

UNIVERSITY OF THE WESTERN CAPE
Faculty of Community and Health Sciences

Title: A Combination of a Physiotherapy and Cognitive Behavioural Therapy
in the Treatment of Non-Specific Chronic Lower Back Pain: A Systematic
Review

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Type of Thesis: Masters by Thesis

Degree: MSc Physiotherapy

Department: Department of Physiotherapy

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Keywords:

Physiotherapy, Psychotherapy, Cognitive Behavioural Therapy, Chronic Pain,
Chronic Lower Back Pain, Pain, Disability, Mental Health, Fear Avoidance

ABSTRACT

Evidence indicates that the current physiotherapy management of patients with chronic non-specific LBP only offers moderate benefit. Combined treatment programmes, addressing body as well as the mind, shows promising results in developed countries with adequate resources but low evidence in poorly-resourced countries and contexts. This is another gap in the existing knowledge. The study aimed to evaluate the effectiveness of a combined physiotherapy and cognitive-behavioral therapy treatment, compared to physiotherapy alone, in reducing pain, disability, mental health and fear-avoidance behavior, in adults with non-specific low back pain. The systematic review included articles published, in English only, between 1985-2018 (July) in the following databases available at the University of The Western Cape: EbscoHost, BioMedCentral, Cambridge Journals Online, CINAHL, Cochrane Library, Medline (EbscoHost), Medline (Pubmed), Sabinet Reference, SAGE Journals Online, ScienceDirect, SciFinder Scholar, SCOPUS, Wiley Online Library, Springerlink and PubMed. Two reviewers independently evaluated the methodological quality of full text articles, using a critical appraisal tool. Fourteen (14) articles were included based on methodological rigour. Five (5) articles were included in the narrative synthesis and nine (9) articles were included in the meta-analyses. Statistically significant improvements in pain, disability and mental health, in favour of combination therapy for patients with chronic lower back pain were found. A small but statistically significant cumulative effect size for mental health ($g = -0.26$, $Z = -4.49$, $p < .01$), physical disability ($g = -0.27$, $Z = -5.09$, $p < .01$) and pain ($g = -.27$, $Z = -5.05$, $p < .01$), in favour of a combination of cognitive behavioural therapy and physiotherapy in patients with chronic lower back pain was found. In addition, a medium but statistically significant cumulative effect size ($g = -0.50$, $Z = -6.95$, $p < .01$), in terms of fear avoidance, was found in favour of the combination therapy. In conclusion, physiotherapy in combination with cognitive-behavioral therapy was more effective than physiotherapy alone, in reducing pain, disability, mental health and fear-avoidance behaviour, in adults with non-specific low back pain. Ethics: Permission for the study was obtained from the university's Biomedical Research Ethics Committee.

DECLARATION

I declare that “A Combination of a Physiotherapy and Cognitive Behavioural Therapy in the Treatment of Chronic Lower Back Pain: A Systematic Review ”, is my own work, that has not been submitted before any degree or examination in any other university, and that all sources I have used or quoted have been indicated and acknowledged as complete references.

Tammy-Lee Pretorius

May 2019



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J.S. Phillips

ACKNOWLEDGEMENTS

I would firstly like to thank my thesis advisor, Prof Julie Phillips of the Physiotherapy Department at the University of the Western Cape. The journey of my thesis did not start off as comfortably as I had hoped, with moving abroad, I expected the communication between us would become challenging but you were only a phone call away. You never hesitated to answer my calls and provide guidance, whether it was personal or thesis related. Thank you to the University of the Western Cape for allowing my thesis completion to become a reality.

I would also like to thank my father in guiding and assisting me with aspects of my thesis that I struggled to overcome independently. Friday nights and weekends were given up by you in order to explain and/or demonstrate these aspects.

I would like to thank my mother for supporting me when times became troublesome and stressful. Thank you for your encouragement and for the space in which you allowed me to focus all my energy and time to my thesis, when needed.

I would like to thank my partner, for always pushing me to do my best, for your listening ear when I needed to vent and for your continuous encouragement.

Without all of you, this thesis would not have been possible. Your undying support and encouragement is sincerely appreciated.

Lastly, without God, these amazing people would not be in my life, therefore, my highest appreciation and thanks goes out to Him.

Tammy-Lee Pretorius

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CHAPTER ONE

INTRODUCTION TO THE RESEARCH

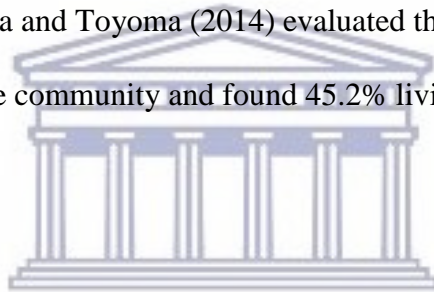
This chapter provides a background and rationale for the study. The phenomenon of chronic lower back pain and the management thereof is highlighted in this chapter. The overall systematic review aims and objectives are also outlined. This chapter concludes with the significance of the study and an outline of the thesis is provided.

1.1 Background

Pain is a common sensation that everyone experiences at some stage of their life. Pain warns us against tissue damage or indicates when a pathological condition sets in or has progressed. Chronic pain, however, is one that is present for more than three months, despite the fact that the tissues have healed (Kieszkowska-Grudny, 2016) It has a complex pathomechanism and becomes a disease on its own as it no longer provides a cautionary or protective function (Kieszkowska-Grudny, 2016). Chronic pain constitutes 73% to 77% of low back pain sufferers (Goldby, Moore, Doust & Trew, 2006). Morone, Greco, and Weiner (2008) reported that chronic pain is a common condition among older adults, affecting one-quarter to one-third which can have devastating consequences. Lower back pain is defined as pain, and discomfort, situated between the costal margin and above the inferior gluteal folds, with or without referred leg pain (Morone et al., 2008). Lower back pain is categorized as acute (<6 weeks), subacute (6-12weeks) or chronic pain (>12 weeks) (Morone et al., 2008).

In a systematic review conducted to establish the prevalence of low back pain in Africa, it was found that the average lifetime prevalence of lower back pain (LBP) among

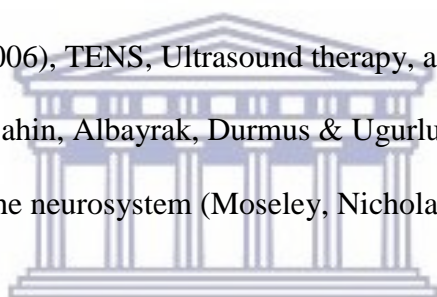
adolescents was 36% and among adults was 62% (Louw, Morris & Grimmer-Somers, 2007). In a study done among steel plant workers in South Africa, a point prevalence of 35.8% for lower back pain and 15.3% for functional disability was found (point prevalence is the prevalence measured at a specific time during the study period) (Van Vuuren, Zinzen, Van Heerden, Becker & Meeusen, 2007). Of the 15.3% that reported functional disability, at least 30% was due to LBP (Van Vuuren et al., 2007). Internationally, the lifetime prevalence of lower back pain in Sweden and US is reported to be at 70-85%, with an annual prevalence of 15% to 45% and a point prevalence at an average of 30% (Fritzell, Hagg, Jonsson, Nordwall & the Swedish Lumbar Spine Study Group, 2004). Nakamura, Nishiwaki, Ushida and Toyoma (2014) evaluated the presence of chronic lower back pain in a Japanese community and found 45.2% living with chronic lower back pain.



The experience of pain is determined by an interaction between physical, cognitive, affective, behavioural, genetic, and environmental factors, which encompasses the biopsychosocial model of lower back pain (Cassidy, Atherton, Robertson, Walsh, & Gillett, 2012; Turk & Monarch, 2002). Leeuw et al. (2007), reported that catastrophizing of one's condition leads to fear-avoidance behaviour in CLBP patients. A reduction in catastrophizing, i.e. viewing activities as less threatening, would therefore lead to improved activity participation (Leeuw et al., 2007). In addition, LBP is also generally associated with sleep disturbances, depression and anxiety (Vowles & McCracken, 2008). A study performed by Freynhagen, Baron, Gockel and Tölle (2006), which aimed at identifying the neuropathic components in patients with lower back pain, found that the neuropathic pain

group exhibited severe depression. In addition, 10.5% (n=707) of the patients suffered from panic/anxiety disorders.

Evidence indicates that the current physiotherapy management of patients with chronic non-specific LBP only offers moderate benefit (Foster, 2011). Physiological as well as psychological factors interact in chronic pain. Treatment programmes addressing the mind are termed behavioural treatments, which involve changing behaviour, cognition and or physiological reactivity (Ostelo et al., 2005). Treatment programmes addressing the body consist of standard physiotherapy management, such as a lumbar stabilisation programme (Goldby et al., 2006), TENS, Ultrasound therapy, a hot pack application and home exercise programme (Sahin, Albayrak, Durmus & Ugurlu, 2011) as well as patient education regarding the neurosystem (Moseley, Nicholas & Hodges, 2004).



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1.2 Problem statement

Chronic lower back pain has a high prevalence in the general population and the current physiotherapy management thereof offers moderate benefits. According to Rubinstein, Middelkoop, Assendelft, De Boer and Van Tulder (2011), LBP is a major health issue because of its high prevalence in the general population. Chronic lower back pain (CLBP) is found in 85% of the population, with up to 80% of patients describing at least one recurrence. Physiological as well as psychological factors interact in chronic pain (Banth & Ardebil, 2015). Chronic pain is often accompanied by a range of somatic symptoms, such as sleep disorders, reduced level of activity, loss of appetite, decreased sexual drive as well as personality changes and mental disorders, such as depression and anxiety

(Kieszkowska-Grudny, 2016).

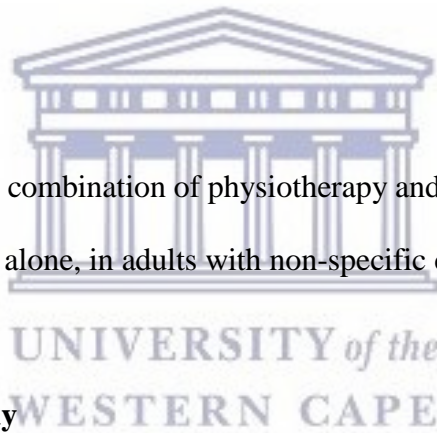
1.3 Rationale

Conflicting evidence exists as to whether a combination of physiotherapy and cognitive behavioural therapy is more effective, for any measured outcome, in chronic lower back pain patients. Hajihasani, Rouhani, Salavati, Hedayati and Kahlaee (2018) in a systematic review, reported on the influence of cognitive behavioural therapy on pain, quality of life, and depression in patients receiving physical therapy for chronic low back pain. These authors found that cognitive behavioural therapy included in physiotherapy treatment of chronic low back pain were advantageous for some in reducing pain and disability as well as improving quality of life, however, for others not. Monticone et al. (2013) and Vong, Cheing, Chan, So and Chan (2011) found a positive effect for the combination of CBT and physiotherapy treatment, on quality of life in adult patients with chronic low back pain, whereas Smeets et al. (2006), Schweikert et al. (2006) and Turner, Clancy, McQuade and Cardenas (1990) found no significant difference between a combination therapy versus physiotherapy treatment alone, on quality of life. Khan, Akhter, Rani, and Shahzad (2014), Monticone (2013), Vong (2011) and Smeets (2006) found a positive effect of the combination therapy versus physiotherapy, on disability, in adult patients with chronic low back pain, whereas Altmaier, Lehmann, Russell, Weinstein and Kao (1992) and Nicholas, Wilson and Goyen (1992) found no significant differences between the two treatments, on disability. Schweikert et al. (2006), Turner et al. (1990), Nicholas, Wilson and Goyen (1991) and Nicholas et al. (1992) found no significant difference between a combination of CBT and physiotherapy versus physiotherapy alone, on depression, in adult patients with CLBP. Smeets et al. (2006), Vong et al. (2011), Turner

et al. (1990), Nicholas et al. (1991) and Nicholas et al. (1992) found that CBT and physiotherapy was more effective than physiotherapy alone, on functional capacity, in adult patients with CLBP, whereas Altmaier et al. (1992), Smeets et al. (2006), Schweikert et al. (2006) and Turner et al. (1990) found no difference between the combination therapy of CBT and physiotherapy versus physiotherapy alone, on functional capacity. . Thus this research intends to bridge the gap of evidence and provide statistical significance, by means of a meta-analysis, to articles assessing the combination of physical therapy and cognitive-behavioural therapy in the treatment of chronic lower back pain, on pain, disability, mental health and fear-avoidance behavior

1.4 Research question

What is the effectiveness of a combination of physiotherapy and cognitive behavioral therapy versus physiotherapy alone, in adults with non-specific chronic low back pain?



1.5 Overall aim of the study

The aim of the study was to synthesize the evidence on the effectiveness of a combination of physiotherapy and cognitive behavioural therapy versus physiotherapy alone, in adults with non-specific chronic low back pain..

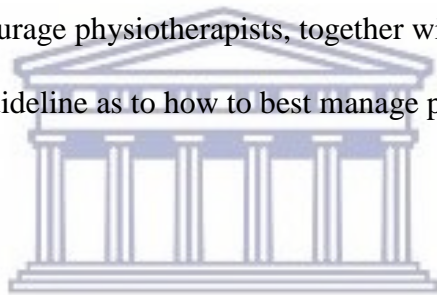
1.6 Objectives

- (a) To determine the effectiveness of a combination of physiotherapy and cognitive behavioural therapy versus physiotherapy alone, in reducing pain, disability, mental health and fear-avoidance behaviour, among patients with non-specific chronic low back pain.

- (b) To systematically appraise the methodological rigour of studies which explore interventions using a combination of physiotherapy and cognitive behavioural therapy in the treatment of chronic pain low back pain.

1.7 Significance of the study

The study clarifies whether a combination of physiotherapy and cognitive behavioural therapy is effective in reducing pain, disability and improving mental health, in patients with CLBP. The review also identifies specific interventions used as part of the physiotherapy management as well as psychological management in the treatment of CLBP. The study could encourage physiotherapists, together with psychologists, to further define a set programme or guideline as to how to best manage patients with CLBP.



1.8 List of abbreviations

ACT	Acceptance and commitment therapy
ADL	Activities of daily living
CLBP	Chronic lower back pain
CBT	Cognitive Behavioral Therapy
CI	Confidence Intervals
DEPS	The Depression Scale
FABQ	Fear avoidance belief questionnaire
IP	Individual Physiotherapy
LBP	Lower back pain
MBCT	Mindfulness-based Cognitive Therapy
MBSR	Mindfulness-based stress reduction
NRS	Numeric Rating Scale
ODI	Oswestry Disability Index

PDI	Pain Disability Index
PHODA	Photograph series of daily activities
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PT	Physiotherapy
PTSD	Post-Traumatic Stress Disorder
QALY	Quality adjusted life years
RCT	Randomized controlled trial
RMDQ	Roland-Morris Disability Questionnaire
SD	Standard Deviation
SMT	Spinal Manipulative Therapy
TENS	Transcutaneous Electrical Nerve Stimulation
TSK	Tampa Scale of Kinesiophobia
VAS	Visual Analogue Scale

1.9 Definitions of terms

Acupuncture: Complementary therapy used in pain management. Originates from Traditional Chinese medicine. Fine needles are inserted in body locations, called acupoints. Theory behind acupuncture is that optimal health is achieved by maintaining the body in a ‘balanced state’.

Aquatic therapy: Previously known as hydrotherapy. Exercises performed in water. Used as a complementary therapy in pain management.

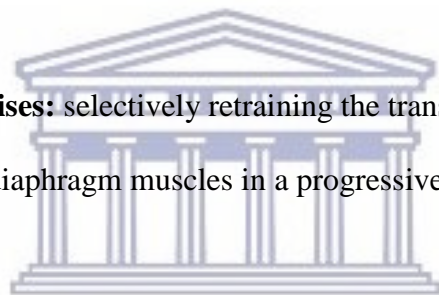
Body awareness therapy: Hands-on and verbal therapy used to facilitate sensory and emotional awareness.

Calisthenic exercises: Whole body exercises without any weights or machines.

Chronic pain: Pain that is present for more than three months, despite the fact that the tissues have healed.

Cognitive behavioural therapy: Psychological therapy, which incorporates cognitive and behavioural techniques to alter behaviour.

Lumbar stabilization exercises: selectively retraining the transversus abdominis, multifidus, pelvic floor and diaphragm muscles in a progressive manner, which focuses on function.



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Mindfulness: Intentional and non-judgmental present moment awareness.

Mindfulness-based stress reduction: Exercises such as formal meditation practice, yoga and exercising mindfulness in everyday life.

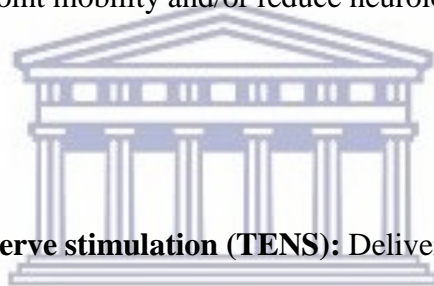
Mindfulness based cognitive therapy: Adaptation of mindfulness-based stress reduction, used to treat depression.

Passive treatment/ Physiotherapy passive treatment: Combinations of massage, spine traction, manual mobilization of the spine, and TENS/therapeutic ultrasound.

Point prevalence: prevalence measured at a specific time during the study period.

Spinal mobilization: Described by Maitland, Banks, English and Hengeveld (2005) as the application of an oscillatory manual force to the spinous process or transverse process of a spinal segment. Usually used to relieve pain and/or stiffness of the spinal segment/joint.

Spinal traction: Mechanical or manual traction applied to the lower limbs, in an attempt to relieve spinal pain, improve joint mobility and/or reduce neurological deficits or painful neurological tension.



Transcutaneous electrical nerve stimulation (TENS): Delivery of mild electrical currents via a machine, across the skin in order to reduce pain.

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Ultrasound: Therapy which uses ultrasonic beams which interact with tissue in order to cause biological changes, via thermal or non-thermal effects in the tissue.

1.10 Outline of the thesis

Chapter One provides a background and rationale for the study. The high prevalence of chronic lower back pain and the phenomenon of chronic pain is outlined. The chapter also includes the overall aim and objectives of the study.

Chapter Two provides an overview of the literature reviewed related to the treatment of chronic lower back pain. Literature discussing chronic pain, its definitions as well as associated comorbidities are reviewed. Literature regarding the use of cognitive behavioural therapy, standard physiotherapy as well as the combination therapy of cognitive behavioural therapy and physiotherapy in the treatment of chronic lower back pain, is reviewed. This chapter also outlines the theoretical framework used in the study.

Chapter Three provides a description of the methods used to reach the aim of the study. The study design and the inclusion/exclusion criteria for the systematic review are described. The levels of the systematic review are described and also represented in a flowchart manner. The critical analysis tool used for the inclusion strong to excellent articles, is also described.

Chapter Four outlines the results and discussion of the systematic review and meta-analysis. This chapter discusses the results of each level of the systematic review as well as the critical appraisal, of the reviewed articles, for methodological rigour. The results of the levels of the systematic review are represented in a flowchart manner. Chapter Four also includes a narrative synthesis of the reviewed articles as well as the results of the meta-analysis. The reviewed articles and the critical appraisal thereof are both represented in table formats. The meta-analysis results are demonstrated in accompanying tables.

Chapter Five provides the conclusion of the systematic review and meta-analysis. It consists of the summary of the conclusion, which also includes the author's comments. The limitations of the study are discussed. In this chapter, recommendations are also made for future research.



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CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the current literature regarding chronic pain and the management thereof. The literature reviewed include studies describing chronic pain and its comorbidities as well as studies using cognitive-behavioral therapy, physiotherapy techniques and a combination of cognitive-behavioral therapy and physiotherapy in the management of chronic lower back pain. The chapter also outlines the theoretical framework of the study.

2.2 Chronic lower back pain

The phenomenon of pain has been defined as “the physical adjunct of an imperative, protective reflex”, by Sherrington (Raffaelli & Arnaudo, 2017).

The founding father of pain medicine, John Bonica, defined chronic pain in 1953 as obstinate, no longer serving its purpose and thereafter becomes destructive, mentally and physically (Raffaelli & Arnaudo, 2017). Chronic pain is associated with depression (Fishbain & Cutler, 1997; Bair, Robinson, Katon & Kroenke, 2003) decreased appetite (Bosley, Weiner, Rudy & Granieri, 2004), impaired sleep (Benca & Ancoli-Israel, 2004) and overall decreased quality of life (Cooper & Kohlmann, 2001).

An updated systematic review performed by Morris, Daniels and Louw (2018), found that the lifetime prevalence of chronic lower back pain in Africa was 47%, the annual prevalence was 57% and the point prevalence was 39%. The prevalence of low back pain

in developed countries such as Canada, The United Kingdom, Sweden and Germany were 28.7 %, 36.1%, 39.2% and 13.7%, respectively (Bener, Alnaqbi & Dafeeah, 2014). The same study reported on the prevalence of low back in developing countries such as Africa, China, Qatar and Nigeria and found the prevalence to be 62.0%, 64.0%, 59.0% and 56.5%.

The above statistics indicate that chronic low back pain in a developing continent such as Africa, is relatively high. The statistics also indicate that low back pain prevalence in developing countries are higher than those in developed countries. As shown above, the discrepancy could be due to poor access to health care facilities as well as poor-moderate standard of medical care in developing countries.

2.3 Management of chronic lower back pain

The earliest theory of pain focused only on the pathophysiological or biological aspect of pain. In the 17th Century, Rene Descartes described pain as only occurring in the sensory nervous system (Gatchel & Howard, 2018). Following a few other theories of pain (The Specificity Theory of Pain and The Pattern Theory of Pain), The Gate Control Theory of Pain was proposed by Melzack and Wall in the 1960's (Melzack & Wall, 1965). In this theory, the role of psychosocial factors in the perception of pain was proposed. This has given rise to the most recent model of pain, the biopsychosocial model of pain, which describes pain as an interaction between physical, psychological and social factors and is also uniquely interpreted by each individual (Gatchel & Howard, 2018)

2.4 Chronic pain and cognitive-behavioral therapy

Veehof, Oskama, Schreurs and Bohlmeijer (2011) highlighted the high comorbidity between chronic pain and depression as well as other psychological problems. For this reason, Cognitive Behavioral Therapy (CBT), has become the standard of treatment for chronic pain patients suffering from psychological distress and disability. CBT incorporates cognitive (e.g. cognitive restructuring) and behavioural techniques (e.g. operant or respondent learning) to alter behaviour, placing emphasis on the role of attributions, efficacy expectations, personal control and problem solving. One of the CBT programmes is the mindfulness-based stress reduction, which includes exercises such as formal meditation practice, yoga and exercising mindfulness in everyday life. According to Kabat-Zinn (1990), mindfulness is defined as intentional and non-judgmental present moment awareness. Mindfulness-Based Cognitive Therapy (MBCT) was used to prevent depressive relapse in patients with chronic pain (Veehof et al., 2011). Veehof et al. (2011) performed a systematic review and meta-analysis to assess the efficacy of acceptance-based interventions, such as: Mindfulness-Based Stress Reduction (MBSR) as well as Acceptance and Commitment Therapy (ACT) in the treatment of CLBP patients. The results shows that mindfulness plays an important role in the adaptation to chronic pain (McCracken, Spertus, Janeck, Sinclair & Wetzel, 1999 ; McCracken, MacKichan & Eccleston, 2007; McCracken, Vowles & Eccleston, 2004) and thus the development of more effective therapies is required.

A systematic review by Hoffman, Papas, Chatkoff and Kerns (2007) found that pain intensity, pain-related interference, health-related quality of life, and depression were improved with psychological therapies, in particular Cognitive-Behavioural self-regulatory treatments compared to control groups. Similarly, a high quality Cochrane

Review performed by Ostelo et al. (2005) found Cognitive Behavioural Therapy to have moderately greater improvement in pain intensity compared to a control group, but not for functional status.

As indicated above, across the literature reviewed for the use of cognitive-behavioural therapy in the management of chronic lower back pain, the mean age of participants included in the studies ranged from 18-65 years old and the outcomes assessed included pain intensity, back-specific disability, depression, anxiety and quality of life.

2.5 Physiotherapy in the treatment of chronic lower back pain

A systematic review by Rubinstein, Middelkoop, Assendelft, De Boer and Van Tulder (2011), assessed the efficacy of Spinal Manipulative Therapy (SMT) on CLBP patients and found that high-quality evidence exists stating that there is no clinically relevant difference between SMT and other interventions on pain intensity and disability. Spinal manipulative therapy refers to manipulation and mobilization of the spine, categorized as “hands-on” treatment (Assendelft et al., 2004). Mobilizations involve using passive movement techniques (low- grade velocity, small or large amplitude) within the patient’s range of motion and control. Manipulation involves applying a thrust of high-velocity to a synovial joint over a short amplitude at or near the end of the passive or physiologic range of motion, which often produces an audible “crack” (Sandoz, 1969).

Goldby et al. (2006) assessed the differential efficacy of a lumbar stabilization programme versus manual therapy versus education for CLBP patients. The stabilization programme consisted of selectively retraining the transversus abdominis, multifidus,

pelvic floor and diaphragm muscles in a progressive exercise class which focused on function. The programme lasted for ten weeks. In the manual therapy group, the physiotherapists were not allowed to prescribe any exercises for the transversus abdominis, multifidus, diaphragm or pelvic floor muscles. The use of electrophysical modalities were also not allowed. The education group consisted of explaining an informational booklet, called “Back in action” (Cherkin et al, 1996). The study demonstrated that quality of life improved, while medication intake, dysfunction, disability and pain reduced in the spinal stabilization group compared to the manual therapy group and the education group, in patients with CLBP. In another similar study Sahin, Albayrak, Durmus, and Ugurlu (2011) reported that pain and functional disability in patients with CLBP was reduced with a back school programme given in combination with physical treatment modalities and exercises. Physical treatment modalities decreased symptoms for a short duration. The back programme was performed for two sessions, over two weeks. The physical treatment modalities were used for ten sessions; once a day, over two weeks (Isaac, Katz & Borenstein 2008). It consisted of TENS (100 Hz, 40 usN, in a continuous waveform for 30 minutes/session) (Simpson, Cholewick & Grauer, 2006) ultrasound therapy (1MHZ frequency and 1.5 w/cm² intensity for 5 minutes (Shahbandar & Press 2005) as well as a hot pack application (Jordan, Konstantinou, Morgan & Weinstein, 2005). The exercise programme consisted of lumbar flexion exercises, lumbar extension exercises, lumbar stretching exercises and strengthening exercises for the quadriceps, hamstrings and gluteal muscles.

The efficacy of current physiotherapy treatments was outlined in a review by Cherkin, Sherman, Deyo and Shekelle (2003). The importance of acupuncture for chronic lower

back pain remains questionable, despite the fact that ten randomized control trials have evaluated its use. However, recent studies reported that acupuncture is more effective than no treatment or placebo treatment but falls in the same category as transcutaneous electrical nerve stimulation (TENS) and nonsteroidal anti-inflammatory drugs for chronic lower back pain (CLBP). Acupuncture has also shown to be less effective than massage. Three trials performed by Cherkin et al. (2011); Preyde (2000) and Hernandez-Reif, Field, Krasnego and Theakston (2001), which were specifically designed to evaluate the efficacy of massage therapy for subacute and CLBP, found positive effects, particularly on patient functioning.

In the above reviewed literature, discussing the physiotherapy management of chronic lower back pain, the length of chronic pain across the studies were generally longer than three months (Rubinstein et al., 2011; Goldby et al., 2006 & Sahin et al., 2011). One review included studies which included patients with back pain ranging from one week to more than three months (Cherkin et al., 2003). In all the studies reviewed, the sample only consisted of adults, older than 18 years of age. The common outcomes assessed across all the reviewed studies included pain intensity, functional status and disability.

2.6 Combined physiotherapy and cognitive-behavioral therapy in the treatment of chronic lower back pain

Patients with chronic lower back pain are often referred for multidisciplinary treatment as chronic pain itself is often resistant to treatment (Fishbain et al. 1995). Multidisciplinary biopsychosocial rehabilitation considers chronic pain the result of interdependent physical, psychological and social/occupational factors (Waddell, 1996; Turk & Rudy, 1987).

Henschke et al. (2010) found that low quality evidence exists proving that behavioural therapy in combination with physiotherapy and back education, is no more effective than physiotherapy and back education alone, in the short and intermediate-term, for improvement in functional status. Henschke et al. (2010) also found that moderate-quality evidence exists proving that behavioural treatment versus group exercise show no significant differences in relieving pain or depressive symptoms in the intermediate to long term. Moderate quality evidence was found to prove that behavioural therapy is more effective than usual care, in relieving pain, in the short term (Henschke et al., 2010).

A systematic review performed by Van Middelkoop et al. (2011) evaluated the effectiveness of exercise therapy, back schools, TENS, superficial heat or cold, low level laser therapy (LLLT), individual patient education, massage, behavioural treatment, lumbar supports, traction and multidisciplinary rehabilitation for chronic non-specific lower back pain. Low level evidence existed for the effectiveness of behavioural therapy in comparison to no treatment for the reduction of pain in patients with chronic lower back pain (Van Middelkoop et al., 2011). Moderate level evidence existed for the effectiveness of multidisciplinary treatment compared to no treatment and other active treatments, at reducing pain in the short term, in patients with chronic lower back pain (Van Middelkoop et al., 2011).

Behavioural treatment involved changing behaviour, cognition and or physiological reactivity, which are our response systems to emotional experiences (Ostelo et al., 2005). Multidisciplinary treatment involves biopsychosocial rehabilitation with one physical therapy aspect and one of the other therapies, such as psychological, social or

occupational therapy. According to the results, no significant treatments effects were found on pain and disability with exercise therapy compared to control groups. No difference in effectiveness was found between TENS and active treatments (e.g. exercise therapy, physiotherapy and usual care). Behavioural treatments and multidisciplinary treatment were found to be more effective at reducing pain and disability, as well as reducing sick leave and costs of sick leave compared to control groups. According to Moseley et al. (2004), a significant reduction in disability was found in the group of patients who were educated regarding the neurosystem compared to the control group.

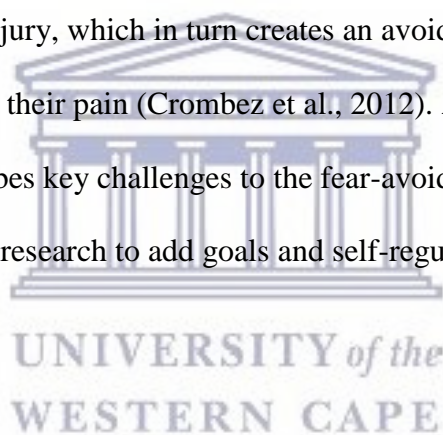
In the systematic reviews included above, all study samples were similar, in that all subjects were adults and had chronic pain for longer than twelve weeks (Henschke et al., 2010; Van Middelkoop et al., 2011; Ostelo et al., 2005). One of the studies that were reviewed, was a randomized controlled trial and included adults with chronic lower back pain for longer than six months (Moseley et al., 2005). The systematic reviews included randomized controlled trials which assessed the same outcomes, such as, pain intensity, return-to-work and back-pain specific disability (Henschke et al., 2010; Van Middelkoop et al., 2011; Ostelo et al., 2005). Only the reviews by Henschke et al. (2010) and Ostelo et al. (2005) included randomized controlled trials which assessed depression and anxiety too. Moseley et al. (2005) assessed back pain-specific disability, pain catastrophizing and pain attitudes, in their systematic review.

2.7 Theoretical framework

Various models of pain exist, however with their own pitfalls. Three models which are closely related to chronic pain and cognitive behavioural therapy are the fear avoidance

model, the structural pathology model and the cognitive behavioural model of pain.

The fear avoidance model is framed within a biopsychosocial perspective and it describes pain as setting off cognitive, behavioural and emotional responses that may or may not increase pain and disability (Crombez, Eccleston, Van Damme, Vlaeyen & Karoly, 2012). After which, the patient interprets the pain as either non-threatening or catastrophic (Crombez et al., 2012). When the pain is interpreted as non-threatening, the patient will normally resume their daily activities after a period of rest or inactivity (Crombez et al., 2012). If the pain is interpreted as catastrophic, the patient would create a fear of movement and re-injury, which in turn creates an avoidance of physical activity which is assumed to increase their pain (Crombez et al., 2012). A narrative review by Crombez et al. (2012) describes key challenges to the fear-avoidance model of chronic pain and recommends future research to add goals and self-regulatory processes to the model.



The structural pathology model describes pain as an output from nociceptive input as well as a measure of tissue damage (Lotze & Moseley, 2015). This model is the opposite of the biopsychosocial model, which views pain as a combination physical, psychological and social factors (Gatchel & Howard, 2018). Thus, chronic pain treatment cannot be based on the structural pathology model.

The early theories of the cognitive behavioural model of pain describes a clear division between the source of pain and the behaviors that are associated with that pain. Recent research however points to limitations in the earlier theories which gave rise to cognitive

behavioural theories taking into consideration the patient's beliefs about their pain and to correct these misbeliefs. (Turk, Dobson & Craig, 1996; Turk & Rudy, 1991; Sharp, 2001; Rudy, Kerns & Turk, 1988).

This research is inspired by the movement continuum theory of physical therapy model, which takes into account physical, psychological, social and environmental factors when dealing with pain.

2.7.1 The movement continuum theory of physical therapy

According to the movement continuum theory, physiotherapy's main aim is to minimise the differential between a patient's preferred and current movement capacity (Cott et al., 1995). This is always done by stopping a decrease in the current movement capacity or by sustaining the current capacity. As a physiotherapist, you need to have a good knowledge of pathology and physiological functioning. However, an understanding about the individual social psychological context and of the broader physical and social context, is also required. The physiotherapist must recognise both internal and external factors involved in the restriction of performance of activities of daily living and appreciate their interactions before selecting and apply effective treatment strategies. Hence, in this model, a biopsychosocial approach is used, where movement levels on the continuum are influenced by physical, psychological, social and environmental factors. A blend of these factors defines the maximum achievable movement potential. The movement continuum theory of physiotherapy theorises movement and approaches problem solving and decision making with their clients (Cott & Finch, 2007).

2.8 Summary of the chapter

Chronic pain is associated with depression and other psychological disturbances and for this reason, cognitive behavioural therapy has become the standard of treatment for patients with chronic pain (Veehof et al., 2011). The literature review has found that spinal stabilization exercises, as part of physiotherapy intervention, reduces dysfunction, disability and pain in patients with chronic lower back pain (Cherkin et al., 1996), while physical therapy treatment modalities only decreased pain and disability in the short term, for patients with CLBP (Sahin et al., 2011). The current literature also reports that massage therapy used for CLBP, produces positive effects on patients' disability (Cherkin et al., 2003).

The literature review has found low level evidence proving that no difference exists between a combination of physiotherapy and behavioural therapy compared to physiotherapy alone, in terms of improvement in disability in patients with CLBP (Henschke et al., 2010), whereas moderate quality level evidence exists for the effectiveness of behavioural and multidisciplinary treatment in comparison to no treatment and/or physiotherapy alone, in reducing pain, disability and sick leave, in patients with CLBP (Middlekoop et al., 2011; Ostelo et al., 2005)

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter discusses the methodology of the study, which includes: The aims, the objectives, the research question, the research design, inclusion criteria, exclusion criteria, levels of review, the method of review, analysis and the ethical considerations of the review.

3.2 Research design

This study utilised a systematic review and meta-analysis in order to report on the effectiveness of a combination of physiotherapy and cognitive behavioural therapy, in the treatment of chronic lower back pain. Moller and Myles (2016) states that a systematic review aims to retrieve, synthesize and appraise existing knowledge on a particular subject. A systematic review evaluates the quality of the study by a process of filtering and thus is considered the highest form of evidence (Rousseau, 2012). A meta-analysis is a statistical tool used to estimate the mean and variance of underlying population effects, from a collection of studies which ultimately address the same research question (Field & Gillet, 2010). The resultant larger sample size, which a meta-analysis produces, provides greater reliability of the estimates of any treatment effect (Moller et al., 2016).

3.3 Method of review

The systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Study selection: The systematic review was conducted at three levels, namely 1) identification of potential titles; 2) screening of abstracts; and 3) evaluation of full texts for

eligibility. Titles and abstracts of all initial hits were screened by the researcher.

Consultation with a second reviewer (thesis supervisor) was pursued. All potential full texts were screened by the two reviewers, and eligibility criteria was applied independently. Any discrepancies regarding eligibility were discussed between reviewers to reach consensus.

The proposed study included articles published between 1985-2018 (July) in the following databases available at the University of The Western Cape: EbscoHost, BioMedCentral, Cambridge Journals Online, CINAHL, Cochrane Library, Medline (EbscoHost), Medline (Pubmed), Sabinet Reference, SAGE Journals Online, ScienceDirect, SciFinder Scholar, SCOPUS, Wiley Online Library, Springerlink and PubMed. Each database has its own indexing terms and functions, and therefore different search strategies were developed for each database by the researcher and the supervisor. The following main search terms were used in different combinations: chronic low back pain, physiotherapy, psychotherapy, mindfulness-based therapy, quality of life, pain intensity, depression, function and disability. Reference lists of all identified documents were hand-searched to identify additional relevant evidence. In the event of missing data, authors were contacted. The search started in September 2018 and ended in October 2018.

3.3.1 Identification: The following mesh terms were used in order to identify suitable and eligible articles: Cognitive Behavioral Therapy and physiotherapy, effectiveness of cognitive behavioral therapy versus physiotherapy in chronic lower back pain. The mesh terms were used across databases available at the University of The Western Cape as well as Google Scholar, such as, EbscoHost, BioMedCentral, Cambridge Journals Online, CINAHL, Cochrane Library, Medline (EbscoHost), Medline (Pubmed), Sabinet Reference, SAGE Journals Online, ScienceDirect, SciFinder

Scholar, SCOPUS, Wiley Online Library, Springerlink, PubMed.

Reference mining: Reference list checks of the included articles were also performed. According to Bronson and Davis (2011), reference mining reduces publication bias which was brought on by the search strategy and inclusion criteria. The search started in January 2019 and ended February 2019.

3.3.2 Screening: The abstracts of the articles identified with the identification process, were screened using the inclusion and exclusion criteria.

3.3.3 Eligibility: The full texts of the articles yielded following the screening process, were evaluated to retrieve data. Full text studies, selected for retrieval of data, were assessed by two independent reviewers (T.P & J.P) for methodological quality prior to inclusion in the review, using the critical appraisal tool developed by Smith, Franciscus and Swartbooi (under review). The tool assesses methodologies in intervention studies and awards scores for elements which are present or not. The critical appraisal tool consists of three versions: 1) intervention studies, 2) general quantitative studies and 3) psychometric studies. For the purpose of this study, version two of the tool was used and consisted of eight subsections of the scale. Any disagreements that arose between the reviewers was resolved through discussion.

3.3.3.1 Threshold score

The critical appraisal tool awards a total score to each article reviewed. The scores are divided into weak (0-40%), moderate (41-60%), strong (61-80%), or excellent (81-100%). Only articles which were scored strong or excellent were included in the review.

3.4 Inclusion criteria

3.4.1 Participants: Patients (male and female), older than 18 years, with non-specific lower back pain present for longer than three months, occurring daily or almost every day. Chronic pain is one that is present for more than three months, despite the fact that the tissues have healed (Kieszkowska-Grudny, 2016).

3.4.2 Time period of the review: The study included articles published between 1989-2018 (July). In 1989, the first meta-analysis was published by Fernandez and Turk in order to evaluate the efficacy of cognitive strategies in alleviating pain.

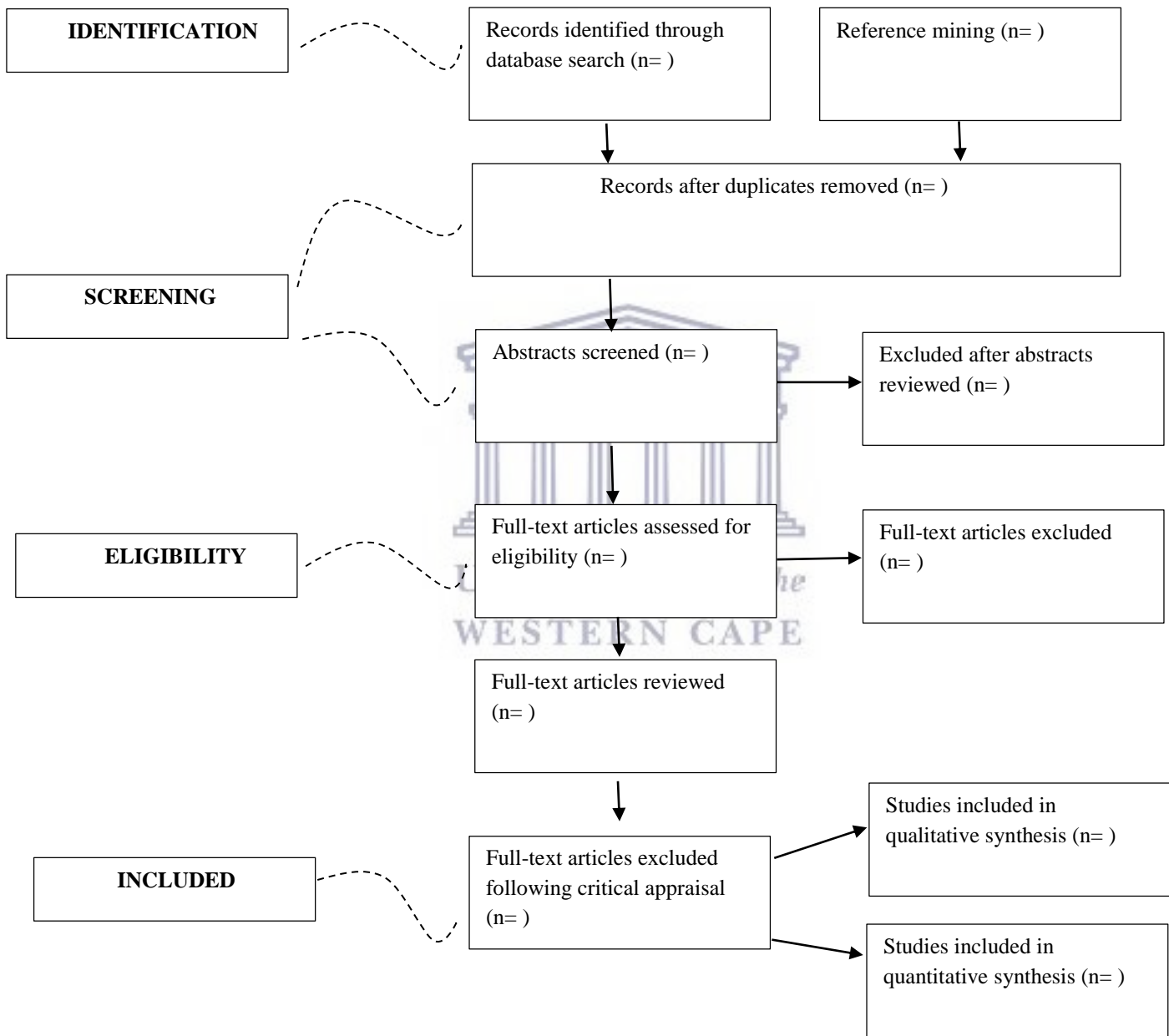
3.4.3 Types of studies: The review included studies that reported on the efficacy of a combination of physiotherapy and cognitive behavioural therapy in the treatment of chronic lower back pain. The studies could use quantitative or qualitative methodologies independently or in combination.

3.5 Exclusion criteria

Studies that are not available in full text, English medium, open access as well as studies which are outside the designated time period, target group and outcomes.

Figure 1 below describes the levels of review in a flow chat manner, according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

Figure 3.1: PRISMA Flowchart

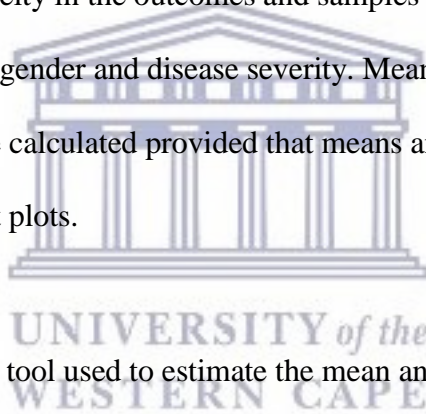


3.6 Data extraction

Data extraction were done using self-constructed data extraction sheets. The sheets includes information of the articles, regarding the authors, publication year, number of participants, age range, study design and outcomes (Uman, 2011).

3.7 Data analysis and synthesis

A narrative description of data was done using text summaries and tables as appropriate. For those outcomes reported in at least two studies, a meta-analysis was conducted using Comprehensive Meta-Analysis Version 3 (Borenstein, Hedges, Higgins & Rothstein, 2013), provided that homogeneity in the outcomes and samples existed regarding units of measurement, test conditions, gender and disease severity. Mean differences and 95% confidence intervals (CI) were calculated provided that means and SD are reported, and are presented graphically as forest plots.



A meta-analysis is a statistical tool used to estimate the mean and variance of underlying population effects, from a collection of studies which ultimately address the same research question (Field & Gillet, 2010). The resultant larger sample size, which a meta-analysis produces, provides greater reliability of the estimates of any treatment effect (Moller et al., 2016). The random effects model will be used so as to generalize the findings beyond the studies included in the meta-analysis (Field & Gillet, 2010).

3.8 Ethics

Permission was obtained from the University of the Western Cape's Biomedical Research Ethics Committee (BMREC). To ensure transparency, all studies included in this review

was published articles, which are available to the public. The primary researcher in this study is a part-time registered student at UWC, thus enabling full access to the university library databases. Additionally, the study will remain sensitive to the ethical shortfalls associated with systematic reviews identified by Vergnes, Marchal-Sixou, Nabet, Maret and Hamel (2010), which are to increase the trustworthiness and reliability of findings and data analysis. Moreover, by conducting a systematic review on the current study, this enables that the research conducted will be answered based on an unbiased assessment (Wager & Wiffen, 2011). Thus, to avoid bias', two people reviewed the current study (the primary researcher and their supervisor).

3.9 Summary of the chapter

In summary, the design of this study is a systematic review and meta-analysis. The systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The systematic review was conducted at three levels, namely 1) identification of potential titles; 2) screening of abstracts; and 3) evaluation of full-texts for eligibility.

Articles were included if they were published between 1989 and July 2018 and assessed the combination of physiotherapy and cognitive-behavioural therapy in the treatment of chronic lower back pain, in patients (females and males). Articles were excluded if they were not available in full text, English medium and open access. The main search terms used in different combinations, to identify potential titles, included chronic lower back pain, physiotherapy, psychotherapy, mindfulness-based therapy, quality of life, pain intensity, depression, function and disability.

Data were extracted using self-constructed data extraction sheets. The data were analyzed and synthesized using a narrative description and tables, as appropriate.

The meta-analysis was conducted using Comprehensive Meta-Analysis Version 3 (Borenstein et al., 2013) across articles that were homogenous in terms of outcome measures assessed as well as sample.

Permission to perform this Systematic Review and Meta-Analysis was obtained from the University of The Western Cape's Biomedical Research Ethics Committee (BMREC).



CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

The aim of the study was to synthesize the evidence on interventions using a combination of physiotherapy and cognitive behavioural therapy aimed at treating chronic lower back pain. This chapter provides the detail of the data extraction process, the synthesis and the study's results.

4.2 Search results

Figure 2 below summarizes the results of the levels of review. As mentioned before, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart was used.

4.2.1 Level 1: Identification

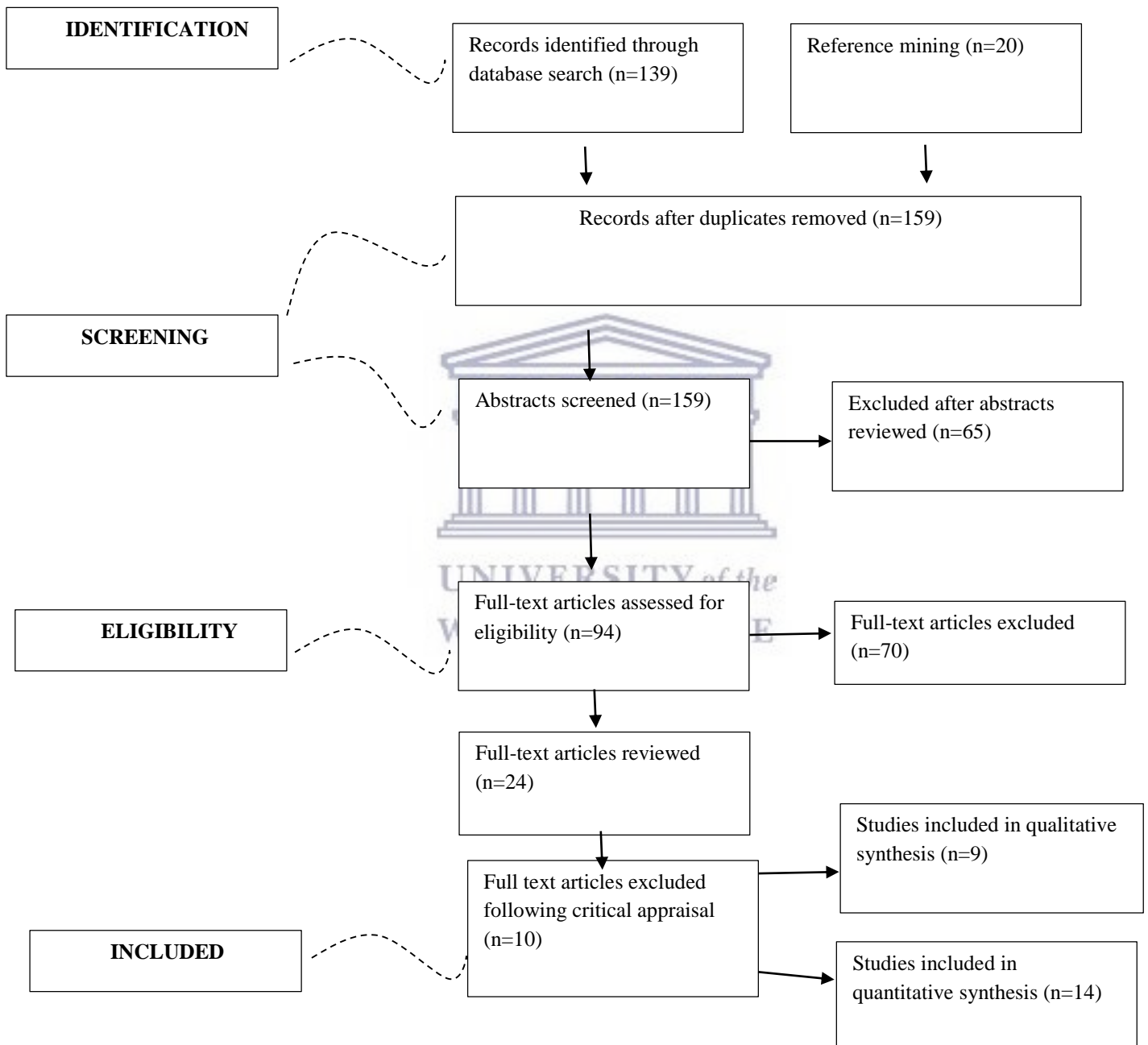
The mesh terms used in a search across all databases mentioned before, yielded a total of 139 hits. Reference mining yielded 30 titles. 10 titles proved to be duplicates, creating a final number of 159 titles.

4.2.2 Level 2: Screening

During the screening process, abstracts were reviewed and 65 articles were excluded. Varying reasons for exclusion existed, such as, the abstract content did not meet the research question (43 abstracts), operant behavioural therapy was used as a intervention, instead of cognitive behavioural therapy (5 abstracts), the study assessed the effects of a multidisciplinary programme, which included treatment provided by an occupational therapist (7 abstracts), the study did not compare the combination of cognitive behavioural

therapy and physiotherapy (10 abstracts). Five additional articles were excluded as they were not freely available and needed to be purchased.

Figure 4.1: PRISMA Flowchart: Results of the levels of review



4.2.3 Level 3: Eligibility

Of the 94 remaining articles, 70 full text articles were reviewed and excluded. Reasons for exclusion consisted of full text content did not meet the research question (17 articles), operant behavioural therapy was used as a intervention, instead of cognitive behavioural therapy (12 articles), commitment therapy was used as a intervention, instead of cognitive behavioural therapy (10 articles), the study assessed the effects of a multidisciplinary program, which included treatment provided by an occupational therapist (20 articles), cognitive behavioural therapy was assessed against physiotherapy, whereas this current review assesses the combination of cognitive behavioural therapy and physiotherapy (10 articles), the source population consisted of patients with subacute low back pain (1). A total of 24 met the inclusion criteria. Table 4.1 below represents the full text articles and the data extracted, prior to the critical appraisal for methodological rigour.



Table 4.1: Summary of reviewed studies

	Year and Authors	Title	Sample size	Study design	Outcome measures	Intervention	Results
1.	Baranoff, J., Hanrahan, S.J., Kapur, D., Connor, J.P (2013)	Acceptance as a process variable in relation to catastrophizing in multidisciplinary pain treatment	Total of 186 for both arms	RCT	<ul style="list-style-type: none"> - NRS scale. -Chronic Pain Acceptance Questionnaire. -The 3 catastrophizing subscale of the Pain Response -Self-Statements Scale. -RMD Questionnaire. -Depression Anxiety and Stress Scale. -Two measures of physical Functioning 	<ul style="list-style-type: none"> -Physiotherapy: mobilizing exercises and activity. -Psychology: Cognitive restructuring, relaxation training, goal setting, and education 	<p>Function: Significant positive large effect size was observed for function.</p> <p>Acceptance, activity engagement, catastrophizing, depression & disability: Significant positive medium effect size was observed for</p> <p>Pain: Significant positive small effects was observed</p>
2.	Price, McBride, Hyerle, and Kivlahan (2007)	Mindful awareness in body-orientated therapy for female veterans with post-traumatic stress-disorder taking prescription analgesics for chronic pain: A feasibility study.	Total of 14 for both arms	RCT	<ul style="list-style-type: none"> - Brief Symptoms Inventory - The PTSD Checklist-Civilian Version - The Dissociative Experiences Scale (DES) - The Medical Symptoms Checklist - The Scale of Body Connection (SBC) - The Body Investment Scale (BIS) 	<ul style="list-style-type: none"> - Massage with body literacy. - Body awareness exercises and self-care skills. 	<p>Patients indicated increased tools for pain relief/relaxation, increased body/mind connection, and increased trust/safety.</p>

					<ul style="list-style-type: none"> - The Therapist Process Evaluation - The Participant Evaluation of Key Intervention Elements (PEKIE) - The Awareness Record in Body-oriented Therapy 		
3.	Basler, H-D., Jakle, C. & Kroner-Herwig, B. (1997)	Incorporation of cognitive-behavioural treatment into the medical care of chronic low back patients: a controlled randomised study in German pain treatment centres	Total of 76 for both arms	RCT	<ul style="list-style-type: none"> -Pain diary - Heidelberg Coping Scale (HCS) - Dusseldorf Disability Scale (DDS) -Days lost at work 	<ul style="list-style-type: none"> - Experimental group: CBT + pain medication, nerve blocks, TENS & physiotherapy. - Control group: Pain medication, nerve blocks, TENS and physiotherapy 	<p>Experimental group: <i>Pain, catastrophizing & avoidance:</i> Decreased significantly. <i>Control of pain:</i> improved by 45%.</p> <p>Control group: <i>Control of pain:</i> little change seen.</p>
4.	Brox et al. (2003)	Randomised clinical trial of Lumbar Instrumented Fusion and Cognitive Intervention and Exercises in Patients with Chronic Low Back Pain and Disc Degeneration	Total of 64 for both arms	RCT	<ul style="list-style-type: none"> - Norwegian version of the ODI - VAS from 0-100. - Pain Index - Documentation of every drug used, and dose. -The General Function Score - Hopkins Symptom Check List-25. 	<ul style="list-style-type: none"> - Combined Therapy: Education, individual endurance and coordination exercises, aerobics or outdoor activities and water gymnastics. - Lumbar fusion group. 	<p>ODI: No significant difference between groups.</p> <p>Combined Therapy: Significant improvement in all outcome measures, besides <i>Lower Limb Pain. FABQ:</i> Significantly more improved compared to Lumbar fusion group.</p> <p>Lumbar Fusion group: Significant</p>

					<ul style="list-style-type: none"> - Fear-Avoidance Belief Questionnaire (FABQ) - Life satisfaction on VAS from 1 to 10 - Global Back Disability -Fingertip Floor distance. -Isokinetic trunk extension muscle performance. -A Radiologist measured back muscle size and density. 		<p>improvements in all outcome measures, besides FABQ and Fingertip-Floor distance. Lower limb pain more reduced compared to the Combined therapy group.</p>
5.	Johnson et al. (2007)	Active Exercise, Education, and Cognitive Behavioural Therapy for Persistent Disabling Low Back Pain	Total of 234 for both arms	RCT	<ul style="list-style-type: none"> - Pain on 100mm VAS - RMDQ - 12-item General Health Questionnaire (GHQ). - EuroQol EQ-5D 	<ul style="list-style-type: none"> - Control group: Self-management education and usual care. -Active intervention group: Self-management education, exercise , CBT & home program. 	<p>-Active intervention group: Pain: substantial reduction in pain but not significant. Disability: small reduction but not significant. General Health: modest improvement.</p>
6.	Kaapa, H.E., Frantsi, K., Sarna, S. & Malmivaara, A. (2006)	Multidisciplinary Group Rehabilitation <i>Versus</i> Individual Physiotherapy for Chronic Nonspecific Low Back Pain	Total of 120 for both arms	RCT	<ul style="list-style-type: none"> - NRS for pain -Sciatic pain intensity rated on a scale of 0–10. - Oswestry disability. -Subjective Working capacity rated on a scale of 0–10. -Sick leave due to back pain (classified on a scale: 0 days, 1–30 days, over 30 	<ul style="list-style-type: none"> - Multidisciplinary rehabilitation (MR): physical training, workplace interventions, back school, relaxation training, and cognitive-behavioral stress management methods. - Individual Physiotherapy (IP): physical exercise and 	<p>-MR Group: General well-being: improvement statistically significant. Healthcare consumption: reduced more compared to IP group.</p> <p>-MR compared to IP: No statistically significant differences in terms of, LBP</p>

					<p>days during past 12 months).</p> <ul style="list-style-type: none"> -Healthcare consumption due to back pain - DEPS - General well-being -Beliefs of working ability rated on a scale of 0–10. 	<p>passive treatment methods.</p>	<p><i>intensity, sciatic pain intensity, back specific disability, subjective working capacity, sick leave, beliefs of working ability and depression.</i></p>
7.	Lamb et al. (2010)	Group cognitive behavioural treatment for low-back pain in primary care: a randomised controlled trial and cost-effectiveness analysis	Total of 701 for both arms	RCT	<p>Primary outcomes:</p> <ul style="list-style-type: none"> - RMD - Modified Van Korff scale. <p>Secondary outcomes:</p> <ul style="list-style-type: none"> - 12-item short form health survey. -Fear avoidance belief questionnaire. (FABQ). -Pain self-efficacy scale -Self rated benefit and satisfaction of treatment. 	<ul style="list-style-type: none"> - Control Group: Active management education. - Intervention group: Active management education and CBT. 	<p>No significant difference between groups</p> <p>-Intervention group: <i>Van Korff:</i> 13.4% change. <i>Satisfaction in treatment:</i> More patients satisfied compared to control group. <i>RMD:</i> Better scores compared to control group. <i>Pain Self-efficacy:</i> substantial improvements. <i>FABQ:</i> substantial improvements. <i>Health survey:</i> substantial improvements.</p>

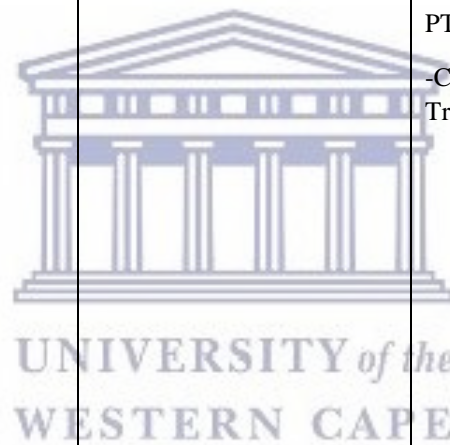
8.	Nicholas, M. K., Wilson, P.H. & Goyen, J. (1992)	Comparison of cognitive-behavioural group treatment and an alternative non-psychological treatment for chronic low back pain	Total of 20 for both arms	RCT	<ul style="list-style-type: none"> -Pain Rating chart -Back depression inventory -Pain beliefs Questionnaire -Coping strategy questionnaire -Sickness impact profile-self -Sickness impact profile-Other -Medication impact -Pain self-efficacy questionnaires 	<ul style="list-style-type: none"> - Control group: exercises, education, hydrotherapy and group pain discussion sessions with psychologist. - Treatment group: exercises, education, hydrotherapy and CBT. 	<p>-Treatment group: Sickness impact profile-other: significantly more improvement. Medication impact: significant reduction in amount of patients using medication. Coping Strategy: significantly more improvement. Self-efficacy beliefs: significantly more improvement.</p>
9.	Fersum, K.V., O'Sullivan, P., Skouen, J.S., Smith, A. & Kvale, A. (2013)	Efficacy of classification-based cognitive functional therapy in patients with non-specific chronic low back pain: A randomised controlled trial	Total of 121 for both arms	RCT	<p>Primary:</p> <ul style="list-style-type: none"> - NRS for pain - Oswestry disability index <p>Secondary:</p> <ul style="list-style-type: none"> - Hopkins symptoms checklist - Fear Avoidance Beliefs Questionnaire (FABQ) - Total lumbar spine range of movements measure by the two inclinometer method. 	<ul style="list-style-type: none"> - Behavioural management group: pain education, movement exercises, physical activity program, functional integration of activities. - Manual therapy and exercise group: Manipulations and joint mobilizations for the spine or pelvis as well as home program 	<p>-Behavioural management group: statistically significant results for <i>all outcome measures</i>, except the degree of <i>lumbar range of motion</i>.</p>

					<ul style="list-style-type: none"> - Patient satisfaction questionnaire - Orebro screening questionnaire - Care-seeking questionnaire. 		
10.	Alaranta et al. (1994)	Intensive physical and psychosocial training programme for patients with chronic low back pain	Total of 293 for both arms	Controlled clinical trial	<ul style="list-style-type: none"> - Flexibility tests - Muscle strength and endurance tests - Subjective physical performance - Leisure time physical activities were assessed. - Pain and disability index. - Other means of treatment used - Sick leave days - Occupational handicap was assessed by a psychiatrist. - Beck depression inventory. - Hopkins Symptom checklist - Multidimensional health locus of control and social adjustment scale 	<ul style="list-style-type: none"> - The intervention group: Cardiovascular training, muscular strength & endurance exercises, self-relaxation, stretching and group CBT. - The control group: Passive treatment, muscle training, indoor and outdoor activities, pool exercises. 	<p>-Intervention group: Physical assessments: more improvement compared to control. Disability: more improvement compared to control. Pain: more improvement compared to control. Occupational handicap: males improved > females. Psychological factors: mild difference compared to the control.</p>

					- Karolinska scales of personality		
11.	Boersma et al. (2004)	Lowering the fear avoidance and enhancing function through exposure in vivo. A multiple baseline study across 6 patients with back pain.	Total of 6 patients	Multiple baseline study	<ul style="list-style-type: none"> - Daily ratings of fear and avoidance beliefs on a scale of 0-10. - NRS of pain. - Weekly measure of fear and avoidance beliefs - TSK - PHODA 	Fear avoidance education, pain education and behavioural experiments.	<p>-Daily ratings: FABQ: 4 patients experienced reductions. 2 patients experienced minimal reductions. Pain: mean reduced for all patients, except one.</p> <p>TSK: Large decrease for all patients. PHODA: significant improvements for all patients.</p>
12.	Ryan, C.G., Gray, H.G., Newton, M. & Granat, M.H. (2010)	Pain biology education and exercise classes compared to pain biology education alone for individuals with chronic low back pain: A pilot randomised controlled trial.	Total of 38 for both arms	RCT	<ul style="list-style-type: none"> - RMD - NRS for pain - Repeated sit-stand test - Fifty foot walk test - 5-minute walk test - Tampa Scale of Kinesiophobia (TSK) - Pain self-efficacy - ActivPal activity monitor 	<ul style="list-style-type: none"> - Education only group (ED): CBT - Education and exercise group (EDEX): CBT + warm-up exercises, aerobic exercises and cool down exercises. 	<p>-Education only group: Pain: improved significantly. Self-efficacy: improved significantly.</p>
13.	Frost, H., Lamb, S.E. & Shackleton, C.H. (2000)	A Functional Restoration Programme for Chronic Low Back Pain	Total of 129 for both arms	Longitudinal prospective study	<ul style="list-style-type: none"> - ODI - General health questionnaire 	- Multidisciplinary treatment (physiotherapist, clinical psychologist & physician): Stretching, muscle strengthening,	<p>Disability: small to moderate effect size. Small minority of patients deteriorated.</p> <p>Psychological distress: small to moderate effect</p>

					<ul style="list-style-type: none"> - Pain self-efficacy questionnaire - Shuttle walking test - Modified zung depression inventory 	<p>spinal stabilisation, endurance and aerobic exercises. Group CBT Education and individual psychological therapy sessions.</p>	<p>size. Small minority of patients deteriorated. Depression: small to moderate effect size.</p>
14.	Haldorsen, E.M.H., Kronholm, K., Skouen, J.S. & Ursin, H. (1998)	Predictors for outcome of a multi-modal cognitive behavioural treatment program for low back pain patients- a 12-month follow-up study	Total of 223 for both arms	RCT	<ul style="list-style-type: none"> - 100mm VAS for pain. - Norwegian version of the Activity discomfort scale. - Ursin's Health inventory. - Graded Reduced Work ability scale. - Multidimensional health locus of control questionnaire. - State-Trait Anxiety Scale. - Hopkins Symptom check list. - Eysenck Personality Inventory. 	<ul style="list-style-type: none"> - Control group: usual care/physiotherapy - Multidisciplinary treatment (neurologist, general practitioner, psychologist, two nurses & four physiotherapists): CBT training, stretches, cardioactive training, relaxation training, group exercise, hydrotherapy, education. 	<ul style="list-style-type: none"> - Multidisciplinary group: 50% had returned to work. Psychological strength: increased. Pain: less. - Control group: 58% had returned to work.
15.	Jensen, I.B., Bergstrom, G., Ljungquist, T., Bodin, L. & Nygren, A.L. (2001)	A randomised control component analysis of a behavioural medicine rehabilitation program for chronic spinal pain: are the	Total of 214 for both arms	RCT	<ul style="list-style-type: none"> - Absence from work - Short form 36 - Perceived relevance of treatment. 	<ul style="list-style-type: none"> - Physiotherapy (PT): muscular endurance exercises, aerobic exercises, aquatic therapy, relaxation techniques, body awareness therapy, education. 	<ul style="list-style-type: none"> - Behavioural medicine group: Absence from work: 299 days for females (mid-range improvement compared to the other groups). No significant difference for males. Vitality (Short form 36):

		effects dependent on gender?				<p>- CBT: Activity planning, goal setting, problem solving, cognitive coping techniques, activity pacing, the role of viscous cycles and how to break them, the role of significant others and assertion training.</p> <p>- Full time behavioural medicine rehabilitation: PT and CBT</p> <p>-Control group: Treatment as usual</p>	<p>significant improvement for males.</p> <p>- PT group: Absence from work: Least amount compared to the other groups, for females. No significant difference for males.</p> <p>- CBT group: Absence from work: Highest amount of days compared to other groups, for females. No significant difference for males. Health related quality of life: significant improvement for females. Mental health: significant improvement for females.</p> <p>- Control group: Absence from work: 316 days, for females (Mid-range improvement compared to the other groups). No significant difference for males.</p>
16.	Miller, J., MacDermid, J.C., Richardson, J.,	Depicting individual responses to physical therapist	Total of 6 patients	Multiple case studies	- Short-Musculoskeletal Function Assessment-Dysfunction Index	- Group self-management exercise, self-management education, CBT education, pain	- Participant 1: Fatigue: Improved. TSK: Improved. Pain: Increased



	Walton, D.M. & Gross, A. (2017)	led chronic pain self-management support with pain science education and exercise in primary health care: multiple case studies			<ul style="list-style-type: none"> - Short-Musculoskeletal Function Assessment-Bother index - NRS for pain - Pain interference item - Pain Catastrophizing Scale - TSK - Injustice experience questionnaire - Neurophysiology of pain Questionnaire - Pain self-efficacy questionnaire - Patient health questionnaire - Post-traumatic stress disorder checklist- civilian version - Global perceived effect - Patient satisfaction - Patient expectations for recovery 	science education and individual support for self-management taught.	<p>- Participant 2: <i>Fatigue:</i> Improved. <i>Depression:</i> Improved. <i>Self-efficacy:</i> Improved. <i>Pain:</i> Worsened. <i>Function:</i> Worsened.</p> <p>- Participant 3: <i>TSK:</i> long term improvement. <i>Function:</i> long term worsening.</p> <p>- Participant 4: <i>TSK:</i> improved. <i>Injustice experience:</i> improved. <i>Function:</i> Worsening</p> <p>- Participant 5: Clinically significant improvements in <i>all outcomes</i></p> <p>- Participant 6: Clinically significant improvements in <i>all outcomes</i>, apart from <i>TSK</i>.</p>
17.	Monticone et al. (2013)	Effect of a long lasting multidisciplinary program on disability and	Total of 99 patients	RCT	<ul style="list-style-type: none"> - Italian version of the Roland-Morris Disability Questionnaire. - TSK 	- Multidisciplinary group: CBT, active and passive mobilisations of the spine, lower limb stretching, lumbar muscle	- Multidisciplinary group: significant improvements for <i>all outcomes</i> , compared to the control group.

		fear-avoidance behaviour in patients with chronic low back pain.			- NRS for pain.	strengthening, spinal motor control. - Control group: active and passive mobilisations of the spine, lower limb stretching, lumbar muscle strengthening, spinal motor control.	
18.	Nagarajan, M. & Nair, M.R. (2010)	Importance of fear-avoidance behavior in chronic non-specific low back pain	Total of 1 patient	Case study	- Active straight leg raise test - Fear-Avoidance beliefs questionnaire - Oswestry Disability Questionnaire - VAS for pain.	CBT, rehabilitation of spinal local muscles and progressions. Postural re-education.	- Combined therapy: Significant improvement on <i>all outcomes</i> .
19.	Nicholas, M.K., Wilson, P.H. & Goyen, J. (1991)	Operant-behavioural and cognitive-behavioural treatment for chronic low back pain	Total of 58 for both arms	RCT	- Pain Rating chart - State-Trait Anxiety Inventory - Pain Beliefs Questionnaire - Coping Strategy Questionnaire - Beck Depression scale	- Group (1) & (2): Cognitive treatment (either with or without relaxation training) and physiotherapy treatment. - Group (3) & (4): Behavioural treatment (either with or without relaxation training) and physiotherapy treatment.	- Treatment groups: <i>Pain Intensity/Pain Rating chart:</i> Significant improvement, compared to controls. <i>Sickness Impact Profile-Self:</i> Significant improved compared to controls. <i>Pain Beliefs:</i> Significant improvement compared

					<ul style="list-style-type: none"> - Sickness Impact Profile-Self - The Sickness Impact Profile-Other - Medication intake - Follow-up measures - Expectation rating scale - Physiotherapist evaluation rating scale 	<ul style="list-style-type: none"> - Control groups: (1) Attention (physiotherapy plus discussion sessions) (2) No-attention (physiotherapy only) 	to controls. Coping Strategy: Significant improvement compared to controls. Medication use: Significant improvement compared to controls.
20.	Pfingsten, M., Hildebrandt, J., Leibing, E., Franz, C. & Saur, P. (1996)	Effectiveness of a multimodal treatment program for chronic low-back pain	Total of 90 for both arms	Cohort Study	<ul style="list-style-type: none"> - VAS for pain. - Lumbar flexion & extension - Trunk flexion performance - Trunk extension performance - Depression - PDI - Catastrophizing - Search for information - Cognitive control 	<ul style="list-style-type: none"> - Pre-programme: education, stretching & calisthenic exercises - Intervention: aerobic exercises, functional strength & endurance exercises, back school education, CBT group therapy, relaxation training and vocational counseling. 	Flexibility: significant improvements. Strength: significant improvements. Endurance: significant improvements. Pain: significant reductions. Disability: significant reductions. Depression: significant reductions. Catastrophizing: long term significant reduction. Search for information: long term significant reduction. Cognitive control: no change.
21.	Rundell, S. & Davenport, T.E. (2010)	Patient Education Based on Principles of Cognitive	Total of 1 patient	Case Report	<ul style="list-style-type: none"> - Modified Oswestry Low Back Disability Questionnaire 	<ul style="list-style-type: none"> - Intervention: prone hip extension active range of motion, side-lying hip abduction & external 	ODI: score reduced by 10%. FABQ: score reduced by 48%. Self-efficacy (Lo-BACSFN):

		Behavioural Therapy for a Patient With Persistent Low Back Pain: A Case Report			<ul style="list-style-type: none"> - Beck Depression Index - Fear-Avoidance Belief Questionnaire physical activity subscale - Fear-Avoidance Beliefs Questionnaire work subscale - Low Back Activity Confidence Scale function (Lo-BACSFN) - Low Back Activity Confidence Scale self-regulation (Lo-BACS-SR) - Low Back Activity Confidence Scale exercise (Lo-BACS-EX) 	rotation active range of motion exercises. Partial forward lunges & partial squats. Abdominal strengthening. Hook lying drawing-in, with alternating knee lifts & alternate upper extremity elevation. Progressed to quadruped hip extension while maintaining a neutral spine position. Hip extension stretch. Prone PA glide on the femoral hip. Gait retraining. CBT.	unchanged. <i>Perceived self-regulation (Lo-BACS-SR)</i> : decreased. <i>Self-efficacy of exercise (Lo-BACS-EX)</i> : score increased to 94%.
22.	Schweikert et al. (2006)	Effectiveness and Cost-Effectiveness of Adding a Cognitive Behavioral Treatment to the Rehabilitation of Chronic Low Back Pain	Total of 409 for both arms	RCT	<ul style="list-style-type: none"> - EuroQol questionnaire - Days off work - QALY - Costs diary - Functional capacity of the back - Depression - Anxiety - Back pain 	<ul style="list-style-type: none"> - Usual care group: Massage, electrotherapy measures, education & exercise programme. - Intervention group: Usual care (as above), CBT & Pain management group. 	No significant differences between groups for <i>all outcome measures</i> , apart from <i>indirect costs</i> : lower in intervention group.

23.	Estlander, A.M., Mellin, G., Vanharanta, H. & Hupli, M. (1991)	Effects and follow-up of a multimodal treatment program including intensive physical training for low back pain patients	Total of 65 for both arms	Cross-sectional study	<ul style="list-style-type: none"> - Pain Index - Disability Questionnaire - Functional capacity Index - Mood Index - Trunk flexion and extension strength - Spinal mobility. 	<ul style="list-style-type: none"> - Pre-programme: stretching & light physical exercises. - Intensive programme: Trunk and limb strengthening, spinal and limb mobilization exercises, aerobic activities, outdoor activities, work simulation activities, education & group CBT. 	<p>Pain: significant improvement.</p> <p>Depression: significant improvement.</p> <p>Functional capacity index: statistically significant average increase. Number of patients working: No significant difference between pre- and post-tests.</p>
24.	Mellin, G., Harkapaa, K., Vanharanta, K., Hupli, M., Heinonen, R. & Jarvikoski, A. (1993)	Outcome of a multimodal treatment including intensive physical training of patients with chronic low back pain.	Total of 194 for both arms	RCT	<ul style="list-style-type: none"> - Functional capacity index. - Change in work status - Lumbar flexion, extension, side flexion & rotation - Trunk Flexion and extension strength - Isokinetic lifting strength 	<ul style="list-style-type: none"> - Treatment programme: programme consisted of: trunk & lower limb strengthening and mobilizing exercises, aerobic exercises, work simulation activities, group CBT, education, relaxation training, socio-economic and vocational counselling 	<p>Functional capacity: modest improvements.</p> <p>Work status: modest improvements.</p>

4.2.3.1 Critical appraisal for methodological rigour

Of the twenty-four full text articles critically appraised, nine articles were scored with a moderate methodological quality and one was rated with a weak methodological quality (Baranoff, Hanrahan, Kapur & Connor, 2013). Fourteen articles were included in the review following critical appraisal. Twelve of those articles were rated with a strong methodological quality and two articles were rated to be excellent (Brox et al., 2003; Monticone et al., 2013). Table 2 below represents the critical appraisal of the fourteen reviewed articles, together with their respective critical appraisal results.



Table 4.2: Critical appraisal of reviewed studies

Study	Purpose	Study Design	Ethics	Data Collection	Data Analysis	Sample	Results	Conclusion	Score %	Included/Excluded
Baranoff et al. (2013)	5	2	2	6	4	2	2	4	60	Excluded
Price et al. (2007)	5	4	2	4	3	5	2	4	64	Included
Basler et al. (1997)	4	5	2	6	4	2	3	4	67	Included
Brox et al. (2003)	5	5	4	7	5	5	3	4	84	Included
Johnson et al. (2007)	5	5	3	5	5	7	2	3	78	Included
Kaapa et al. (2006)	3	4	3	4	4	8	3	4	73	Included
Lamb et al. (2010)	5	4	3	5	5	4	3	3	71	Included
Nicholas et al. (1992)	3	2	0	4	4	2	2	4	47	Excluded
Fersum et al. (2013)	5	6	3	5	5	3	3	4	75	Included
Alaranta et al. (1994)	3	1	0	3	4	4	2	0	38	Excluded
Boersma et al. (2004)	5	7	1	7	2	6	1	4	73	Included
Ryan et al. (2010)	3	6	2	7	4	7	3	4	80	Included
Frost et al. (2000)	5	0	0	7	5	3	2	4	58	Excluded
Haldorsen et al. (1998)	5	6	2	6	5	2	3	3	69	Included
Jensen et al. (2001)	5	5	2	6	5	7	2	4	80	Included
Miller et al. (2017)	5	5	4	4	2	3	2	2	60	Excluded
Monticone et al. (2013)	5	7	2	7	5	6	2	4	84	Included
Nagarajan et al. (2010)	5	5	0	5	1	3	1	2	51	Excluded

Nicholas et al. (1991)	4	5	0	5	4	1	2	4	58	Excluded
Pfingsten et al. (1996)	5	6	1	6	5	2	3	4	75	Included
Rundell et al. (2010)	5	5	0	6	1	1	1	4	51	Excluded
Schweikert et al. (2006)	5	5	4	6	5	4	2	4	78	Included
Estlander et al. (1991)	5	2	0	5	4	3	2	4	53	Excluded
Mellin et al. (1993)	5	2	0	5	4	2	2	3	53	Excluded

Weak (<40%) Moderate (41-60%) Strong (61-80%) Excellent (>80%)



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4.3 Narrative synthesis

4.3.1 Study setting and duration of chronic low back pain

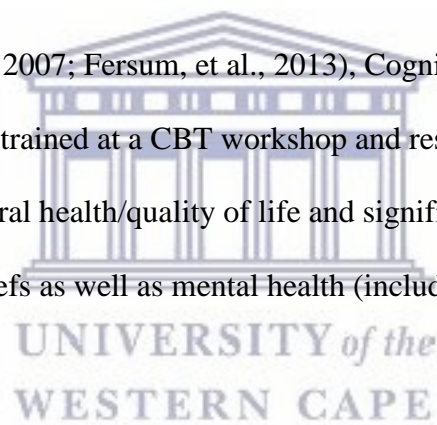
Of the fourteen studies included in the review, participants were treated mostly as out-patients (Brox et al, 2003; Monticone et al, 2013; Jensen, Bergstrom, Ljungquist, Bodin & Nygren, 2001; Ryan, Gray, Newton & Granat, 2010; Johnson et al, 2007; Pfingsten, Hildebrandt, Leibing, Franz & Saur, 1996; Fersum, O’Sullivan, Skouen, Smith & Kvale, 2013; Boersma et al, 2004; Kaapa, Frantsi, Sarna & Malmivaara, 2006; Lamb et al, 2010; Haldorsen, Kronholm, Skouen & Ursin, 1998; Basler, Jakle & Kroner-Herwig, 1997; Price, McBride, Hyerle, & Kivlahan, 2007), only one of the studies reported on participants being treated in an in-patient rehabilitation centre (Schweikert et al., 2006). All participants included in the studies were as a result of their CLBP. The duration of CLBP however was not consistent throughout and varied across the included studies. One study included patients that had CLBP for a minimum of six weeks, but when asked about the length of their pain, described their pain to be present on average of thirteen years (Lamb et al, 2010), Jensen et al. (2001) did not specify the duration but used the term “long term”, five studies did not define the length of CLBP at all (Price et al., 2007; Basler et al., 1997; Haldorsen et al., 1998; Pfingsten et al., 1996; Johnson et al., 2007), two studies defined the length of CLBP, for inclusion, “more than one year” (Kaapa et al., 2006; Brox et al. 2003), some studies included patients who have been suffering from CBLP for more than three months (Monticone et al., 2013; Ryan et al., 2010; Fersum et al., 2013), other studies’ prerequisite for inclusion consisted of CLBP for more than six months (Schweikert et al, 2006; Boersma et al, 2004).

4.3.2. Cognitive behavioural therapy treatment

The CBT treatment across the reviewed studies, seemed to largely be similar. One of the CBT approaches, used in most studies, involved problem solving, pacing activities, regulation of activities, challenging distorted cognitions, identifying helpful and unhelpful

thoughts about pain and activity, decreasing fear avoidance, targeting behaviours and beliefs regarding physical activity as well as teaching relaxation training. (Schweikert et al, 2006; Haldorsen et al., 1998; Johnson et al, 2007; Lamb et al, 2010; Ryan et al., 2010; Monticone et al, 2013; Pflingsten et al., 1996; Jensen et al., 2001). Other forms of CBT used across the studies, included, Body-awareness therapy (Price et al., 2007; Haldorsen et al., 1998; Jensen et al., 2001), workplace interventions (Kaapa et al., 2006), movement activities designed to normalise maladaptive behaviour (Fersum, K.V., O'Sullivan, P., Skouen, J.S., Smith, A. & Kvale, A., 2013) as well as general education regarding anatomy, physiology and back care (which was used as a CBT approach, targeting cognition) (Schweikert et al, 2006; Haldorsen et al., 1998; Jensen et al., 2001; Brox et al, 2003; Lamb et al, 2010).

In two studies (Johnson et al., 2007; Fersum, et al., 2013), Cognitive behavioural therapy was provided by a physiotherapist trained at a CBT workshop and resulted in decreases in pain, modest improvements in general health/quality of life and significant improvements in disability, fear-avoidance beliefs as well as mental health (including anxiety and depression).



4.3.3 Physiotherapy treatment

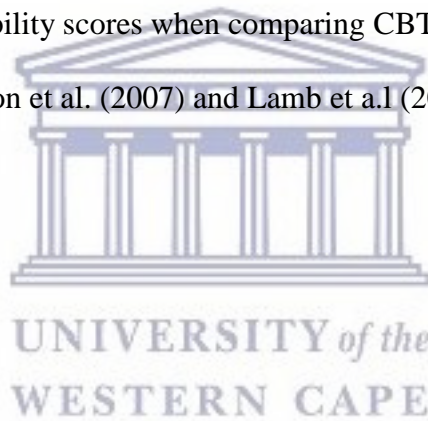
Physiotherapy intervention seen across the reviewed studies, included, various passive treatments (Price et al., 2007; Kaapa et al., 2006; Fersum et al., 2013; Monticone et al., 2013; Schweikert et al., 2006), general physical exercises (consisting of aerobics, aquatic therapy, outdoor activities, indoor activities and unspecified individual exercises) (Pflingsten et al., 1996; Brox et al, 2003; Kaapa et al., 2006; Ryan et al., 2010; Fersum et al., 2013; Haldorsen et al., 1998; Jensen et al., 2001) as well as motor control exercises (Monticone et al, 2013; Fersum et al., 2013).

4.3.4 Pain

The reduction of pain was a common outcome seen across the fourteen included studies, some articles found significant reductions in pain (Basler et al., 1997; Brox et al, 2003; Fersum et al., 2013; Ryan et al., 2010; Monticone et al, 2013; Pfingsten, et al., 1996), others only found reductions in pain (Johnson et al, 2007; Boersma et al, 2004; Haldorsen et al., 1998) and one article found no significant changes in pain (Schweikert et al, 2006).

4.3.5 Disability

Disability was found reduced when combining PT and CBT, significantly, by Fersum et al. (2013), Monticone et al. (2013), and Pfingsten et al. (1996). Brox et al. (2003) found no significant differences in disability scores when comparing CBT and PT to lumbar fusion, for the treatment of CLBP. Johnson et al. (2007) and Lamb et al. (2010) found reductions in disability.



4.3.6 Fear-avoidance

Fear-avoidance beliefs were reduced significantly (Basler et al., 1997; Brox et al., 2003; Fersum et al., 2013; Monticone et al, 2013), substantially (Lamb et al., 2010) and non-significantly (Boersma et al., 2004).

4.3.7 Mental Health

Anxiety/depression/mental health were often assessed collectively in outcome measures across the fourteen reviewed studies. The outcomes showed significant improvements in mental health (Pfingsten et al., 1996; Fersum et al., 2013), non-significant improvements

(Haldorsen et al., 1998), significant improvements amongst females (Jensen et al., 2001) and one study found no significant changes in mental health when combining CBT and PT, in the treatment of CLBP (Schweikert et al., 2006).

4.3.8 Quality of Life

General health/quality of Life showed modest improvement (Johnson et al., 2007; Kaapa et al., 2006), substantial improvement (Lamb et al., 2010) and significant improvement generally as well as specifically amongst females (Brox et al., 2003; Jensen et al., 2001) respectively. One study by Schweikert et al (2006) found no significant changes in general health/quality of life.



4.3.9 Pain self-efficacy

Pain self-efficacy improved, substantially and significantly across two studies (Lamb et al., 2010; Ryan et al., 2010), respectively.

4.3.10 Healthcare consumption

Healthcare consumption reduced significantly in a study performed by Fersum et al. (2013) and non-significantly in a study by Kaapa et al. (2006).

4.3.11 Catastrophizing

Catastrophizing, as an outcome measure, was found to be significantly reduced in two articles (Basler et al., 1997; Pfingsten et al., 1996).

4.3.12 Control of pain

Control of pain was reduced in only one study (Basler et al., 1997) and no significant change seen in another study (Pfingsten et al., 1996).

4.4 Meta-Analysis

Of the fourteen articles which were critically appraised and included in the study, five articles did not meet the requirements for inclusion in the meta-analysis. Jensen, Bergstrom, Ljungquist, Bodin & Nygren (2001) assessed the comparison between genders in terms of a combination therapy (physiotherapy combined with cognitive behavioural therapy) versus treatment as usual versus behaviour orientated physical therapy and therefore no direct comparison between a treatment group and a control group could be performed. Pfingsten, Hildebrandt, Leibing, Franz & Saur (1997) had no control group and therefore could also not be included in the meta-analysis. Haldorsen, Kronholm, Skouen and Ursin (1998) used a discriminative analysis, in that, they assessed the effect of combination therapy between people who returned to work as opposed to those who did not. In this case, a direct comparison could not be made between a treatment group and a control group, for meta-analysis purposes. The case study by Boersma et al. (2004) assessed individuals and not groups and therefore could also not be included in the meta-analysis. Price, McBride, Hyerle,

and Kivlahan (2007) study was quantitative, and therefore not appropriate for inclusion into meta-analysis.

4.4.1 Results of Meta-Analysis

The nine studies included in the meta-analysis used four comparable outcome measures, namely mental health (depression or emotional distress), physical disability, pain and fear avoidance. The statistical analyses followed the procedure described by Hunter and Schmidt (2004). Means and standard deviations were extracted from the twelve studies to calculate effect sizes (Hedge's g), 95% Confidence intervals (CI_{95}) and the Q values. The rule of thumb for interpreting Hedge's g is suggested as: 0.2 => small effect, 0.5 => medium effect and, 0.8 => large effect. If Hedge's g is bigger than 1, the difference between the two means is larger than one standard deviation while anything larger than 2 means that the difference is larger than two standard deviations. A significant Q value indicates that the data are heterogeneous which suggests that the variability among studies are not due to sampling error. One study (Lamb et al, 2010) did not report means and standard deviations and in this instance, sample size and p -value were used to calculate the effect size. Meta-analysis was conducted using Comprehensive Meta-Analysis Version 3 (Borenstein et al., 2013).

In addition to an effect size for each study as well as an overall (cumulative) effect size, a Z -test is also provided that test the Null Hypothesis that the true effect is different from zero. A significant Z -value indicates a rejection of the null hypothesis of no differences between groups.

The results of the meta-analyses for the four outcome measures are also summarised in the forest plot on the right of each of the tables below. In such a forest plot negative effect sizes (below zero) "favours" the treatment group, while positive effect sizes "favours" the control

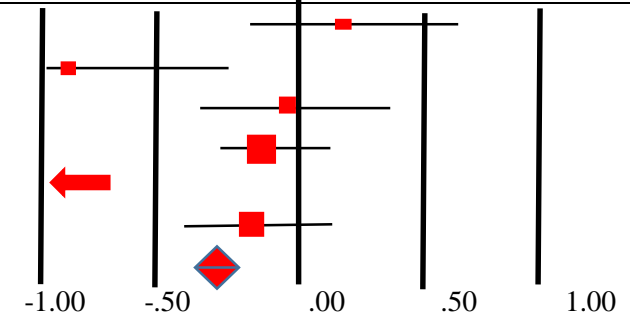
group. The rectangles show the effect size of each study relative to zero (or no difference). The horizontal lines around the rectangles reflect the CI_{95} . The size of the rectangles reflect the relative weight (based on sample size) assigned to the study in calculating the overall (cumulative) effect size. The diamond at the bottom of the forest plot represents the overall (cumulative) effect and the position of the diamond (to left or right of 0) indicates whether treatment effects were more positive for treatment groups (on left side of 0) than control groups (right side of 0).

4.4.1.1 Mental Health

The meta-analysis for mental health is reflected in Table 3. In this instance mental health refers to indices such as depression, anxiety or emotional distress where higher scores reflect poorer mental health. Six studies included a measure of mental health. Table 3 shows that, with the exception of Brox et al. (2003), all the studies had negative effect sizes which would indicate better mental health for the treatment group as opposed to the control group. However, only two of the studies had a significant Z-value indicating a statistically significant difference between the two groups, namely Fersum et al (2013) ($g = -0.71$, $Z = -3.37$, $p < .01$) and Monticone et al. (2013) ($g = -2.84$, $Z = -9.54$, $p < .01$). The effect size for Fersum et al. was -0.71, which in terms of the rule of thumb would indicate a medium effect size. The Monticone study had an unusually large effect size (-2.84) indicating that the differences between treatment and control exceeded more than two standard deviations. The overall (cumulative) effect size ($g = -0.26$, $Z = -4.49$, $p < .01$) showed a small but statistically significant effect for treatment. The index of heterogeneity was significant and indicated that the variability among studies was not due to sampling error (or chance) but represents a true effect ($Q = 87.58$, $df = 5$, $p < .01$).

Table 4.3: Meta-analysis with mental has outcome measure

Study name	Statistics for each study			Sample size		Relative Weight	Hedge's G and 95% CI	
	Hedges's g	Standard error	Z-Value	Treatment	Control		Favour Treatment	Favour Control
Brox et al 2003	0.22	0.26	0.87	26	35	5.20		
Fersum et al 2010	-0.71	0.21	-3.37**	51	43	7.62		
Kaapa et al 2006	-0.04	0.18	-0.20	59	61	10.38		
Lamb et al 2010	-0.14	0.09	-1.52	355	190	42.34		
Monticone et al 2013	-2.84	0.30	-9.54**	45	45	3.87		
Schweikert et al 2006	-0.16	0.11	-1.49	168	191	30.59		
OVERALL	-0.26	0.06	-4.49**					



** p < .01

* p < .05



4.4.1.2 Physical disability

The meta-analysis for physical disability is reflected in Table 4. Nine of the twelve studies included a measure of physical disability as an outcome. The table shows that only three of the studies had a significant Z-value indicating a statistically significant difference between the two groups, namely Fersum et al. (2010) ($g = -1.47$, $Z = -6.33$, $p < .01$), Lamb et al (2010) ($g = -0.28$, $Z = -3.08$, $p < .01$) and Monticone et al (2013) ($g = -5.32$, $Z = -11.87$, $p < .01$). The effect size for Lamb et al (2010) was -0.28 , which represents a small effect size. Two studies had effect sizes greater than 1, namely the Fersum ($g = -1.47$) and the Monticone ($g = -5.32$) studies indicating that the differences between treatment and control groups exceeded more than one and five standard deviations respectively. The overall (cumulative) effect size ($g = -0.27$, $Z = -5.09$, $p < .01$) showed a small but statistically significant effect for treatment. The index of heterogeneity was significant and indicated that the variability among studies was not due to sampling error (or chance) but represents a true effect ($Q = 171.43$, $df = 8$, $p < .01$).

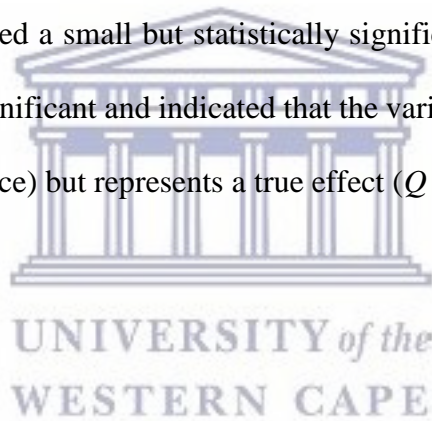
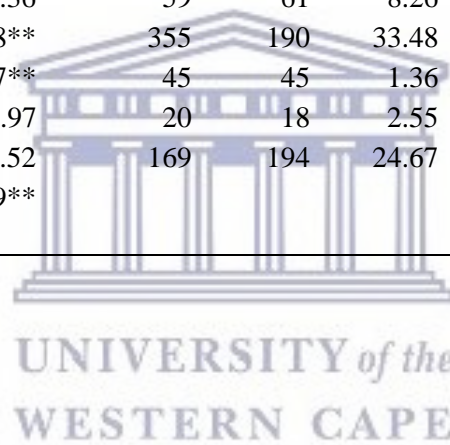


Table 4.4: Meta-analysis with physical disability as outcome measure

Study name	Statistics for each study			Sample size		Relative weight	Hedge's G and 95% CI	
	Hedges's g	Standard error	Z-Value	Treatment	Control		Favour Treatment	Favour Control
Basler et al 1997	-0.28	0.23	-1.21	36	40	5.21		
Brox et al 2003	0.18	0.26	0.71	26	35	4.15		
Fersum et al 2010	-1.47	0.23	-6.33**	51	43	5.08	←	
Johnson et al 2007	-0.11	0.13	-0.84	110	113	15.25		
Kaapa et al 2006	-0.06	0.18	-0.36	59	61	8.26		
Lamb et al 2010	-0.28	0.09	-3.08**	355	190	33.48	←	
Monticone et al 2013	-5.32	0.45	-11.87**	45	45	1.36	←	
Ryan et al 2010	0.64	0.33	1.97	20	18	2.55		
Schweikert et al 2006	-0.05	0.11	-0.52	169	194	24.67		
OVERALL	-0.27	0.05	-5.09**					

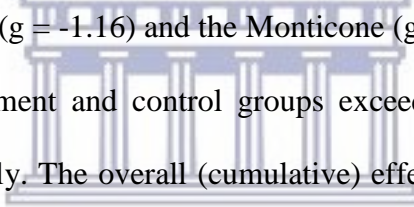
* p < .01

* p < .05



4.4.1.3 Pain

The meta-analysis for pain as outcome measure is reflected in Table 5. Nine of the twelve studies included a measure of pain as an outcome. The table shows that four of the nine studies had a significant Z-value indicating a statistically significant difference between the two groups, namely Fersum et al. (2010) ($g = -1.16$, $Z = -5.23$, $p < .01$), Lamb et al. (2010) ($g = -0.35$, $Z = -3.89$, $p < .01$), Monticone et al. (2013) ($g = -3.41$, $Z = -10.37$, $p < .01$) and Ryan et al. (2010) ($g = .86$, $Z = 2.58$, $p < .05$), The effect size for Lamb et al. (2010) was -0.35, which represents a small effect size. The effect size for Ryan et al. (2010) was 0.86 which represents a large effect, but it was positive and on the right side of the forest plot, reflecting a higher pain score for the treatment group



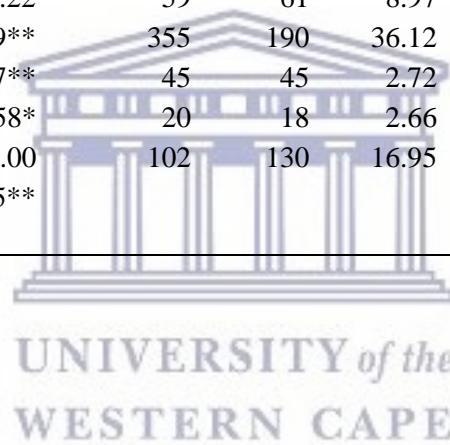
The effect size for the Fersum ($g = -1.16$) and the Monticone ($g = -3.41$) studies indicated that the differences between treatment and control groups exceeded more than one and three standard deviations respectively. The overall (cumulative) effect size ($g = -.27$, $Z = -5.05$, $p < .01$) showed a small but statistically significant effect for treatment. The index of heterogeneity was significant and indicated that the variability among studies was not due to sampling error (or chance), but represents a true effect ($Q = 137.43$, $df = 8$, $p < .01$).

Table 4.5: Meta-analysis with pain as outcome measure

Study name	Statistics for each study			Sample size		Relative weight	Hedge's G and 95% CI	
	Hedges's g	Standard error	Z-Value	Treatment	Control		Favour Treatment	Favour Control
Basler et al 1997	-0.06	0.23	-0.25	36	40	5.71		
Brox et al 2003	0.37	0.26	1.43	26	35	4.44		
Fersum et al 2010	-1.16	0.22	-5.23**	51	43	5.98	←	
Johnson et al 2007	-0.24	0.13	-1.80	110	113	16.45		
Kaapa et al 2006	-0.04	0.18	-0.22	59	61	8.97		
Lamb et al 2010	-0.35	0.09	-3.89**	355	190	36.12	←	
Monticone et al 2013	-3.41	0.33	-10.37**	45	45	2.72	←	
Ryan et al 2010	0.86	0.33	2.58*	20	18	2.66		
Schweikert et al 2006	0.13	0.13	1.00	102	130	16.95		
OVERALL	-0.27	0.05	-5.05**					

* p < .01

* p < .05



4.4.1.4 Fear avoidance

The meta-analysis for fear avoidance as outcome measure is reflected in Table 6. Six of the twelve studies included a measure of fear avoidance as an outcome. The table shows that four of the nine studies had a significant Z-value, indicating a statistically significant difference between the two groups, namely Brox et al. (2003) ($g = -0.80$, $Z = -3.01$, $p < .01$), Fersum et al. (2010) ($g = -0.76$, $Z = -3.57$, $p < .01$), Lamb et al. (2010) ($g = -0.32$, $Z = -3.54$, $p < .01$), and Monticone et al. (2013) ($g = -6.73$, $Z = -10.37$, $p < .01$). The effect size for Lamb et al. (2010) was -0.35 , which represents a small effect size, while the effect sizes for the Fersum study (-0.76) and the Brox study (-0.80) represent a medium and large effect respectively. The Monticone study had an effect size greater than 1 ($g = -6.73$), indicating that the difference between the treatment and control groups exceeded more than six standard deviations. The overall (cumulative) effect size ($g = -0.50$, $Z = -6.95$, $p < .01$) showed a medium and statistically significant effect for treatment. The index of heterogeneity was significant and indicated that the variability among studies was not due to sampling error (or chance) but represents a true effect ($Q = 141.91$, $df = 5$, $p < .01$).

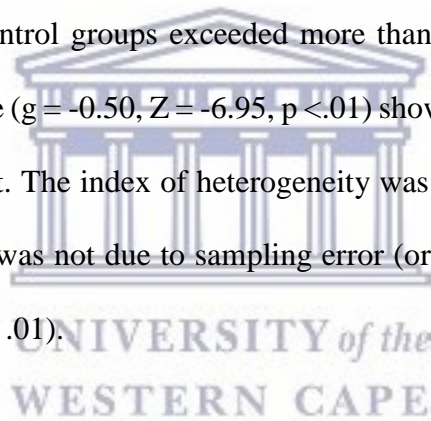
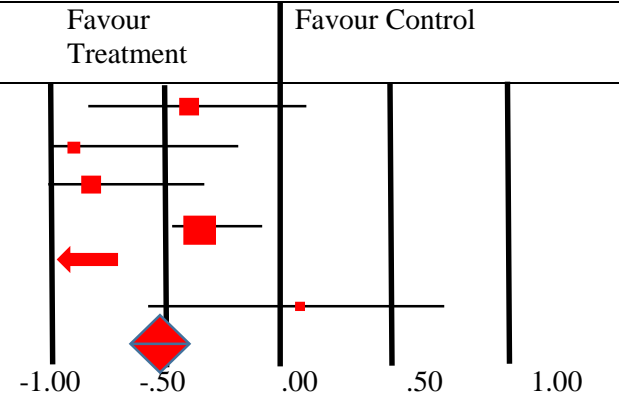


Table 4.6: Meta-analysis with fear avoidance as outcome measure

Study name	Statistics for each study			Sample size		Relative weight	Hedge's G and 95% CI	
	Hedges's g	Standard error	Z-Value	Treatment	Control		Favour Treatment	Favour Control
Basler et al 1997	-0.35	0.23	-1.53	36	40	9.96		
Brox et al 2003	-0.80	0.27	-3.01**	26	35	7.41		
Fersum et al 2010	-0.76	0.21	-3.57**	51	43	11.56		
Lamb et al 2010	-0.32	0.09	-3.54**	355	190	64.14		
Monticone et al 2013	-6.73	0.54	-12.38**	45	45	1.77		
Ryan et al 2010	0.08	0.32	0.25	20	18	5.16		
OVERALL	-0.50	0.07	-6.95**					



* p < .01

* p < .05

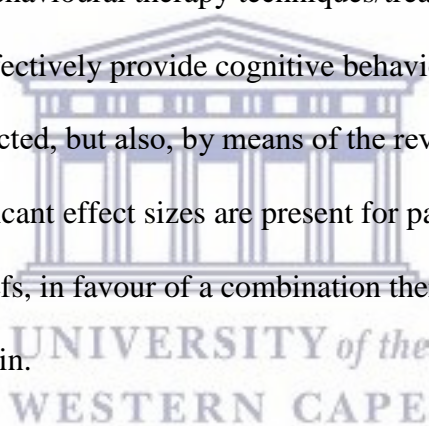


CHAPTER FIVE

CONCLUSION

5.1 Summary of conclusion

This study performed a systematic review and meta-analysis on the available and current literature assessing the combination of physiotherapy and cognitive behavioural therapy in the treatment of chronic lower back pain. As seen from the quantitative synthesis of the fourteen reviewed articles, the outcome measures; pain, disability, fear-avoidance beliefs, general health/quality of life as well as mental health (including anxiety and depression) is positively affected in patients with chronic lower back pain, when combining physiotherapy interventions with cognitive behavioural therapy techniques/treatment. It is also evident that physiotherapists are able to effectively provide cognitive behavioural therapy. Not only are these outcomes positively affected, but also, by means of the review's meta-analysis, it is evident that statistically significant effect sizes are present for pain, disability, mental health as well as fear-avoidance beliefs, in favour of a combination therapy in the treatment of non-specific chronic lower back pain.

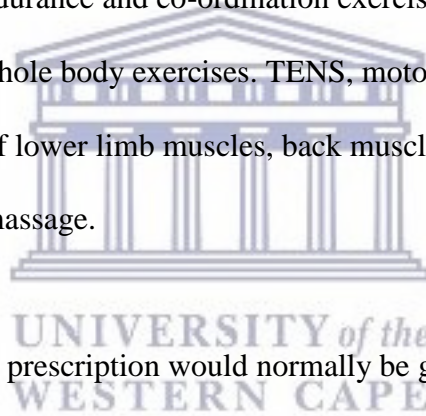


5.2 Implications for practice

The differences in length of CLBP presence across the included studies, may account for differences in treatment effects across studies. Patients with chronic lower back pain for longer than one year may responded differently to a combination of physiotherapy and cognitive behavioural therapy when compared to patients suffering from chronic lower back pain for six months.

When considering the use of combination therapy in the treatment of chronic lower back pain, no consensus has been reached in the literature reviewed in terms of the physiotherapy and cognitive behavioural therapy prescription. However, common themes were seen.

Combinations of physiotherapy intervention were not largely consistent across the included studies, however common combinations were used, such as, passive physiotherapy (massage, spinal mobilization), TENS and an exercise programme, paced activity programmes and self-management of back pain. Passive physiotherapy (massage, spinal traction, spinal mobilization), ultrasound, TENS, stretching and strengthening of lower limb muscles, back muscles and core muscles. Endurance and co-ordination exercises, aerobics, outdoor activities, hydrotherapy and whole body exercises. TENS, motor control exercises and stretching and strengthening of lower limb muscles, back muscles and core muscles. Lastly, body awareness therapy and massage.



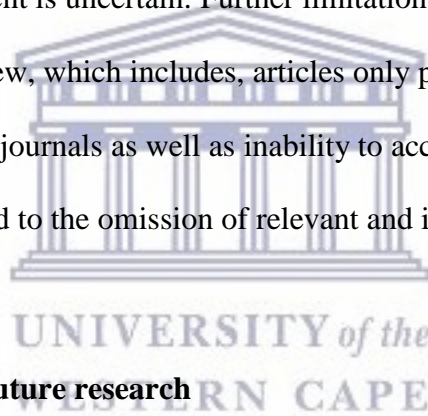
Cognitive behavioural therapy prescription would normally be given at the discretion of the psychologist, however, it can also be provided by a physiotherapist who has had extra training in cognitive behavioural therapy. The literature reviewed had a common theme with regards to CBT treatment, which involved, problem solving, pacing activities, regulation of activities, challenging distorted cognitions, identifying unhelpful thoughts regarding pain, and activity, decreasing fear avoidance, targeting behaviours and beliefs regarding physical activity as well as teaching relaxation training.

The most current study performed by Hajihasani et al. (2018) assesses the combination of cognitive behavioural therapy and physiotherapy versus physiotherapy alone, in the treatment of chronic low back pain, however does not assess the effectiveness of this treatment via a

meta-analysis. This study therefore adds reliability of treatment effects when combining cognitive behavioural therapy and physiotherapy, in patients with chronic non-specific low back pain, to reduce pain, disability, mental health and fear avoidance behaviours.

5.3 Limitations of the study

In a few articles, the combination therapy is compared to “usual care”, which typically refers to physiotherapy, however, not specified, it could refer to homeopathy or medication prescription, etcetera. Variations in physiotherapy as well as cognitive behavioural intervention content and prescription were noted in this review. The effect of these variations on the effectiveness of treatment is uncertain. Further limitations are created by the eligibility criteria of this systematic review, which includes, articles only published in English, articles only published in open access journals as well as inability to access other grey literature. These limitations may have led to the omission of relevant and important studies.



5.4 Recommendations for future research

It would be beneficial to the CLBP patient population if future research focused on designing a standardised method of physiotherapy intervention to be used in combination with a standardised cognitive behavioural therapy intervention. Collaboration on future research would require a physiotherapist as well as a clinical psychologist. Perhaps future research should focus on the significance of combination therapy versus physiotherapy alone, in an attempt to reduce health care costs.

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Appendix: Critical Appraisal Tool

Bibliographic Details	Author	Title	Source

Title		Year

Purpose	Yes(1) No(0)
<p>1. Is there evidence that literature has been consulted in providing context or background? 2. Is there a clear problem statement? 3. Is there a clear rationale for the study? 4. Are the aims of the study clearly stated? 5. Are the aims explicitly related to the problem statement?</p> <p>Total points for this section: 5</p>	

Study Design	Yes(1) No(0)
<p>1. Is the theoretical orientation of the study reported? 2. Was the theoretical orientation described in detail? 3. Is the design of the study reported? 4. Did the authors motivate their design choices? 5. Were the elements of the design reported on? 6. What is the relationship of the design to the aim of the study? a) Minimal to no relevance (0) b) Moderate relevance (1) c) Highly relevant (2)</p> <p>Total points for this section: 7</p>	



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Ethics	Yes(1) No(0)
<p>1. Was ethics approval obtained from an identifiable committee? 2. Was informed consent obtained from the participants of the study? 3. Have ethical issues been reported on? a) Confidentiality? b) Anonymity? c) Withdrawal? d) Informed consent?</p> <p>Total points for this section: 6</p>	

Data collection	Yes(1) No(0)

1. Were data collection methods clearly identified?
2. Was choice of data collection methods motivated?
3. Were methods of collection appropriate for the outcomes identified?
4. For quantitative studies:
 - a) Did they report on psychometric properties?
 - b) Did they report on psychometric properties of the scale for this sample?
 - c) Did the authors report on the type of data produced by the instruments?
 - d) Did the instruments produce data that supported the data analysis
- For qualitative studies: Did they report on
 - a) Trustworthiness
 - b) Credibility
 - c) Reflexivity
 - d) Respondent validation

Total points for this section: 7

Data Analysis

Yes(1) No(0)

1. Was the method of analysis made explicit?
2. Was the method of analysis motivated?
3. Was the method of analysis appropriate relative to the research question?
4. Were the conclusions drawn appropriate and supported by the data?
5. Were the inferences drawn supported by the type of sampling?

Total points for section: 5



Sample

Yes(1) No(0)

1. Was the source population clearly identified?
2. Were the inclusion/exclusion criteria specified?
3. Was the sampling choice motivated?
4. Was the sampling method appropriate?
5. How was the size of the study sample determined?
 - a) Not reported (0)
 - b) Using threshold numbers (1)
 - c) Formulas (2)
 - d) Statistical requirements (3)
 - e) Saturation (3)
6. Were techniques used to ensure optimal sample size?

Total points for this section: 8

Results

Yes(1) No(0)

- For Quantitative studies:
1. Were alpha levels reported?
 2. Were results correctly interpreted?
 3. Were the results clearly linked to the research questions?
- For Qualitative studies:
1. Was saturation reached?
 2. Were multiple reviewers used?
 3. Were the results clearly linked to the research questions?

Total points for this section: 3

<u>Conclusion</u>	Yes(1) No(0)
1. Was a clear conclusion drawn? 2. Was the conclusion supported by the findings? 3. Were relevant recommendations made based on the findings? 4. Were limitations identified Total points for this section: 4	

Total Score/Score(%)

Score _____ Score % _____

Weak (<40%)__

Moderate (41-60%)__

Strong(61-80%)__

Excellent (>80%)__

Overall Appraisal: Include_____

Exclude_____

Seek further info_____



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18 October 2017

Ms T Pretorius
Physiotherapy
Faculty of Community and Health Sciences

Ethics Reference Number: BM17/8/10

Project Title: Integrating physiotherapy and psychological therapy techniques in the treatment of chronic lower back pain.

Approval Period: 17 October 2017 to 17 October 2018

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report in good time for annual renewal.

The Committee must be informed of any serious adverse event and/or termination of the study.

A handwritten signature in black ink, appearing to read 'Josias', is placed over a white rectangular box.

*Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape*

PROVISIONAL REC NUMBER -130416-050