface of the sacrum and sacrotuberous ligament	Superior border of greater trochanter of femur	Laterally rotate extended thigh and abduct flexed thigh
Psoas major and minor	TVP's of lumbar vertebrae, vertebral bodies of T12-L5 and intervening intervertebral discs	Strong tendon to lesser trochanter of the femur	Flexes the thigh (with iliacus), acts superiorly to flex vertebral column laterally

(TVP = transverse process, SP = spinous process, C4-C7 = 4th - 7th cervical vertebra, T1-T3 = 1st to 3rd thoracic vertebra, T12-L5 = 12th thoracic to 5th lumbar vertebra, PSIS = Posterior superior iliac spine, M = multifidus, R = rotatores, I = intertransversarii)

Appendix B

MEMORANDUM

To : Prof Puckree
Chair : RHDC

Prof Adam
Chair : IREC

From : Dr Charmaine Korporaal
Clinic Director : Chiropractic Day Clinic : Chiropractic and Somatology

Date : 21.08.2014

Re : Request for permission to use the Chiropractic Day Clinic for research purposes

---

Permission is hereby granted to :

Mr Keric Allenbrook (Student Number: 20912261)

Research title : The role of selected prognostic factors in short-term improvement of acute and chronic low back pain in patients attending the DUT chiropractic clinic.

Mr Allenbrook, is requested to submit a copy of his RHDC / IREC approved proposal along with proof of his MTech: Chiropractic registration to the Clinic Administrators before he starts with his research in order that any special procedures with regards to his research can be implemented prior to the commencement of him seeing patients.

Thank you for your time.

Kind regards

Dr Charmaine Korporaal

Clinic Director : Chiropractic Day Clinic : Chiropractic and Somatology

Cc: Mrs Pat van den Berg : Chiropractic Day Clinic

Dr L O'Connor : Research co-ordinator and supervisor

Appendix C

DUT
DURBAN
UNIVERSITY OF
TECHNOLOGY

Institutional Research Ethics Committee
Faculty of Health Sciences
Room MS 49, Mansfield School Site
Gate 8, Ritson Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2900
Fax: 031 373 2407
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

24 July 2015

IREC Reference Number: **REC 62/15**

Mr K P Allenbrook
P O Box 1327
Wandsbeck
3631

Dear Mr Allenbrook

The role of selected factors in the short-term prognosis of acute and chronic low back pain in patients attending the Durban University of Technology Chiropractic Day Clinic

I am pleased to inform you that Full Approval has been granted to your proposal REC 62/15.

The Proposal has been allocated the following Ethical Clearance number **IREC 068/15**. Please use this number in all communication with this office.

Approval has been granted for a period of two years, before the expiry of which you are required to apply for safety monitoring and annual recertification. Please use the Safety Monitoring and Annual Recertification Report form which can be found in the Standard Operating Procedures [SOP's] of the IREC. This form must be submitted to the IREC at least 3 months before the ethics approval for the study expires.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC SOP's. In addition, you will be responsible to ensure gatekeeper permission.

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely

[redacted]

Professor J K Adam
Chairperson: IREC

DUT DURBAN UNIVERSITY OF TECHNOLOGY
2015 -07- 24
INSITUTUTIONAL RESEARCH ETHICS COMMITTEE
P O BOX 1334 DURBAN 4000 SOUTH AFRICA

Appendix D

LETTER OF INFORMATION

Dear Participant,

Thank you for taking an interest in participating in my study.

Title: The role of selected factors in the short-term prognosis of acute and chronic low back pain in patients attending the Durban University of Technology Chiropractic Day Clinic.

Researcher: Keric Allenbrook, BSc: Human Bioscience (UCT), B. Tech Chiropractic

Supervisor: Dr L. O'Connor, M. Tech Chiropractic

Co-supervisor: Mrs K. Young, M Ed (Psych)

Introduction: Low back pain is a common complaint that can often become chronic. Identifying the factors that may play a role in low back pain becoming chronic has become a focus in low back pain research. Early detection of these factors may alter the prognosis of low back pain thus this study aims to determine the role, if any, of these factors in patients with low back pain attending the DUT chiropractic day clinic.

Outline of Procedures:

To partake in this research you will be required to have a diagnosis of low back pain for which this must be your first consultation and you must be older than 18 years of age. The research involves allowing the researcher to have access to your file to obtain information about your medical history and presenting complaint. You will also be required to complete two questionnaires, which will give the researcher more information about your low back pain, at your initial visit and then one again at your 4^{th}/5^{th} and 10^{th} visit. It takes approximately 5-10 minutes to complete the questionnaires. Should you cease attending the clinic before the 4^{th}/5^{th} or 10^{th} visit, the researcher will contact you telephonically in order to determine the reason for terminating the treatment.

Risk or Discomforts to the Participant: There is no risk involved in participating in this research.

Benefits: The results of the research will be used to improve the management of low back pain however there is no direct benefit for you to partake in the research.

Reason/s why the Participant May Be Withdrawn from the Study: If during your treatment you develop a condition that could affect the diagnosis of mechanical low back pain you will be withdrawn from the study. Should you wish to withdraw from the study at any time, there will be no negative impact on the treatment you receive at the DUT chiropractic day clinic.

Confidentiality: All information obtained from you will be kept confidential. When the information is recorded it will be coded so that your name is not associated with the data. All research data will be kept for five years securely in the Department of Chiropractic and Somatology until it is shredded.

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (071 135 0456), my supervisor (031 373 2923) or the Institutional Research Ethics administrator on 031 373 2900. Complaints can be reported to the DVC: Prof S. Moyo on 031 373 2576 or moyos@dut.ac.za.

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher**,** Keric Allenbrook, about the nature, conduct, benefits and risks of this study – Research Ethics Clearance Number: ……..
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of this study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____. _____. _____. _____.

Full name of Participant **Date** **Time** **Signature**

I, , herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____. _____. _____. _____.

Full name of Researcher **Date** **Time** **Signature**

Appendix E

BQ PRE-TREATMENT (Baseline)
Patient reference number (for clinic use only):

This questionnaire is about the pain complaint you have presented for treatment at this clinic. We want to evaluate your treatment and therefore need to ask you now and in the future about your painful complaint and how you are doing. Please answer every question in order. The information you give will be treated in complete confidence. For EACH question, please tick ONE box only unless instructed otherwise.

Q1 **PATIENT: START HERE: YOUR SURNAME:**

Q2 TODAY'S date:

Q3 Age (years):

Q4 Are you?
Male ☐ Female ☐

Q5 What place(s) do you feel most pain? (more than one box allowed)
Low back ☐ Headache ☐
Leg ☐ Shoulder/arm ☐
Neck ☐ Other ☐

Q6 If your pain is in your back or neck, does it go down into your leg(s) or your arm(s)?
Yes ☐ No ☐

Q7 Have you had this SAME or a similar complaint anytime in the PAST?
Yes ☐ No ☐

Q8 Have you had a WHOLE MONTH in the past 6 months WITHOUT any pain from a similar complaint?
Yes ☐ No ☐

Q9 How long has this PRESENT EPISODE of your painful complaint lasted?
Less than 1 week ☐ Between 1 and 3 months ☐
Between 1 and 4 weeks ☐ More than 3 months ☐

Q10 How would you describe this PRESENT EPISODE of your pain?
Comes and goes ☐ There constantly ☐

Q11 Has this PRESENT EPISODE of your painful complaint been bad enough to limit your usual activities or change your daily routine for MORE THAN ONE DAY?
Yes ☐ No ☐

Q12 Are you taking medication ON A DAILY BASIS, either bought over-the-counter at a pharmacist or prescribed by your GP, for this PRESENT EPISODE of your painful complaint?
Yes ☐ No ☐

Q13 Have you sought help from ANY OTHER PRACTITIONER, such as your GP or another healthcare professional, for this PRESENT EPISODE of your painful complaint?
Yes ☐ No ☐

Q14 How do you expect your condition to RESPOND TO TREATMENT in the next few weeks?
Recover/ improve ☐ Stay about the same ☐
Get worse ☐

Q15 Are you currently in PAID EMPLOYMENT?
Yes ☐ No ☐

Q16 Have you taken any time OFF WORK for this PRESENT EPISODE of your painful complaint?
Not in paid employment ☐ Yes, 1-2 days ☐
Yes, 3-7 days ☐
In paid employment but not taken any time off work ☐ Yes,1-3 weeks ☐
Yes, more than 3 weeks ☐

Q17 Do you smoke?
Yes ☐ No ☐

Q18 Compared with people of a similar age and in a similar position, how would you rate your OVERALL PHYSICAL ACTIVITY?
More/about the same ☐ Less ☐

Q19 Apart from this complaint, how would you rate your GENERAL HEALTH and WELL-BEING?
Excellent/Good ☐ Fair/Poor ☐

CONTINUED OVERLEAF

Put a TICK in ONE box for EACH of the following statements that best describes your painful complaint and how it is affecting you NOW. Please read each question carefully before answering.

Q20 Over the past few days, on average, how would you rate your pain on a scale where '0' is 'no pain' and '10' is 'worst pain possible'?

	0	1	2	3	4	5	6	7	8	9	10
No pain	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q21 Over the past few days, on average, how has your complaint interfered with your daily activities (housework, washing, dressing, lifting, walking, reading, driving, climbing stairs, getting in/out of bed/chair, sleeping) on a scale where '0' is 'no interference' and '10' is 'completely unable to carry on with normal daily activities'?

	0	1	2	3	4	5	6	7	8	9	10
No interference	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q22 Over the past few days, on average, how much has your painful complaint interfered with your normal social routine including recreational, social and family activities, on a scale where '0' is 'no interference' and '10' is 'completely unable to participate in any social and recreational activity'?

	0	1	2	3	4	5	6	7	8	9	10
No interference	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q23 Over the past few days, on average, how anxious (uptight, tense, irritable, difficulty in relaxing/concentrating) have you been feeling, on a scale where '0' is 'not at all anxious' and '10' is 'extremely anxious'?

	0	1	2	3	4	5	6	7	8	9	10
Not at all anxious	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q24 Over the past few days, how depressed (down-in-the-dumps, sad, in low spirits, pessimistic, lethargic) have you been feeling, on a scale where '0' is 'not at all depressed' and '10' is 'extremely depressed'?

	0	1	2	3	4	5	6	7	8	9	10
Not at all depressed	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q25 Over the past few days, how do you think your work (both inside the home and/or employed work) have affected your painful complaint, on a scale where '0' is 'make it no worse' and '10 is 'make it very much worse'?

	0	1	2	3	4	5	6	7	8	9	10
Make it no worse	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q26 Over the past few days, on average, how much have you been able to control (help/reduce) and cope with your pain on your own, on a scale where '0' is 'I can control it completely' and '10' is 'I have no control whatsoever'?

	0	1	2	3	4	5	6	7	8	9	10
I have complete control over my pain	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q27 Finally, over the past few days, how BOTHERSOME has your painful complaint been?
Not at all ☐ Very much ☐
Slightly ☐ Extremely ☐
Moderately ☐

THANK YOU VERY MUCH FOR YOUR TIME IN COMPLETING THIS QUESTIONNAIRE

Appendix F

Patients' Global Impression of Change (PGIC) scale.

Name: _____ **Date:** _____ **DOB:** _____

Chief Complaint: _____

Since beginning treatment at this clinic, how would you describe the change (if any) in ACTIVITY LIMITATIONS, SYMPTOMS, EMOTIONS and OVERALL QUALITY OF LIFE, related to your painful condition? (tick ONE box).

No change (or condition has got worse)	☐	1
Almost the same, hardly any change at all	☐	2
A little better, but no noticeable change	☐	3
Somewhat better, but the change has not made any real difference	☐	4
Moderately better, and a slight but noticeable change	☐	5
Better, and a definite improvement that has made a real and worthwhile difference	☐	6
A great deal better, and a considerable improvement that has made all the difference	☐	7

In a similar way, please circle the number below, that matches your degree of change since beginning care at this clinic:

Much Better					No Change					Much Worse
0	1	2	3	4	5	6	7	8	9	10

Patient's signature: _____ **Date:** _____

Reference: Hurst H, Bolton J. Assessing the clinical significance of change scores recorded on subjective outcome measures. J Manipulative Physiol Ther 2004;27:26-35.

Appendix G

File No. _____

Lumbar ☐

Thoracic ☐

Cervical ☐

Other ☐

Appendix H

Bournemouth Questionnaire (BACK Px)

Put a CROSS in ONE box for EACH of the following statements that best describes your painful complaint and how it is affecting you NOW. Please read each question carefully before answering.

Q1 Over the past few days, on average, how would you rate your back pain on a scale where '0' is 'no pain' and '10' is 'worst pain possible'?

	0	1	2	3	4	5	6	7	8	9	10
No pain	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q2 Over the past few days, on average, how has your back pain interfered with your daily activities (housework, washing, dressing, lifting, walking, driving, climbing stairs, getting in/out of bed/chair, sleeping) on a scale where '0' is 'no interference' and '10' is 'completely unable to carry on with normal daily activities'?

	0	1	2	3	4	5	6	7	8	9	10
No interference	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q3 Over the past few days, on average, how much has your back pain interfered with your normal social routine including recreational, social and family activities, on a scale where '0' is 'no interference' and '10' is 'completely unable to participate in any social and recreational activity'?

	0	1	2	3	4	5	6	7	8	9	10
No interference	☐	☐	☐	☐	☐	☐	☐	☐	X	☐	☐

Q4 Over the past few days, on average, how anxious (uptight, tense, irritable, difficulty in relaxing/concentrating) have you been feeling, on a scale where '0' is 'not at all anxious' and '10' is 'extremely anxious'?

	0	1	2	3	4	5	6	7	8	9	10
Not at all anxious	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q5 Over the past few days, how depressed (down-in-the-dumps, sad, in low spirits, pessimistic, lethargic) have you been feeling, on a scale where '0' is 'not at all depressed' and '10' is 'extremely depressed'?

	0	1	2	3	4	5	6	7	8	9	10
Not at all depressed	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q6 Over the past few days, how do you think your work (both inside the home and/or employed work) have affected your back pain, on a scale where '0' is 'make it no worse' and '10 is 'make it very much worse'?

	0	1	2	3	4	5	6	7	8	9	10
Make it no worse	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q7 Over the past few days, on average, how much have you been able to control (help/reduce) and cope with your back pain on your own, on a scale where '0' is 'I can control it completely' and '10' is 'I have no control whatsoever'?

	0	1	2	3	4	5	6	7	8	9	10
I have complete control over my pain	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

THANK YOU VERY MUCH FOR YOUR TIME IN COMPLETING THIS QUESTIONNAIRE

Appendix I

Dear Mrs van den Berg, Ms Mkhwanazi and Ms Chavalala,

RE: A request for assistance with administration of research project titled: The role of selected factors in the short-term prognosis of acute and chronic low back pain in patients attending the Durban University of Technology Chiropractic Day Clinic.

The aim of this study is to identify selected factors that may influence the prognosis of low back pain. In order to do this each patient attending the clinic between 03 August 2015 and 30 October 2015 dates for their first consultation for low back pain will be invited to participate. The researcher will provide you with a box of research files which will consist of the necessary paperwork.

Role of Ms Mkhwanazi and Ms Chavalala:

When a patient with low back pain or a spinal complaint presents to the chiropractic clinic or if a student requests a lumbar spine regional please can you give them one of my research folders. The student will then ask the patient if they are willing to participate, should the patient agree they will complete the necessary paperwork and this will be put in their file and returned to the clinic.

Mrs Van Den Berg:

When the patient file comes in for capturing, if you could please remove the research file from the patients file, write the patients file number on the cover of the research file and store it in the box provided. Whether the patient chose to participate or not the research folder will be returned with the patients file. If the patient chose not to participate or was not a low back pain patient, could you please put the uncompleted files into a different box provided.

At the end of each day the researcher will come to the reception and remove the completed research files and record the number of files that were given out and who volunteered to participate. This will continue until a minimum of 100 participants have been enrolled in the study.

Your assistance in this study would be greatly appreciated.

Please tick appropriate:

I am willing to participate in this study ……..

I do not wish to participate in this study…….

Yours sincerely,

Keric Allenbrook

BSc: Human Bioscience (UCT), B. Tech Chiropractic

Dr L. O'Connor (supervisor)
M. Tech Chiropractic

Mrs K. Young (co-supervisor)
M Ed (Psych)

I…… agree to assist Mr K Allenbrook with the administration of his research.

_____.	_____.	_____.	_____.
Full name of Participant	**Date**	**Time**	**Signature**

I…… agree to assist Mr K Allenbrook with the administration of his research.

_____.	_____.	_____.	_____.
Full name of Participant	**Date**	**Time**	**Signature**

I…… agree to assist Mr K Allenbrook with the administration of his research.

_____.	_____.	_____.	_____.
Full name of Participant	**Date**	**Time**	**Signature**

Appendix J

LETTER OF PARTICIPATION

Dear Student,

Thank you for taking an interest in participating in my study.

Title: The role of selected factors in the short-term prognosis of acute and chronic low back pain in patients attending the Durban University of Technology Chiropractic Day Clinic.

Researcher: Keric Allenbrook, BSc: Human Bioscience (UCT), B. Tech Chiropractic

Tel**:** 071 135 0456 email: keric.allenbrook@gmail.com

Supervisor: Dr L. O'Connor, M. Tech Chiropractic

Tel: 031 373 2923 email: lauraw@dut.ac.za

Co-supervisor: Mrs K. Young, M Ed (Psych)

Tel**:** 031 373 6799 email: kariny@dut.ac.za

Introduction: This study aims to identify selected prognostic factors that may be present and result in a delayed recovery time of patients with low back pain. If it is found that any of these factors are predictive of a patient's condition turning chronic, the information may be used to inform the current teaching curriculum and the treatment approach used in the future.

Outline of Procedures: When a patient presents to you with a spinal complaint you will be given the spinal regional examination in a folder. The cover page of the folder will have a block denoting cervical, thoracic and lumbar, you will need to place a tick in the appropriate box indicating which area of the spine was examined.

Should the patient present with low back pain and after you have performed the case history, physical and regional examination, you will need to determine the patients eligibility to join the study based on the following criteria:

The inclusion criteria for this study are:

1. The participant must have mechanical low back pain as diagnosed by the student chiropractor and clinician. It must be the participant's first consultation for the LBP. If the LBP is recurrent they must not have received treatment within the last 12 weeks (Croft *et al.,* 1998).
2. The participant must sign the informed consent form.
3. Participants must be older than 18 years of age.

Exclusion criteria:

1. Patient currently receiving treatment for low back pain.

Should the patient qualify you will need to explain the study to them, give them the patient letter of information and consent to read and sign, and allow the patient to ask any research related questions.

Once the informed consent has been obtained, please explain to the patient how to complete the first questionnaire, this can be done while you are meeting with the clinician. Once the patient has completed the paperwork please place the questionnaire together with the letter of information and consent back into the folder. Hand the folder back to the clinic admin staff with the patients file at the end of treatment.

You will administer two questionnaires at the first consultation and two at the 4^{th}/5^{th} and 10^{th} consultations if the patient is still attending the clinic for treatment. The first questionnaire that will be given at the initial consultation is a questionnaire about the participant's personal demographics and the second is seven questions about how the pain that they currently have is affecting them. If the participant is still attending at the 4^{th}/5^{th} and 10^{th} visits there will be one more one-question questionnaire about how their condition has changed. In total it will take approximately 5-10mins to fill out the initial questionnaires and about 2-5mins on the second occasion. As the researcher I will be following up with you and the clinic staff to find out when the participant will be returning for their 4^{th}/5^{th} and 10^{th} treatments.

If treatment stops between the first and fourth treatments or sixth and ninth treatments then the researcher will contact you to find out the reason for the cessation of treatment. If this is unavailable the researcher will be contacting the patients telephonically to find out the reason.

Risk or Discomforts to the Participant: By participating in this study you will be required to decide whether or not the participants meet the inclusion and exclusion criteria as well as administer the questionnaires to the participants. After discussing with the clinician that the LBP is mechanical in nature the questionnaires may be filled out by the participants when you are meeting with the clinician after this time.

Benefits: The results of this research may benefit you indirectly as the information obtained may help to improve patient management of low back pain.

Reason/s why the Participant May Be Withdrawn from the Study: If during the treatment the patient develops a condition that could affect the diagnosis of mechanical low back pain they will be withdrawn from the study. Should the patient wish to withdraw from the study at any time, there will be no negative impact on the treatment they will receive at the DUT chiropractic clinic. You as the chiropractic intern may wish to not participate in the study or may choose to withdraw at any time.

Confidentiality: All information obtained from the patient will be kept confidential. When the information is recorded it will be coded so that the patients name is not associated with the data. All research data will be kept for five years securely in the Department of Chiropractic and Somatology until it is shredded. As the chiropractic intern you must maintain patient confidentiality for the information obtained during the research the same as for a regular consultation.

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher**,** Keric Allenbrook, about the nature, conduct, benefits and risks of this study – Research Ethics Clearance Number:
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____. _____. _____. _____.

Full name of Participant **Date** **Time** **Signature**

I, Keric Allenbrook, herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____. _____. _____. _____.

Full name of Researcher **Date** **Time** **Signature**