UNIVERSITY OF KWAZULU-NATAL™
INYUVESI YAKWAZULU-NATALI

INVESTIGATING OCCUPATIONAL RISK FACTORS OF LOW BACK PAIN AND RELATED DISABILITY AMONG PATIENTS ATTENDING A PRIVATE PHYSIOTHERAPY PRACTICE IN GABORONE, BOTSWANA

Noreen Vimbiso Chihumbiri

Student number: 214577373

A mini-thesis submitted in partial fulfilment of the requirements for the degree **Master of Health Sciences (MMSHSC)** at the School of Health Sciences, University of KwaZulu-Natal

January 2018

SUPERVISORS' PERMISSION TO SUBMIT FOR EXAMINATION

Student Name: Noreen Vimbiso Chihumbiri

Student Number: 214577373

Thesis Title

Investigating occupational risk factors of low back pain and related disability among patients attending a private physiotherapy practice in Gaborone, Botswana

As the above candidate's supervisor, I AGREE to the submission of this thesis in the form of a mini dissertation for examination. This is to certify that the contents of this mini-dissertation are the original research work of Ms Noreen Vimbiso Chihumbiri.

Supervisors

[redacted]

Dr T Nadasan
Main Supervisor

X

Mr Ntsikelelo Pefile
Co-Supervisor

DECLARATION

I, Noreen Vimbiso Chihumbiri, declare that the research entitled "Investigating occupational risk factors of low back pain and related disability among patients attending a private physiotherapy practice in Gaborone, Botswana," is my original work which has never been submitted or therein a part of for any degree or examination at any other university and that everything quoted or sourced from others has been correctly and completely referenced.

X [redacted]

Noree[redacted]

Student

[redacted]

Witness (Main Supervisor)

X

Mr. Ntsikelelo Pefile
Witness (Co-Supervisor)

January, 2018.

DEDICATION

GOD

"I will give thanks to you, LORD, with all my heart; I will tell of all your wonderful deeds." Psalms 9:1 (NIV). Thank you Almighty Father for having taken me this far: Great is thy Faithfulness.

PARENTS

This is also dedicated to my parents, Martin and Margaret Chihumbiri, for their unwavering support through it all.

ACKNOWLEDGEMENTS

My sincere gratitude goes to the following for their unwavering support and guidance with this dissertation:

My supervisor Doctor Thayananthee Nadasan and co-supervisor Mr Ntsikelelo Pefile for their patience and expertise right throughout the study.

The owner and staff of Ergo-Physiotherapy Clinic for their advice and availability.

My family and friends for their constant motivation.

Mr David Mooketsi for his assistance in the statistical analysis of the results.

The UKZN College of Health Sciences Research Office for financing the study.

All participants who willingly took part in the study.

ABSTRACT

Globally, low back pain (LBP) is regarded as the most common cause of occupational illness, job-related disability and absenteeism from work. The presence of LBP in the working age is a great cause for concern, as it is this population that contributes greatly to the productivity and economic viability of a country. However, in order to effect meaningful changes, such as formulating primary prevention and subsequent management strategies aimed at curbing the rising burden of occupational LBP, it is necessary to understand the physical activities that workers are frequently exposed to in the work place that put them at risk of developing LBP. Botswana is largely dependent on the working age population to drive its economy therefore necessitating introductory research, as reported in various industries on occupational risk factors that may hamper optimal worker participation.

This research therefore aimed to determine the occupational risk factors and the resulting back-related disability in patients presenting with LBP to a private physiotherapy practice in Gaborone, Botswana. The objectives were fulfilled by using a structured, self–administered questionnaire to describe the demographics of the individuals, determine the extent of sickness absenteeism from work owing to LBP and to establish the resulting back-related disability through the Roland-Morris Disability Questionnaire (RDQ). Furthermore, the relationship between occupational risk factors and the level of back-related disability as well as the demographic profile of the study participants and the level of back-related disability were determined based on statistical analysis.

The study was successful in establishing that the slight majority were females (52%) and the mean age of participants was 41 years. 35.3 percent of the study participants had between 10 to 19 years of work experience while 43.7 percent were classified as overweight. The results also reflect that minor LBP disability level was reported by 79.8% while 57.2 percent had missed between three to seven days of work in the previous year because of LBP. The occupational risk factors dynamic loads, static loads, repetitive loads, ergonomic environmental conditions, vibrations, prolonged standing, prolonged sitting, prolonged walking were significantly associated with LBP. The odds of having severe back-related disability are increased approximately 163 % for females *(p-value= .043613).*

The presence of LBP and its associated disability in the working age, a population that drives the commercial hub of a nation, calls for recognition of this growing burden as a liability to the economic growth of Botswana. Investigating occupational factors of LBP would assist in making policies that address the different risk factors of LBP particularly in females and the 30 to 39 years age group as these are the commonly affected. In addition, emerging industries with increased risk of back-related disability can be prioritised in terms of ergonomic interventions as well as implementing health policies to help curb the escalating burden of LBP and facilitate optimal worker participation whose indefinite benefits would go a long way in enhancing the economy.

Keywords: Low back pain, Risk factors, Disability, Occupational Health, Health Promotion

TABLE OF CONTENTS

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

ADLs: Activities of Daily Living

AIDS: Acquired Immune Deficiency Syndrome

BMI: Body Mass Index

HIV: Human Immunodeficiency Virus

ICF: International Classification of Functioning, Disability and Health

ILO: International Labour Organization

LBP: Low Back Pain

OHS: Occupational Health and Safety

RTW: Return to Work

RDQ: Roland-Morris Disability Questionnaire

SIP: Sickness Impact Profile

SPSS: Statistical Package for Social Sciences

SMEs: Small and Medium Enterprises

WHO: World Health Organization

WRMDs: Work-related Musculoskeletal Disorders

CHAPTER 1. INTRODUCTION

1.1 Introduction

This chapter provides a general overview of the study. It presents the background of the study as well as the problem statement. The research question, aim and objectives of the study are stated. It concludes with the significance of the study, a summary as well as the brief outline of the rest of the study.

1.2 Background

Low back pain (LBP) is defined as pain, stiffness and discomfort experienced in the area on the posterior aspect of the body from the lower margin of the twelfth rib to the lower gluteal folds that could be referred into one or both lower limbs lasting for at least one day (Hoy et al., 2010). Globally, it affects an estimated 90% of the population at some stage of their life, occurs in similar proportions in all cultures and is present across all age groups (Driscoll et al., 2014). It is considered to be a highly prevalent musculoskeletal disorder in both developed and developing countries, and has also been identified as the single leading cause of disability worldwide (Hartvigsen, Morsø, Bendix, & Manniche, 2010). Moreover, in the workplace, LBP (including osteoporosis, rheumatoid arthritis and osteoarthritis) is regarded as the most common cause of occupational illness, job-related disability and absenteeism from work (Hoy et al., 2012; Mafuyai et al., 2014).

Work-related LBP, commonly referred to as occupational LBP, is therefore called because it is common in adults of working age, with the first incident occurring between the ages of 20 to 40 years being aggravated by workplace exposures (Casazza, 2012). In the work place, manual workers are most commonly exposed to awkward or static work postures, repetitive movements, prolonged periods of walking or standing, vibrating tools, manual handling and labour intensive tasks(Ganiyu, Olabode, Stanley, & Muhammad, 2015; Mafuyai, Babangida, Mador, Bakwa, & Jabil, 2014). This repeated contact often puts them at risk of developing LBP, and the resulting back-related disability being activity limiting, significantly effecting their capacity for work and activities of daily living (ADLs), as reflected by the Roland-Morris Disability Questionnaire (RDQ) (Davidson, 2014). The RDQ expresses low back functional disability by taking into account an individual's physical ability, resting pattern, psychosocial factors, household management, eating and pain frequency, all of which affect capacity of performance (Stevens, Lin, & Maher, 2016). In developing nations, the extensive subprime industrial working conditions, ignorance of ergonomic issues, training and educational programmes, coupled with the fact that approximately 80 percent to 90 percent of the population are involved in heavy physical work, escalate the burden of LBP (Driscoll et al., 2014). Consequently, this inflates the annual healthcare-related costs. The resulting socio-economic constraints are of great concern in Africa, the world's poorest continent that has also been negatively affected by HIV/AIDS.

The already restricted funds in Africa often go towards healthcare interventions, and target the HIV/AIDS epidemics, sparing very little for use to address other life changing conditions (March et al., 2014; Murray & Lopez, 2013).

The socio-economic implications of occupational injuries are substantial, significantly affecting the working individual and his or her family, with its rippling effects extending to communities, healthcare and business systems, ultimately reflected by high direct and indirect costs for society as a whole. According to Dembe, "An injury or illness, whether caused occupationally or not, can represent a significant life event, becoming part of a person's individual identity and approach to daily existence. An injury or illness therefore potentially affects every aspect of life: the pursuit of career, leisure activities, religious orientation and practice, personal and group relationships, family responsibilities, involvement in political activities, and so forth" (Dembe, 2001, p. 23).

Therefore without work, individuals may not reach their full potential at the cost of themselves, their families as well as their society (Aylward et al., 2010; Black, 2008). Direct charges include compensation in cases of early retirement or loss of work, medical costs, injury on duty costs, and the costs of interruption of production, which adversely affects productivity. Indirect expenses include the costs of lost earnings to dependents, and the costs associated with care-giving by families and communities (Erick & Smith, 2014; Hoy et al., 2010).

Given the high prevalence of LBP, negative health consequences and associated expenses, LBP is a key occupational health concern, necessitating the need for occupational health and safety (OHS) research on it (Roffey, Wai, Bishop, Kwon, & Dagenais, 2010a). OHS is an important discipline that safeguards the health and well-being of workers, supports poverty eradication, boosts productivity hence the economic viability of a country (Kok, Deijl, & Veldhuis-Van-Essen, 2013). It is, however, still a novel discipline globally whose existence though recognized has not receive the priority it deserves and as such its adoption remains at subprime levels (Moyo, Zungu, Kgalamono, & Mwila, 2015). Botswana, an upper middle income country with a formal sector employment of 403 681 workers as is the case in many other expanding economies is no exception. To this end, Botswana has made efforts to embrace six ratifications from the endorsed 177 technical conventions concerned with health and safety by the International Labour Organization (ILO) (Seoke & Kamungoma-Dada, 2014). A recent study in the country has shown that at enterprise level, ILO centred OHS management systems are not common leading to under reporting of workplace accidents, and when present they are more commonly implemented in larger enterprises (Seoke & Kamungoma-Dada, 2014). This gap necessitates the need to forge comprehensive policies and legislative guidelines across all enterprises, implement adequate monitoring systems with the goal of improving OHS in every enterprise (Seoke & Kamungoma-Dada, 2014).

Furthermore, developing extensive policies targeting the prevention of LBP onset should be given precedence, particularly in developing countries, as in the ensuing decade, they are expected to have the greatest increase in LBP prevalence. (Driscoll et al., 2014; Punnett et al., 2005). The increasing prevalence of LBP in developing countries is related to advances in technology, mechanization as well as expansion of the construction, agriculture, transport, healthcare and warehousing industries which are occupations associated with a high prevalence of LBP (Driscoll et al., 2014; Manchikanti, 2000). Currently Botswana, an upper middle-income country has adopted a national plan earmarked to promote growth, economic diversification and employment creation (Statistics-Botswana, 2016). This plan is centred on facilitating an expansion of the private sector, small and medium enterprises (SMEs), as well as the informal sector. The expanding industries include manufacturing, agriculture, tourism and construction which pause an occupational health concern because of their association with LBP (Statistics-Botswana, 2016). Investigating the risk factors for work-related LBP would assist in formulating primary prevention and subsequent management strategies to protect the health, manage and treat the workforce, as well as to augment their involvement in the economy, as these benefits would go a long way to boost the country's wealth.

1.3 Problem statement

The expansion of various industries in Botswana that are associated with a high prevalence of LBP is a key occupational health concern. The country is largely dependent on the working age population to drive its economy. However, the presence of LBP, and the resulting disability in this group, is a significant threat to the financial sustainability of the country. Moreover, the absence of a national occupational health and safety policy in the country suggests a major limitation in light of preventing these work-related musculoskeletal disorders (WRMDs), particularly LBP. Maintaining the ability of the workforce to perform optimally and participate in the country's trade and industry is therefore extremely important in light of the current industrial expansion. Obtaining information on LBP and its associated disability in the country is equally important as it allows for its recognition as a big risk to the proficiency of trades and industries in the country. This information would build up a solid body of knowledge on the risk factors of occupational LBP and its related disability to pave way for subsequent prevention strategies.

1.4 Research question

What are the occupational risk factors that result in back-related disability among patients attending a private physiotherapy practice in Gaborone, Botswana?

1.5 Aim of the study

The study aims to determine the occupational risk factors and the resulting back-related disability in patients presenting to a private physiotherapy practice in Gaborone, Botswana.

1.6 Objectives of the study

1. To describe the demographic profile of the study participants.

2. To determine the extent of sick absenteeism related to occupational LBP.

3. To establish the level of back-related disability through the Roland-Morris Disability Questionnaire among the patients in the study setting.

4. To determine the relationship between the occupational risk factors for LBP and the level of back-related disability among the study participants using statistical analysis.

5. To determine the relationship between the demographic profile of the study participants and the level of back-related disability using statistical analysis.

1.7 Study outline

The study is presented in the following six chapters:

Chapter 2: Literature review: This chapter provides a broad view of LBP and occupational LBP with its resulting disability as well as the various risk factors. It also reviews the epidemiology of LBP in both developing and developed nations.

Chapter 3: Methodology: This chapter presents the methodology used in this study, and describes the study area, participants, data collection tools, pilot study and participant recruitment process. It describes the methods used to analyse the data, and reviews the ethical issues that were taken into account during the study.

Chapter 4: Results: This chapter first notes the participants' demographic details, then presents the study findings with respect to the remaining study objectives.

Chapter 5: Discussion: This chapter discusses the results from the study with respect to the five study objectives, and compares them to the available literature on the subject.

Chapter 6: Conclusion: This chapter addresses the extent to which the problem has been addressed and the aim achieved by reviewing the findings related to each objective. It indicates the significance of the study for those affected by LBP and identifies the limitations encountered and future research recommendations.

1.8 Summary

Enhancing a worker's health and well-being goes a long-way in maintaining their work capability and optimal work participation which are essential for the effective functioning of a country, whether in the private or public sectors. The need for data on the risk factors for LBP and the resulting disability amongst the working population in Botswana has necessitated research in this field. The next chapter delves into the current literature on occupational LBP with its associated disability and risk factors.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to review literature on LBP and the various factors relating to LBP. The background briefly discusses LBP and occupational LBP. Following this is a section on the epidemiology of LBP in both developed and developing countries. The last section is on the risk factors of LBP and its associated disability.

This information was gathered from a broad literature search using Google scholar, WorldCat, Cochrane, PubMed (Medline) and Statistics Botswana databases. The search strategy included the following terms: risk factors, LBP, lumbago, occupational LBP, work-related LBP, work-related musculoskeletal disorders as well as LBP disability. While conducting the literature review for this study as only a few studies on occupational risk factors for LBP were found in the database searches. The inclusion criteria for articles specified articles written in English. The exclusion criteria for the data base search consisted of articles in other languages and older than 2000.

The researcher did not manage to source any evidence of occupational risk factors for LBP among individuals attending private physiotherapy in a Botswana context. Consequently, the paucity of articles necessitated the use of dated literature which, nevertheless provided vital content and bearing to the research topic.

2.2 Introduction to low back pain

Pain, tautness and discomfort behind the body originating from the lower border of the last rib spreading to the lower gluteal folds that could be referred into one or both lower limbs for at least a day describes LBP . Depending on the duration, LBP can be classified into acute, sub-acute and chronic. Acute episodes range between six to twelve weeks while sub-acute pain overlaps between four and twelve weeks with chronic pain persisting for three months or more (Balagué, Mannion, Pellisé, & Cedraschi, 2012).

In the working population, LBP is a very common occupational disorder and also remains the primary reason why this population seeks medical care (Casazza, 2012). Work-related LBP is common in adults of working age with the first incidence occurring between the ages of 20 to 40 years. Furthermore, it is activity-limiting hence frequently affects capacity for work and often presents for occupational healthcare (Casazza, 2012; Hoy et al., 2010). It is also regarded as the most common cause of job-related disability, occupational illness and missing work (Buchbinder et al., 2013). Absenteeism from work as a result of LBP is an essential indicator of LBP associated disability and is associated with low labour force participation resulting in major economic impact on many individuals, their families, businesses and governments (Cunningham, Flynn, & Blake, 2006; Hoy et al., 2012).

Moreover, the high incidence of LBP amongst the working age is a great cause for concern as it is this population whose crucial work competence forms the basis of society's trade and industry (Hoy et al., 2010; Wieser et al., 2011). Financial compromise occurs when unrelenting LBP symptoms interfere with one's ability to meet the physical demands of his or her occupation. This forces an individual to miss work, withdraw early from work or forfeit employment (Erick & Smith, 2014; Wai, Roffey, Bishop, Kwon, & Dagenais, 2010b). In addition, there are significant costs incurred in cases of early retirement, loss of work, damage in the work environment and interruption of production. Other expenses include lost earnings to dependents and the costs associated with care-giving by families and communities. In Africa, the cascading socio-economic constraints emphasize the high prevalence of musculo-skeletal-related disability (Ekpenyong, Udokang, Akpan, & Samson, 2012).

2.2.1 Epidemiology of low back pain in developed countries

The identified studies were conducted in Thailand, New Zealand, Ireland and France between the years 2011 and 2013. Table 1 below summarises the countries in which the studies were conducted, the population under study and the study design. It also shows tools used for data collection, age ranges in years of the participants, gender of the represented sample as well as the one-year prevalence for each study. All studies were cross-sectional in nature, had both male and female representation and had varied age ranges with the youngest participant being aged 18 years. The one-year prevalence rate of LBP ranged from 37 percent to 57 percent. The current study too was cross-sectional in nature, made use of a questionnaire to gather required data and included both males and female participants.

Table 1: Summary of one-year LBP prevalence rates in developed countries

Author	Population	Sample size	Study design	Tool	Gender		Age	One-year prevalence rate (%)
(Nopkesorn & Supasit Pannarunothai, 2011), Thailand	Rice farmers	283	Cross-sectional	Question-naire	F/M		29-72	56.2
(Widanarko et al., 2011), New Zealand	Working population	3 003	Cross-sectional	Question-naire	F/M		20-64	54
(Osborne et al., 2013), Ireland	Farmers	600	Cross-sectional	Question-naire	F/M		18-85	37
(Parot-Schinkel et al., 2012), France	Working population	3 710	Cross-sectional	Question-naire	F/M		20-59	57

2.2.2 Epidemiology of low back pain in developing countries

The following studies were carried out between 2012 and 2016 in Nigeria, Botswana, Zambia, Indonesia and China. Table 2 below highlights the population under study, the sample size, age range in years of the participants, tools used to gather data as well as the one-year prevalence for each study. All studies were cross-sectional in nature and they used questionnaires to gather data required for these studies. The age range of participants were not mentioned in three of the studies. All studies had both males and females and the one-year prevalence rates of LBP ranged from 38.4 percent to 71.6 percent. In this study, the participants were all part of the working-population. They belonged to one of the following occupational categories: education, construction, administration, transport, health sector, mining and agriculture. In addition, each occupational category had both males and females except for the transport industry which only had males.

Table 2: Summary of one-year LBP prevalence rates in developing countries

Author(s)	Population	Sample size	Study design	Tool	Gender	Age	One-year prevalence rate (%)
(Ganiyu et al., 2015), Nigeria	Healthcare professionals	151	Cross-sectional	Question-naire	F/M	NM	71.6
(Erick & Smith, 2014), Botswana	School teachers	1 747	Cross-sectional	Question-naire	F/M	NM	55.7
(Nkhata et al., 2015), Zambia	Nurses	267	Cross-sectional	Question-naire	F/M	NM	53.3
(Novitasari et al., 2016), Indonesia	Productive age	808	Cross-sectional	Question-naire	F/M	18-64	38.4
(Li et al., 2012), China	Industrial workers	7 200	Cross-sectional	Question-naire	F/M	$\geq$18	57.9

* NM-Not mentioned

2.3 Risk factors of low back pain

LBP risk factors are variables associated with an increased likelihood of the presence of LBP. As LBP is complex in nature because of the several factors contributing to its occurrence, three primary risk factor categories have been identified as: (a) individual factors such as age, gender and body mass index (BMI), (b) occupational factors such as force exertions, dynamic loads, static loads, peak loads, repetitive loads, vibration, climate and ergonomic environmental conditions (c) psychosocial factors such as low job control and low job satisfaction (Govindu & Babski-Reeves, 2014; Hildebrandt, Bongers, Van Dijk, Kemper, & Dul, 2001; Riihimäki, 1991; Vargas-Prada et al., 2013; Widanarko et al., 2011).

2.3.1 Individual risk factors

Epidemiological studies have demonstrated that individual factors such as gender, age and BMI are associated with higher musculoskeletal prevalence rates (Erick & Smith, 2014). Reports from some studies indicate that females are at a higher risk of LBP than males and attribute this to stress associated with hormonal changes, child bearing, osteoporosis and gynaecological problems (Carruth & Pryor, 2009; Hoy et al., 2012; Schneider, Randoll, & Buchner, 2006). Furthermore, females indulge in heavier house duties daily than males and this has been emphasized by some authors as the baseline for differences in prevalence of WRMDs between the two genders (Punnett & Herbert, 2000). A study on the prevalence and characteristics of LBP among the productive age in Jatinangor, Indonesia reported the presence of LBP in more than half of females (64.5%) (Novitasari et al., 2016). Similarly study results on LBP prevalence and associated factors in an Iranian population-based study revealed that the presence of LBP was associated with the female gender (O.R: 3.05) (Biglarian et al., 2012). Parallels could also be drawn to results of a study on correlates and predictors of LBP disability and its impact on health-related quality of life in Nigeria where the majority of females (70.6%) reported LBP (Okokon, John, Udonwa, Oku, & Asibong, 2016). Conversely, a study in Ireland found no correlation between gender and the presence of LBP amongst a population of farmers possibly because only a few women were involved in the study (Osborne et al., 2013).

Age is regarded as a common risk factor for LBP being associated with an increased prevalence as people enter their working years reaching its peak in the third decade (WHO, 2003). The general prevalence continues to steadily rise with age until age 60 to 65 years after which it gradually declines (Hoy et al., 2010). The third decade of life represent some of the most productive years of an individual's working life and the peak prevalence of LBP has major economic impact as it greatly affects the capacity for work (Hoy et al., 2012). The increasing prevalence after the third decade of life could be due to decreases in musculoskeletal function stemming from the occurrence of age linked degenerative disorders associated with muscle mass wasting, decreased tissue elasticity and joint cartilage thinning (Bernard, 1997; Erick & Smith, 2014). A productive age population study in Indonesia found that the age group 30 to 39 years old was most frequently found in the participants although the 50 to 59 years old age group reported the highest presence of LBP (48.7%) (Novitasari et al., 2016). The high occupational exposure in the early years of productive age coupled with degenerative diseases in the older population may account for the highest prevalence of LBP in the 50 to 59 age group (Novitasari et al., 2016).

In a study on the prevalence of LBP among rice farmers in a rural community in Thailand, the highest prevalence of LBP appeared in the youngest age ranging between 25 to 34 years (Nopkesorn & Supasit Pannarunothai, 2011). The highest prevalence rate recorded in the youngest farmers compared with older farmers may be attributed to poorer farming skills in the youngest farmers although in the same study no relationship was found between age and LBP (Nopkesorn & Supasit Pannarunothai, 2011). The lack of a relationship between age and LBP could be because the youngest age group recorded a small number of farmers since the majority of the younger generation prefers to work in urban cities instead of inheriting their parents' farms (Nopkesorn & Supasit Pannarunothai, 2011).

The BMI is regarded as being positively associated with chronic LBP (Biglarian et al., 2012). It is a ratio calculated using the formula weight (kg) / height (m^2). The World Health Organization (WHO) classifies underweight BMI to be <18.5, normal BMI to be between 18.5 to 24.9, overweight as BMI in the range 25 to 29.9, while obese is BMI ≥30 (WHO, 2015). Obesity increases shear or compressive force on the lumbar spinal structures when one is carrying out various activities, raising the spinal mechanical load putting the spine at risk of disc degeneration therefore may precipitate LBP (Biglarian et al., 2012; Foster, 2011; Hu, Chou, Chou, Chen, & Huang, 2009; Rapoport, Jacobs, Bell, & Klarenbach, 2004).

In addition, obesity is associated with an increased production of cytokines, acute-phase reactants, as well as the activation of pro-inflammatory pathways. Over the long-term, this may progress to systemic chronic inflammation that manifests as pain (Karppinen, 2007; Shiri, Karppinen, Leino-Arjas, Solovieva, & Viikari-Juntura, 2010; Tilg & Moschen, 2006). Results from a meta-analysis on the association between overweight, obesity and LBP show that the two are risk factors for LBP and also show a very strong association with chronic LBP and related disability (Shiri et al., 2010). Similarly, an Iranian national health survey had results which indicated that obesity is positively associated with the presence of LBP in adults (O.R: 1.62) (Biglarian et al., 2012). However, a Chinese working age population study did not find a significant association between BMI and LBP as most of the participants had BMI in the normal range (Li et al., 2012).

Occupation accounts for 37 percent of the world's LBP prevalence (Punnett et al., 2005). Prior studies have suggested occupations with low levels of manual labour were associated with lower than average prevalence of LBP (Hengel, Visser, & Sluiter, 2011; Szeto et al., 2009). Results from a study on the

Chinese working population suggested occupation by industry to be a related risk factor for LBP with manufacturing workers being the most affected possibly because the manufacturing industry is dominated by heavy physical work and awkward postures both of which are associated with LBP (Li et al., 2012). However, assessing the effect of occupation on each individual is difficult as different individuals in the same occupation execute different tasks, despite having a similar occupation hence they have different exposures (Manchikanti, 2000). In addition, an individual's ability to respond to occupational risk factors may be modified by his or her own capacity such as tissue resistance to coiling when left to increased force demands hence no similar symptoms are expected in individuals with the same work experience (Bernard, 1997). The level, period and recurrence of exposure coupled with adequacy of recovery time are critical components in whether increased tolerance or deconditioning occurs, with the latter more likely to lead to musculoskeletal diseases (Bernard, 1997).

2.3.2 Occupational risk factors

Musculoskeletal symptoms from ergonomic exposures at work are as a result of increased internal physical loads prompted by poor postures, movement patterns and high force exertions needed to perform the work duties (Hildebrandt et al., 2001). The Dutch Musculoskeletal Questionnaire (DMQ) is a tool widely used to analyse these harmful postures, forces and movements among the working population by seven homogenous indices: force exertions, dynamic loads, static loads, repetitive loads, ergonomic environmental condition, vibration, climatic factors as well as four independent questions on prolonged sitting, standing, walking and uncomfortable postures (Hildebrandt et al., 2001). Dichotomous answering categories 'Yes' or 'No' from the DMQ are used to indicate the presence or absence of an occupational risk factor without quantifying the amount of discomfort caused. It is a validated tool commonly used in worker populations by occupational health professionals to measure work-related musculoskeletal risk factors and symptoms in a standardized manner (Hildebrandt et al., 2001).

2.3.2.1 Force exertions and low back pain

Lifting, carrying, pushing, pulling, high physical exertion, force exertions are among the most demanding yet often repeated physical tasks common in several trades. These activities force the spine to sustain multiple stresses which include vertical compression, rotational torque and shear (Bullock, 1990; Wai et al., 2010b). In its upright position, the body is balanced with almost no muscular activity, however, during force exertions, the spine moves towards a more horizontal stance therefore compressive forces acting along the long axis of the spine build up (Rambabu & Suneetha, 2014).

Furthermore, all the structural elements of the trunk (ligaments, tendons, intervertebral discs, nerves, vertebrae of the lumbar spine, spinal ligaments and spinal muscles) take part in exertion. Therefore, they endure the stress increasing chances of muscle strain, nerve impingement, disc herniation and these changes may ultimately culminate in LBP (Bullock, 1990; van den Heuvel, Ariëns, Boshuizen, Hoogendoorn, & Bongers, 2004; Videman, Ojajärvi, Riihimäki, & Troup, 2005).

A case control study in China assessing risk factors of LBP among the Chinese occupational population found force exertions to be associated with LBP because of the constant and repeated loading of the spine during these activities which precipitates LBP (risk ratio:1.152) (Li et al., 2012). In China, the major industries include coal mining, manufacturing, steel making and transport all of which involve a great degree of force exertions(Li et al., 2012). Similar findings are also documented in a study conducted amongst a group of rice farmers in Ireland where lifting, pulling, pushing activities were reported as the most commonly attributable cause of LBP (Osborne et al., 2013). Excessive and repetitive loading of the spine during the activities of pushing, pulling or lifting have been reported as contributing to LBP (Yilmaz & Dedeli, 2014).

2.3.2.2 Dynamic loads and low back pain

Dynamic trunk loading has been reportable in literature as a potential cause of musculoskeletal disorders including LBP (Pedersen, Essendrop, Skotte, Jørgensen, & Fallentin, 2004). These intense flexion postures such as seen in pinching, stooping, sudden unexpected movements, reaching, bending and or twisting postures are typical in construction, mining, agricultural, healthcare and manufacturing industries (Bernard, 1997; Ganiyu et al., 2015). During dynamic loading, the spine is often in a flexion position. Extensive loading of the posterior spinal ligaments at sub-failure loads results in increased levels of pro-inflammatory cytokines suggesting acute inflammatory. Subsequently these changes become chronic if the loading continues and therefore culminate in WRMDs (D'Ambrosia et al., 2010).

The resulting work-related musculoskeletal symptoms are accelerated by the increased internal physical load on the spine caused by these potentially harmful postures and movements needed to carry out demands (Punnett et al., 2005). A review on the effects of dynamic loading on the intervertebral disc reports an association between high frequency loading and LBP (Chan, Ferguson, & Gantenbein-Ritter, 2011). A similar link also been demonstrated by a case control study in China assessing risk factors of LBP among the Chinese workers which found a positive relationship between LBP and dynamic loads (Li et al., 2012). Strong evidence associating dynamic trunk loading with low back injuries has also been reported in other studies (Marras, 2000; Salvendy, 2012). However, a recent review of evidence of the biological plausibility on the effects of occupational bending and or twisting in relation to injury of lumbar tissues is still limited (Kwon, Roffey, Bishop, Dagenais, & Wai, 2011).

Ballistic loading of the spine is also associated with tears of the spinal ligaments and is most commonly observed when one falls or slips (McGill & Stuart, 2015). Alternatively, ballistic loading can be experienced in the event of a traumatic sporting event with the spine at it end range of motion (McGill & Stuart, 2015). Consequently the joint laxity accelerates the rate of arthritic changes which ultimately result in back pain (Kirkaldy-Willis, Burton, & Cassidy, 1992).

2.3.2.3 Static muscle work and low back pain

Static muscle work as confirmed by a number of studies, is a significant postural health hazard in the work place and is precipitated by bent or twisted trunk posture (Ganiyu et al., 2015; McCrady & Levine, 2009; Pope, Goh, & Magnusson, 2002; Roffey, Wai, Bishop, Kwon, & Dagenais, 2010b; Shokunbi, 2014). It is suggested that these working postures can result in static loading of the soft tissues. The static muscle work rapidly fatigues muscles due to the concurrent constriction of blood vessels with an increased demand for oxygen and nutrients as well as the need to disperse the accumulating metabolites (Pelham, White, & Lee, 2005; Shokunbi, 2014).

The rapidly accumulating waste products cause muscle fatigue, discomfort, cramps, pain and also accelerate the rate of disc degeneration therefore precipitate WRMDs (Nutter, 1987). In Indonesia, a study on the working-age population revealed that static postures accounted for prolonged periods of physical activity during work which posed as a risk factor for LBP (Novitasari et al., 2016). Prolonged static work posture was associated with a 31 percent increase in odds of WRMD in a study on the prevalence and perceived contributing factors for WRMDs among nurses at the university teaching hospital in Lusaka, Zambia (Nkhata et al., 2015).

2.3.2.4 Repetitive motion and low back pain

Repetitive strain injuries describe the pain felt in muscles, nerves and tendons caused by working in the same postures, making the same movements and overuse frequently arising in adults of working age (Van Tulder, Malmivaara, & Koes, 2007). Occupational demands for very rapid repetitive movements with a high demand for precision and concentration raise psychological stress levels in the working individual. This adds to further muscular activity besides that induced by load moments therefore cause and or exacerbate symptoms of work-related musculoskeletal disorders (Bullock, 1990). Results from a case control study on possible ergonomic deficiencies in a Botswana textile factory support that exposure to repetitive tasks can lead to musculoskeletal disorders and repetitive strain injuries (Sealetsa & Thatcher, 2011).

2.3.2.5 Ergonomic environmental conditions and low back pain

Ergonomics is a science concerned with adjusting the work environment to suit the needs of the worker. It is thought that facilitating proper ergonomic design at work through designing an environment that limits awkward positioning of the body can prevent musculoskeletal disorders including LBP (Azodo, Ezeja, & Ehikhamenor, 2011; Luttmann, Jäger, Griefahn, Caffier, & Liebers, 2003; Salvendy, 2012)

Activities that involve poor ergonomics resulting in slips and falls or limited working space are thought to place undue stress on the spine and soft tissue structures (Campo, Weiser, Koenig, & Nordin, 2008). This in turn increases the intradiscal pressure therefore puts discs at risk of degeneration or herniation while simultaneously causing discomfort and pain in the soft tissue structures (Campo et al., 2008; van den Heuvel et al., 2004; Videman et al., 2005).

A number of studies have confirmed that knowledge and awareness of ergonomics at work are vital in preventing the development of WRMDs including LBP (Damanhuri, Zulkifli, Lau, & Zainuddin, 2014; Khan, Surti, Rehman, & Ali, 2012; Mahmud, Kenny, Zein, & Hassan, 2011).

2.3.2.6 Vibration and low back pain

Driving, whole body vibration and vibrating tools are suggested to contribute to the pathology of vertebral damage (Bernard, 1997). During healing, the induction of micro fractures at vertebral end plates with callus formation as well as the altered disc dimension under load may slow down the rate of nutrient diffusion (Johanning et al., 2006). In addition, vibration caused by mechanical overload resulting in continued compression and stretching of spinal structures may precipitate spinal muscle fatigue (Johanning et al., 2006).

2.3.2.7 Uncomfortable postures and low back pain

Uncomfortable postures exert abnormal pressures on the spinal ligaments and muscles which precipitates premature degeneration of intervertebral disc injuries therefore result in LBP (Helfenstein Junior, Goldenfum, & Siena, 2010). The association between LPB and awkward body positioning was found to be significant *($p< .001$)* in a Botswana study on LBP among school teachers (Erick & Smith, 2014). Parallels can be drawn to a study on among self-employed sewing machine operators in Nigeria which identified prolonged working in awkward positions to be among the most important risk factors for WRMDs (Maduagwu et al., 2015).

2.3.2.8 Sitting and low back pain

Currently sitting occupations are quite common partly due to nowadays service-oriented professions. It has been suggested that prolonged sitting exerts pressure on the vertebral discs, particularly the third lumbar vertebrae and reduces the lumbar lordosis causing an increase in muscular activity, ischial pressure and intradiscal pressure all of which may cause disc degeneration, disc rapture or herniation therefore potentially precipitates LBP (Sheeran, Sparkes, Caterson, Busse-Morris, & van Deursen, 2012). Supporting statistics report that one spends an average of 10 hours out of a 24 hour day seated making prolonged sitting a potentially significant static work hazard (McCrady & Levine, 2009; Roffey et al., 2010b).

2.3.2.9 Standing and low back pain

Standing is a physical action typically executed in several occupations (Roffey, Wai, Bishop, Kwon, & Dagenais, 2010c). Both biomechanical and observational studies have pointed out that prolonged standing may cause significant compression in vertebral endplate and intervertebral discs as well as raising the intradiscal pressure. Subsequently, these changes may trigger degeneration of discs (Claus, Hides, Moseley, & Hodges, 2008; Van Deursen, Van Deursen, Snijders, & Wilke, 2005; van Dieën & Toussaint, 1993; Wilke, Neef, Caimi, Hoogland, & Claes, 1999). Results from a cross-sectional study in Qatar on the prevalence and correlates of LBP in primary care revealed that prolonged standing had a significant effect on the presence of LBP (Bener, Dafeeah, & Alnaqbi, 2014). Conversely in the Chinese study on occupational population, standing for prolonged periods was not a risk factor for LBP (O.R<1) (Li et al., 2012). However, in the same Chinese study results from a univariate logistic analysis found standing to be a risk factor for LBP (O.R>1) indicating that there may have been interactions between standing and other variables (Li et al., 2012).

2.3.2.10 Walking and low back pain

Walking is a physical act typically executed among a wide range of jobs (Roffey et al., 2010c). Both biomechanical and observational studies have pointed out that prolonged walking may cause significant compression in vertebral endplate and intervertebral discs as well as raising the intradiscal pressure. These changes potentially trigger degeneration of discs (Claus et al., 2008; Van Deursen et al., 2005; van Dieën & Toussaint, 1993; Wilke et al., 1999).

Despite the abundant literature linking occupational risk factors to LBP, not all workers performing similar tasks develop the same injuries. Previous studies have confirmed that LBP is a common condition in both heavy and light manual workers (Govindu & Babski-Reeves, 2014). Therefore it gives rise to the notion that other factors such as psycho-social factors should be taken into account when determining risk factors for LBP (Burton & Erg, 2005; Govindu & Babski-Reeves, 2014; Harcombe, McBride, Derrett, & Gray, 2010; Widanarko et al., 2011).

2.3.3 Psychological risk factors

Psychosocial work conditions including work demands, dominion, autonomy, work organization, social support and work satisfaction may play an important role for workers with musculoskeletal disorders (Bongers, de Winter, Kompier, & Hildebrandt, 1993). It is believed that a combination of low job control, low social support, high psychological demands and high perceived workloads may cause psychosocial job strain (Claiborne, Vandenburgh, Krause, & Leung, 2002). The resulting impacts are manifested through insomnia, irritability, anxiety and depression and these ultimately affect an individual's capability to work effectively (Claiborne et al., 2002; Elders & Burdorf, 2001). The next section focuses on the resulting LBP disability.

2.4 Measuring the level of back-related disability

The effect of pain on an individual's daily functioning can be expressed as a one's disability level therefore disability is viewed as a core outcome measure in LBP (Lin et al., 2011). The WHO classification of Functioning, Disability and Health (ICF), regards disability as a broad term encompassing body functions and structures, activity limitations, and participation restrictions (WHO, 2007).

Questionnaires on LBP-related disability are centred on reduced performance capability, and altered performance of ADLs and other health limitations (Grotle, Brox, & Vøllestad, 2005). The Roland-Morris Disability Questionnaire (RDQ) is a tool specifically developed for patients with LBP that is designed to measure the level of disability grounded on their perception of pain and related dysfunction (Roland & Morris, 1983). It is self-administered with 24 questions inferring the level of disability as reflected by an individual's physical ability, rest patterns, psychosocial factors, household management, eating habits and frequency of pain (Stevens et al., 2016).

The scoring is based on the number of items ticked by a patient out of the 24 points (Davidson, 2014). Each ticked item receives a score of one with scores ranging from 0 (no disability) to 24 (maximum possible disability) and the higher the score, the greater the level of disability (Davidson, 2014). The RDQ is easy to understand, widely used, available in several languages and is the most validated outcome measure for LBP (Stevens et al., 2016). The RDQ has sound psychometric properties, as reflected by its responsiveness and internal consistency, reporting estimated Cronbach's alpha coefficient values between 0.84-0.93 (Hsieh, Phillips, Adams, & Pope, 1992; Järvikoski et al., 1993; Kopec & Esdaile, 1995). These coefficient values are good as they lie within the recommended range of 0.7-0.9 (Roland & Fairbank, 2000).

2.5 Summary

The chapter reviewed critical aspects regarding occupational LBP amongst workers, epidemiological details of LBP in both developed and developing countries, as well as occupational risk factors. Highlighted also in this chapter are the effects of LBP on the worker with regards to direct and indirect costs. However, throughout the literature review process, it has become increasingly evident that limited evidence exists on occupational risk factors for LBP and the resulting disability in developing countries. The current study was descriptive in nature with the purpose of adding to current literature and creating a sound foundation for future research surrounding the topic. This was accomplished by using a self-administered structured questionnaire, which is discussed in Chapter 3 together with other constructs such as study setting, sample size as well as statistical analysis procedures.

CHAPTER 3. METHODOLOGY

3.1 Introduction

This chapter describes the research design, setting, target population, inclusion criteria, exclusion criteria, sampling method and sample size. It also provides an overview of data collection tools, procedures and pilot study results.

Table 3: Study objectives and methods

Objectives		Method
1	To describe the demographic profile of the study participants.	Questionnaire
2	To determine the extent of sick absenteeism related to occupational LBP.	
3	To establish the level of back-related disability through the Roland-Morris Disability Questionnaire among the patients in the study setting.	
4	To determine the relationship between the occupational risk factors for LBP and the level of LBP disability among the study participants using statistical analysis.	Statistical analysis
5	To determine the relationship between the demographic profile of the study participants and the level of back-related disability using statistical analysis.	

3.2 Research design

A quantitative, descriptive, cross-sectional study design was utilised in this study. The quantitative paradigm is characterised by its emphasis on measurement (Russel, Carter, Lubinsky, & Domholdt, 2005). It is also based on the notion that one can only be certain of knowledge which is verifiable through measurement and observation. Descriptive studies seek, amongst others, quantify the extent of the problem and to describe extensively the current state of the situation of a particular aspect of health (Joubert, Ehrlich, Katzenellenbogen, & Abdool Karim, 2007).

3.3 Research setting

The study was conducted in Gaborone, the administrative capital and economic hub of Botswana with a population of approximately 232 000. The study was conducted at the Ergo-Physiotherapy Clinic, a place close to where the researcher is employed. The site was chosen due to the researcher having an appreciable relationship with the physiotherapist at the clinic and who had also shown interest in this study. This clinic was established in 1999 and is based at Medswana house which is a medical centre with a variety of healthcare experts offering a range of medical services. Most patients coming to Ergo-Physiotherapy Clinic therefore have diverse backgrounds since they are diagnosed and referred by the various in-house physicians and consultants as well as other medical practices across Gaborone.

3.4 Study population and study sample

The study population was all patients with occupational LBP attending private physiotherapy at Ergo-Physiotherapy Clinic in Gaborone. The study sample comprised a voluntary sample of participants between the ages of 18 to 65 years who attended the clinic during the time of the study and agreed to participate.

3.4.1 Sampling method and sample size

Non-probability convenience sampling was used. The participants were recruited over two weeks and a sample size of 119 was reached.

The sample size was calculated using the formula below.

$$n = \frac{1.96^2 p(1-p)}{d^2}$$

From the formula, *n* is considered to be the sample size, *p* represents the population proportion and *d* represents the margin of error. Taking the unknown value of *p* to be 0.5 and the margin of error to be 10%, using the formula above, sample size was determined to be 96. Assuming an 80% response rate, adjustments were made and the sample size was calculated to be 119.

3.4.2 Inclusion criteria

All the patients with a Doctor's referral who were receiving physiotherapy treatment for occupational LBP at Ergo-Physiotherapy Clinic and between the ages of 18 to 65 years which is the legal working age in Botswana were included in the study.

3.4.3 Exclusion criteria

All patients who were presenting with LBP due to pregnancy, congenital deformities of the spine (e.g. spina bifida, congenital scoliosis, and congenital kyphosis), connective tissue disorders (e.g. cellulites, scleroderma), age-related conditions (e.g. osteoarthritis of the spine, lumbar spondylosis), malignancy

(e. g spinal tumours) and infectious diseases of the spine (disc space infection, tuberculosis of the spine) were excluded from the study.

3.5 Data collection tools

The height of the participants was measured using a tape measure in meters while a calibrated bathroom scale was used to measure their weight in kilograms. The calibration button was then turned on until the scale read zero. Known weights which were 2 kg dumbbells were placed on the scale. The researcher then waited for the scale to record the weights, then turned off the calibration button. The scale was then switched off to restart and that is how the calibration was done. In addition, their height were also measured in a standing position with shoes removed and each participant recorded his or her height accordingly. The participants recorded their measured height and weight which were used to calculate their BMI by the researcher using the formula weight (kg)/height (m^2) (WHO, 2015).

3.6 Data collection instrument

Further data collection was by means of a self-administered questionnaire (Appendix F) which was made up of three sections and took approximately 15 minutes to be completed. To address objective 1, consenting participants were invited to fill in the rest of their demographic details on age, BMI, gender, duration of employment which comprised Section A of the questionnaire. For objective 2, participants were asked to indicate days they missed worked due to occupational LBP under Section A in order to determine the extent of sick absenteeism-related to LBP.

To tackle objective 3, patients were required to complete the Roland-Morris Disability Questionnaire in Section B, (Appendix F) to establish their level of back-related disability according to the number of responses ticked. The RDQ consisted of 24 statements on back-related disability from the Roland-Morris Disability Questionnaire (Roland & Morris, 1983). It is designed to measure limitations encountered by an individual with back pain based on how the individual is feeling on that particular day (Davidson, 2014). The participant only ticks a sentence if that particular sentence describes how the participant feels based on that day with the total score being the sum of positive responses out of 24 and the higher score the greater the disability (Davidson, 2014).

To address objective 4, individuals were requested to complete Section C (Appendix F) of the questionnaire to indicate the occupational risk factors for LBP that they were constantly exposed to in the workplace which were used to determine the relationship between these occupational risk factors and LBP disability using statistical analysis. The 39 questions were obtained from the Dutch Musculoskeletal Questionnaire (DMQ) (Hildebrandt et al., 2001). The DMQ distinguishes a large number of potentially harmful postures, movements, force-exertions, potentially hazardous working conditions and the resulting various work-related musculoskeletal symptoms. In it are different sections which address individual factors, the psychosocial aspect as well as the musculoskeletal workload for a variety of musculoskeletal conditions (Bernard, 1997). However, for the purposes of this study, only questions that focused on the occupational risk factors for LBP were included. Questions on the climatic, psychosocial factors and risk factors for other musculoskeletal conditions were excluded.

Section C of the questionnaire for this study therefore only had 39 questions from the DMQ section on musculoskeletal workload. The 39 questions were categorized into six potentially hazardous workloads and four independent questions namely: Force exertions, dynamic loads, static loads, repetitive loads, ergonomic environmental conditions, vibration, uncomfortable postures, sitting, standing, walking (Hildebrandt et al., 2001). Dichotomous answering categories 'Yes' or 'No' were used to indicate the presence or absence of a risk factor without quantifying the amount of discomfort caused.

To address objective 5, demographic information of participants and results from the RDQ on LBP disability were used to determine the relationship between them by performing statistical analysis.

3.6.1 Validity and reliability

Validity refers to whether the research accurately measures that which it is intended to measure (Joppe, 2000). Reliability refers to the extent to which a research instrument consistently has the same results in the same situation on repeated occasions (Joppe, 2000). The Dutch Musculoskeletal Questionnaire has been found to be reliable with a Cronbach's alpha value of more than 0.80 (Hildebrandt et al., 2001). It is a validated tool commonly used in both developed and developing countries in the general population among various occupational groups to measure work-related musculoskeletal risk factors and symptoms in a standardized manner (Hildebrandt et al., 2001; Li et al., 2012). Its choice of potentially harmful postures, movements, force exertions and hazardous working variables was founded on available epidemiological literature reviews to ensure optimal content validity (Ariens, van Mechelen, Bongers, Bouter, & van der Wal, 2000; Bernard, 1997; Hoogendoorn, van Poppel, Bongers, Koes, & Bouter, 1999).

From the 136 Sickness Impact Profile questions (SIP), the RDQ with its 24 'because of my back' statements was developed based on their ability to assess disability secondary to LBP therefore a tool specifically for patients with LBP was developed and validated (Bergner, Bobbitt, Carter, & Gilson, 1981; Roland & Morris, 1983). Further research on LBP supports the use of the RDQ as a 'core outcome measure' making it the most validated disability questionnaire hence its widespread use in various studies which is also compounded by its availability in a number of translated languages, its simplicity and effortless scoring making it easy to administer (Deyo et al., 1998; Deyo & Centor, 1986; Frymoyer, Nelson, Spangfort, & Waddell, 1991; Lankhorst, Van de Stadt, Vogelaar, Van der Korst, & Prevo, 1981; Nusbaum, Natour, Ferraz, & Goldenberg, 2001; Smeets, Köke, Lin, Ferreira, & Demoulin, 2011). The RDQ has been used in a rural community in Thailand to measure disability levels among rice farmers in Thailand (Nopkesorn & Supasit Pannarunothai, 2011). It has also been used in India to measure disability levels among pondicherry drivers (Jaiswal, 2013).

Though the test–retest reliability of the RDQ is good, it is somewhat complicated since this instrument is designed to highlight short-term changes in a well-known to be ever changing condition (Roland & Fairbank, 2000). Therefore, usually in periods where test-retest intervals are short, correlations between two sets of scores are higher than when the test-retest interval is long such as in the case of same day scores versus one week scores (Roland & Fairbank, 2000). Roland-Morris (1983) report same day test–retest correlations to be 0.91 while Johansson and Lindberg (1998) report one-week test-retest correlations of 0.88 and because of its sound psychometric properties, as reflected by its responsiveness and internal consistency, the RDQ reports estimated Cronbach's alpha coefficient values between 0.84-0.93 (Hsieh et al., 1992; Järvikoski et al., 1993; Kopec & Esdaile, 1995). These coefficient values are good as they lie within the recommended range of 0.7-0.9 (Roland & Fairbank, 2000).

To determine the face validity of the tool, four academic staff from the University of Botswana were consulted to get feedback on how to improve the suitability of the tool, the kind of questions posed, as well as the structure of the instrument. However, they agreed with the structure and content of the questionnaire therefore no changes were warranted.

3.7 Pilot study

Piloting involves executing a smaller scale study whose results would help to design a further substantiating study (Arain, Campbell, Cooper, & Lancaster, 2010). Furthermore, a pilot study serves to test a questionnaire's face validity, its suitability as well as to provide an estimation of the rate at which study participants are recruited (Thabane et al., 2013). For this study, a pilot study was undertaken in order to determine the time taken to complete the questionnaire, to ascertain whether the participants understood the questionnaire, and to allow the researcher to test its suitability to the current study. The pilot study was conducted on ten patients presenting with LBP at Ergo-Physiotherapy Clinic and as no alterations were necessitated, their responses were included in the main study. The completion of the questions, as described above, generally did not give any problems, even in less educated worker groups and the self-administered questionnaire completion took about 15 minutes.

3.8 Internal validity

Social desirability

Social desirability bias occurs when participants respond to questions in a manner that is deemed socially acceptable rather than answering honestly. In order to reduce this form of bias the questionnaire is anonymous and self-administered hence; participants are not linked to their responses. Therefore participant privacy and confidentiality is assumed to reduce social desirability bias.

Recall bias

The use of a self-administered questionnaire introduces recall bias inherent to this type of data collection, likely to lead to an over-estimation of more recent and serious back-related disability.

Response bias

Response bias in questionnaire studies may occur due to leading and ambiguous questions. In order to reduce information bias, the researcher consulted four academic staff from the University of Botswana to get feedback on how to improve the suitability of the tool, the kind of questions posed, as well as the structure of the instrument. However, they agreed with the structure and content of the questionnaire therefore no changes were warranted.

3.9 External validity

The study may lack external validity as the study sample is restricted to one private physiotherapy clinic in Gaborone Botswana and findings may not be generalizable to other private practices in the general population in Botswana.

3.10 Data collection process

The researcher obtained ethical clearance (Appendix A) from the University of Kwa-Zulu Natal as well as permission to conduct the study from the Ministry of Health and Wellness, Botswana, Health Research and Development Division (Appendix B). Thereafter, the researcher wrote to the management at Ergo-Physiotherapy Clinic asking for permission to engage with patients from the clinic (Appendix C). Both clearance letters from University of Kwa-Zulu Natal (Appendix A) and the Ministry of Health Botswana, Health Research and Development Division (Appendix B) together with copies of the project proposal are enclosed.

Upon gate keeper's approval (Appendix D) the study participants were conveniently recruited. During the two weeks of the study, the receptionist helped with the screening of patients in the waiting area. The receptionist checked for the diagnosis and age of the patients from the patient's referral forms issued by the referring doctors. The patients who fit the criterion were told about the study and introduced to researcher. They had the study purpose, foreseeable potential benefits to the individual or others as well as potential discomforts or risks of the study explained. Participants were also informed of their right to withdraw at any time without suffering penalty. They were also informed that no names or any identifying information would be contained in the questionnaire to maintain confidentiality at all times and upon agreement to participate in the study, the participants were requested to sign the informed consent form (Appendix E), of which a copy was provided to them. Participants were taken to a quiet room at the clinic and were requested to remove their shoes, empty their pockets and any heavy jacket or jersey, after which they were weighed, with the results being provided to them so they could record on their questionnaires. Further data collection to fill in the rest of the self-administered questionnaire (Appendix F) then followed in the absence of the researcher to give the patients privacy.

3.11 Data analysis

The data was coded and entered into SPSS version 24.0 for analysis. The data cleaning process was carried out to check for outliers and incorrect entries. The categorical data on demographic characteristics, absenteeism from work due to LBP and level of LBP disability was analysed using descriptive statistics and presented in tables (objectives 1, 2 and 3). Data to establish back-related disability was presented in a table showing the response rates from the RDQ. Furthermore, the responses were grouped according to level of back-related disability classified as *mild, moderate or severe disability* depending on the 0 to 24 scoring of the RDQ and presented in a table. For the purpose of this study, the variable level of disability was categorised as follows; 0 to 8 scores on the RDQ as minor level of LBP disability, 9 to 16 scores as moderate levels of back-related disability and 16 to 24 scores as severe levels of LBP disability

The 39 variables for occupational risk factors were categorized into six potentially hazardous workloads and four independent questions namely:

Force exertions: lift heavy weights more than 5 kg, pull heavy weight more than 5 kg, carry heavy loads more than 5kg, lift in an awkward posture, lift with load far from the body, lift with a twisted trunk, lift with the load above chest height, lift a load that is hard to hold, lift a very heavy load more than 20 kg, perform short but maximal force exertions, exert great force on tools and machinery, work being physically taxing.

Static loads: stoop for a prolonged time, work in a slightly bent posture for prolonged time, work in a heavily bent posture for prolonged time, work in a slightly twisted posture for a prolonged time, work in a heavily twisted posture for a long-time.

Dynamic loads: bend slightly with trunk, bend heavily with trunk, twist slightly with trunk, twist heavily with trunk, twist and bend with trunk, work in a bent and twisted posture for a prolonged time, make sudden unexpected movements.

Repetitive loads: work in the same posture for long, always make the same movements with your trunk most of the work day.

Ergonomic environmental conditions: not enough room around to perform work, not enough room above to perform work, difficulty in exerting enough force because of uncomfortable postures, too few facilities to lean on during work, trouble in reaching things with tools, sometimes slip or fall during work.

Vibration: experiencing noticeable mechanical vibrations or shocks during work, carry vibrating tools during work, drive vehicles during work.

Four independent risk factors: work in uncomfortable postures, stand for prolonged time at work, sit for prolonged time, and walk for prolonged time at work. The above 39 variables were assessed using the Pearson chi-square test to determine associations between them and the *level of back-related disability* (objective 4).

Additional tests to determine the relationship between the *demographic profile* of the study participants and *the level of back-related disability* using univariate logistic regression were conducted with a *p-value* less than *.05* being considered significant (objective 4). The *mild* and *moderate* categories indicating the *level of back-related disability* were combined to represent the *minor back-related disability category,* while the second category remained as is representing *severe back-related disability. These two categories were then used* as the binary response variable. Univariate logistic regression was fitted for the risk factors that were significant in test of associations as covariates and the binary variable as the dependant variable to obtain the odds ratios.

Univariate logistic regression analysis was used to determine the relationship between the demographic characteristics; *age, gender, BMI* as well as *occupation* and *the level of back-related disability* with a *p-value* less than *.05* being considered significant (objective 5).

3.12 Data management and storage

All gathered data and information was kept strictly confidential and was only accessed by the researcher, the statistician and the research supervisor. All collected questionnaires were safely locked up in a cupboard for security, and a back-up system was set up off site.

3.13 Ethical considerations

Upon obtaining written permission by the Biomedical Research Ethics Committee of the University of KwaZulu-Natal (Appendix A), the researcher sought permission from the Ministry of Health and Wellness Botswana, Health Research and Development Division (Appendix B). Permission was also obtained from management at Ergo-Physiotherapy Clinic (Appendix D), Medswana House, Gaborone after which the study commenced. The study purpose, potential benefits to the participants and others, as well as potential discomforts or risks of the study were explained to participants verbally and written on the consent form (Appendix E). Participants were informed of their right to withdraw at any time without suffering any penalty, and that no names or any identifying information would be contained in the questionnaire to maintain confidentiality at all times. The forms were signed voluntarily as a way of showing their willingness to be part of the study.

3.14 Summary

This descriptive study undertaken at Ergo-Physiotherapy Clinic at Medswana House in Gaborone entailed the use of a structured questionnaire from consenting participants to gather data on risk factors for LBP which was analysed statistically. The results obtained are presented in Chapter 4.

CHAPTER 4. RESULTS

4.1 Introduction

This chapter presents the results of the study with respect to the five objectives:

Objective 1: To describe the demographic profile of the study participants.

Objective 2: To determine the extent of sick absenteeism-related to occupational LBP.

Objective 3: To establish the level of back-related disability through the RDQ among the patients in the study setting.

Objective 4: To determine the relationship between the occupational risk factors and the level of back-related disability among the study participants using statistical analysis.

Objective 5: To determine the relationship between the demographic profile of the study participants and the level of back-related disability using statistical analysis.

4.2 Demographic profile of the study participants

With respect to objective 1, the demographic profile of the study participants, all the 119 participants responded giving a 100% response rate, however, one participant did not indicate his occupation category, and was therefore excluded from the demographic analysis of participants by occupation leaving 118 questionnaires. Table 4 displays the demographic data such as gender, age, BMI, occupation category and years of work experience of the participants provided as percentages and numbers. Of the 119 participants, most were between the ages of 31 to 40 years. There were 62 were females (52%). The males had a mean age of 45.82 (SD=10.8) years which was higher than females who had a lower mean age of 35.85 (SD=9.742) years. Most of the participants were overweight (43.7%) or obese (30.3%), with only 0.8 percent being underweight.

In terms of occupation category, 28.0 percent belonged to the administration category whereas only 5.9 percent were in the mining field. One participant did not specify his occupation category, hence the occupation analysis was based on 118 participants. The majority of the participants had from the 10 to 19 years of work experience category (35.3 %) closely followed by those who worked for less than 10 years (31.1%), with very few having worked at least forty years (6.7%).

Table 4: Participants' demographic profile (n=119)

Variable	No.	%	Variable	No.	%
Age group			**Occupation category**		
>20	1	0.8	Administration	33	28.0%
21-30	26	21.8	Agriculture	21	17.8%
31-40	40	33.6	Education	21	17.8%
41-50	21	17.6	Construction	14	11.9%
51-60	28	23.5	Health	13	11.0%
≥61	3	2.5	Transport	9	7.6%
Gender			Mining	7	5.9%
Females	62	52%	Missing	1	0.8%
Males	57	48%			
BMI			**Work experience**		
Under weight	1	0.8%	<10	37	31.1%
Normal weight	30	25.2%	10-19	42	35.3%
Overweight	52	43.7%	20-39	32	26.9%
Obese	36	30.3%	≥40	8	6.7%

4.3 Extent of sick absenteeism from work due to occupational LBP

Table 5 shows the extent of sick absenteeism from work due to occupational LBP, and out of the 119 participants, 68 (57.2 %) reported that they were absent from work for more than three days either at once or intermittently in the past year (objective 2).

Table 5: Extent of sick absenteeism from work due to occupational LBP over the past year

Absenteeism	Number (%)
Never	27 (22.7)
1-2	24 (20.2)
3-7	36 (30.3)
more than 7 days	32 (26.9)
Total	119 (100)

4.4 Level of back-related disability of the patients presenting with occupational LBP

To establish the level of back-related disability of the patients presenting with occupational LBP, the RDQ was utilised (objective 3).

4.4.1 Roland-Morris Disability Questionnaire response rate

The positive response rate to each item on the RDQ is shown in Table 6, high positive responses were found in the following questions: *I change position frequently to try and get my back comfortable* (89.1 %), *I sleep less well on my back* (58.8%), and *I find it difficult to turn over in bed because of my back* (47.1%).

Table 6: Positive response rates among participants with LBP by the Roland-Morris Disability Questionnaire (n=119)

Response	No.	%
I stay at home most of the time because of my back	27	22.7
I change position frequently to try and get my back comfortable	106	89.1
I walk more slowly than usual because of my back	25	21.0
Because of my back I am not doing any of the jobs that I usually do around the house	31	26.1
Because of my back, I use a handrail to get upstairs	12	10.1
Because of my back, I lie down to rest more often	30	25.2
Because of my back, I have to hold on to something to get out of an easy chair	24	20.2
Because of my back, I try to get other people to do things for me	17	14.3
I get dressed more slowly than usual because of my back	14	11.8
I only stand for short periods of time because of my back	25	21.0
Because of my back, I try not to bend or kneel down	30	25.2
I find it difficult to get out of a chair because of my back	18	15.1
My back is painful almost all the time	53	44.5
I find it difficult to turn over in bed because of my back	56	47.1

My appetite is not very good because of my back pain	6	5.0
I have trouble putting on my socks (or stockings) because of the pain in my back	28	23.5
I only walk short distances because of my back	21	17.6
I sleep less well on my back	70	58.8
Because of my back pain, I get dressed with help from someone else	7	5.9
I sit down for most of the day because of my back	17	14.3
I avoid heavy jobs around the house because of my back	28	23.5
Because of my back pain, I am more irritable and bad tempered with people than usual	9	7.6
Because of my back, I go upstairs more slowly than usual	15	12.6
I stay in bed most of the time because of my back	26	21.8

4.4.2 Distribution of the level of back-related disability

Table 7 shows the level of back-related disability amongst the participants. Of the 119 participants, 95 (79.8 %) reported *minor back-related disability*, while only 13 (10.9%) reported *severe back-related disability*. For the purpose of this study, the variable *level of back-related disability* was categorised as follows; 0 to 8 scores on the RDQ as minor level of back-related disability, 9 to16 scores as moderate levels of back-related disability and 16 to 24 scores as severe levels of back-related disability.

Table 7: Distribution of the level of back-related disability

Level of back-related disability	Count (%)
Minor	95 (79.8)
Moderate	11 (9.2)
Severe	13 (10.9)
Total	119 (100)

4.5 Relationship between demographic profile of the study participants and the level of back-related disability

To determine the relationship between demographic profile of the study participants and the level of back-related disability, a univariate logistic regression analysis was conducted (objective 4) and the results are represented in Table 8. From the results, the odds of having severe back-related disability are increased approximately 163 % for females which was statistically significant *(p-value= .043613).* On the other hand, age and BMI were not significant factors in determining the level of back-related disability. From the table, taking the experience of 40 years and above as the reference category, the odds of having severe back-related disability is reduced 423% *(p-value=.018492),* 598% *(p-= .005787)* and 188% *(p= .414357)* for participants with an experience of less than 10 years, 10 to 19 years and 20 to 39 years respectively which were all significant. However the odds were not significant for the age group between 40 and 49 years.

Table 8: Univariate logistic regression of the level of back-related disability and demographic covariates

Covariates		Odds ratio	***p-value***
Gender	Male (reference category)		***<0.001***
	Female	2.634146341	***.043613***
Age	Age 50 and above(reference category)		***.002922***
	Age below 30	0.210526316	***.027965***
	Age 30 to 39	0.136752137	***.001491***
	Age 40 to 49	0.156862745	***.024207***
Experience	Experience 40 years and above (reference category)		***.019866***
	Experience less than 10 years	0.236111111	***.018492***
	Experience 10 to 19 years	0.166666667	***.005787***
	Experience 20 to 39 years	0.53125	***.414357***
BMI	Obese (reference category)		***.240101***
	Underweight	<0.001	***.999595***
	Normal weight	0.229665072	***.075532***
	Overweight	0.447552448	***.130867***
Occupation	Agriculture (reference category)		***0.28854***
	Health	<0.001	***.998489***
	Construction	0.3	***.124769***
	Transport	<0.001	***.998743***
	Mining	0.44	***.384413***
	Education	0.258823529	***.055879***
	Administrative	0.196428571	***.012715***

4.6 Occupational risk factors amongst individuals presenting with LBP

Seven relationships were explored to determine the occupational risk factors with respect to the level of back-related disability, these being: *force exertion; static, dynamic and repetitive loads; ergonomic environmental conditions, vibration* and *four independent* risk factors (Objective 5).

4.6.1 Associations between force exertions and the level of back-related disability

Table 9 displays the associations between risk factors classified as *force exertions* and the *level of back-related disability*, according to the RDQ, with the respective tests for associations. Most participants (n=45) reported having minor levels of back-related disability with the variable *work being physically taxing*. All the *force exertions* variables were statistically significant, with *p-values <.05*.

Table 9: Associations between force exertions and the level of back- related disability

Force exertion risk-factors		Level of back-related disability counts				***p-value***
		Minor	Moderate	Severe	Total	
Lift heavy weights more than 5 kg	No	58	1	7	66	
	Yes	37	10	6	53	***.005****
Pull heavy weight more than 5 kg	No	57	1	7	65	
	Yes	38	10	6	54	***.006****
Carry heavy loads more than 5 kg	No	61	1	7	69	
	Yes	34	10	6	50	***.002****
Lift in an awkward posture	No	57	1	6	64	
	Yes	38	10	7	55	***.005****
Lift with load far from the body	No	63	1	6	70	
	Yes	32	10	7	49	***.001****
Lift with a twisted trunk	No	61	1	5	67	
	Yes	34	10	8	52	***.001****

Lift with the load above chest height	No	64	3	6	73	
	Yes	31	8	7	46	***.017****
Lift a load that is hard to hold	No	64	1	6	71	
	Yes	31	10	7	48	***.001****
Lift a very heavy load more than 20 kg	No	65	3	6	74	
	Yes	30	8	7	45	***.013****
Perform short but maximal force exertions	No	64	2	6	72	
	Yes	31	9	7	47	***.004****
Exert great force on tools and machinery	No	70	2	6	78	
	Yes	25	9	7	41	***<.001****
Work being physically taxing	No	50	1	5	56	
	Yes	45	10	8	63	***.019****

***The Chi-square statistic were interpreted as significant at the .05 level.**

4.6.1.1 Relationship between force exertions and the level of back-related disability

Table 10 displays the odds ratios between *force exertion* risk factors and the *level of back-related disability*. From the results, all the fore exertion risk factors increase the risk of having a severe back-related disability as all are significant at the 5% level of significance. The odds of having severe back-related disability are increased by about 5.6 folds when one is exposed to exerting great pressure on tools and machinery whereas the odds are increased by about 5.382 and 5.014 when one is exposed lifting with a twisted trunk and lifting a load that is difficult to hold respectively.

Table 10: Relationship between force exertions and the level of back- related disability

Force exertion risk factors	Odds ratio	***p-value***
Lift heavy weights (more than 5 kg)	3.135	***.018***
Pull heavy weight (more than 5 kg)	3.000	***.022***
Carry heavy loads (more than 5 kg)	3.588	***.008***
Lift in an awkward posture	3.643	***.009***
Lift with the load far from the body	4.781	***.002***
Lift with a twisted trunk	5.382	***.001***
Lift a load that is hard to hold	5.014	***.001***
Lift a very heavy load (more than 20 kg)	3.611	**.007**
Perform short but maximal force exertions	4.129	**.003**
Exert great force on tools and machinery	5.600	**.000**
Work physically taxing	3.333	**.019**

4.6.2 Associations between static loads and the level of back-related disability

Table 11 shows the associations between *static loads* risk factors and the *level of back-related disability*, and out of the 119 respondents, 83 reported to *stand for prolonged periods* at work. The lowest number of respondents reported to *work in a heavily twisted posture for prolonged time* (n=33). The conducted tests for associations between *static loads* and the *level of back-related disability* were significant for the variable *stoop for a prolonged time (p=.035).*

Table 11: Associations between static loads and the level of back-related disability

Static loads risk factors		Level of back-related disability counts				***p-value***
		Minor	Moderate	Severe	Total	
Stoop for a prolonged time	No	51	2	4	57	
	Yes	44	9	9	62	***.035****
Work in a slightly bent posture for prolonged time	No	49	6	7	62	
	Yes	46	5	6	57	***.974***
Work in a heavily bent posture for prolonged time	No	70	5	7	82	
	Yes	25	6	6	37	***.074***
Work in a slightly twisted posture for a prolonged time	No	72	6	10	88	
	Yes	23	5	3	31	***.305***
Work in a heavily twisted posture for a long-time	No	73	5	8	86	
	Yes	22	6	5	33	***.058***

***The Chi-square statistic were interpreted as significant at the .05 level.**

4.6.2.1 Relationship between static loads and the level of back-related disability

Table 12 shows the odds ratios between static risk factors and the level of back-related disability. The odds of having a severe back-related disability when one is exposed to stooping for prolonged time is increased by about 3.477 folds.

Table 12: Relationship between static loads and the level of back-related disability

Static loads risk factor	Odds ratio	***p-value***
Stoop for a prolonged time	3.477	**.015**

4.6.3 Associations between dynamic loads and the level of back-related disability

Table 13 shows the tests for associations between the *dynamic load* risk factors and the *level of back-related disability*, and of the 119 respondents, 65 reported to bend slightly with their trunk during work, while the least number of participants reported to be exposed to twisting heavily with their trunk during work (n=32). From the tests for association between the *dynamic load* risk factors and the *level of back-related disability,* statistically significant associations were found between: *twist heavily with trunk (p=.043*), *twist and bent with trunk (p=.044), work in a bent and twisted posture for prolonged time (p=.028)* and *make sudden unexpected movements (p=.003).*

Table 13: Associations between dynamic loads and the level of back-related disability

Dynamic loads risk factors		Level of back-related disability counts				***p- value***
		Minor	Moderate	Severe	Total	
Bend slightly with trunk	No	39	6	9	54	***.130***
	Yes	56	5	4	65	
Bend heavily with trunk	No	69	5	7	81	***.095***
	Yes	26	6	6	38	
Twist slightly with trunk	No	69	7	10	86	***.757***
	Yes	26	4	3	33	
Twist heavily with trunk	No	74	5	8	87	***.043****
	Yes	21	6	5	32	
Twist and bend with trunk	No	58	3	5	66	***.044****
	Yes	37	8	8	53	
Work in a bent and twisted posture for a long time	No	64	3	7	74	***.028****
	Yes	31	8	6	45	
Make sudden, unexpected movements	No	66	2	7	75	***.003****
	Yes	29	9	6	44	

***The Chi-square statistic were interpreted as significant at the .05 level.**

4.6.3.1 Relationship between dynamic loads and the level of back-related disability

Table 14 displays the odds ratios between *dynamic loads* risk factors and the *level of back-related disability*. The odds are increased by about 3.79 (*p-value=0.005*) and 3.14 (*p-value=0.017*) when one is exposed to making sudden, unexpected movements and twisting and bending with trunk respectively.

Table 14: Relationship between dynamic loads and the level of back-related disability

Dynamic loads risk factors	Odds ratio	***p-value***
Twist heavily with trunk	2.981685	***.022422***
Twist and bend with trunk	3.135135	***.017619***
Work in a bent and twisted posture for a prolonged time	2.890322	***.023427***
Make sudden, unexpected movements	3.793103	***.005179***

4.6.4 Associations between repetitive loads and the level of back-related disability

Table 15 shows the associations between *repetitive loads* risk factors and the *level of back-related disability* amongst the participants, with majority (n=110) reporting that they worked in the same postures, whereas about half reported that they always make the same movement with their trunk. However, only the risk factor; *always work in the same movement with trunk*, was statistically significant *(p=.013*).

Table15: Associations between repetitive loads and the level of back-related disability

Repetitive loads risk factors		Level of back-related disability counts				
		Minor	Moderate	Severe	Total	***p-value***
Work in the same posture for long	No	9	0	0	9	
	Yes	86	11	13	110	***.292***
Always make the same movements with your trunk	No	53	1	6	60	
	Yes	42	10	7	59	***.013****

***The Chi-square statistic were interpreted as significant at the .05 level.**

4.6.4.1 Relationship between repetitive loads and the level of back-related disability

Table 16 shows the odds ratios between *repetitive risk factors* and the *level of back-related disability*. The odds of severe back-related disability when one is exposed to always making the same movements with trunk is increased by about 3.06 folds.

Table 16: Relationship between repetitive loads and back-related disability

Repetitive loads risk factor	Odds ratios	***p-value***
Always make the same movements with your trunk	3.064626	***.023478***

4.6.5 Associations between ergonomic environmental risk factors and the level of back-related disability

Table 17 displays the associations between *ergonomic environmental* risk factors and the *level of back-related disability*, with very few participants (26%) reporting to have trouble in reaching for things with tools. Significant associations were noted among the variables: *not enough room to perform work* (*p=.025*), *difficulty in exerting enough force because of uncomfortable postures* (*p=.002*), *too few facilities to lean on during work* (*p=.002*), troubles in reaching things with your tools (*p=.006*) and *sometimes slip or fall during work* (*p=.002*).

Table 17: Associations between ergonomic environmental risk factors and the level of back-related disability

Ergonomic environmental conditions risk factors		Level of back-related disability counts				
		Minor	Moderate	Severe	Total	***p-value***
Not enough room around to perform work	No	57	2	6	65	
	Yes	38	9	7	54	***.025****
Not enough room above to perform work	No	55	3	6	64	
	Yes	40	8	7	55	***.131***
Difficulty in exerting enough force because of uncomfortable postures	No	66	2	6	74	
	Yes	29	9	7	45	***.002****
Too few facilities to lean on during work	No	73	3	8	84	
	Yes	22	8	5	35	***.002****
Trouble in reaching things with your tools	No	75	4	8	87	
	Yes	20	7	5	32	***.006****
Sometimes slip or fall during work	No	71	4	5	80	
	Yes	24	7	8	39	***.002****

***The Chi-square statistic were interpreted as significant at the .05 level.**

4.6.5.1 Relationship between ergonomic environmental risk factors and the level of back-related disability

Table 18 displays the odds ratio between *ergonomic risk factors* and the *level of back-related disability*. The odds of having a severe back-related disability when one is exposed to slipping or falling during work are increased by about 4.931 (*p=.001*) folds and b 3.921 *(p=.004*) if one is exposed to few facilities to lean on.

Table 18: Relationship between ergonomic environmental risk factors and the level of back-related disability

Ergonomic environmental risk factors	Odds ratios	***p-value***
Not enough room around to perform work	3.000	***.022***
Too few facilities to lean on during work	3.921	***.004***
Trouble in reaching things with your tools	3.750	***.006***
Sometimes slip or fall during work	4.931	***.001***

4.6.6 Associations between vibration risk factors and the level of back-related disability

Table 19 displays the associations between vibrating risk factors and the level of back-related disability, and the respective tests for associations. The risk factors; *experiencing noticeable risk mechanical vibrations or shocks during work* and *carry vibrating tools during work* were statistically significant with *p-values* of *.023* and *.007* respectively.

Table 19: Relationship between vibration risk factors and the level of back-related disability

Vibration risk factors		Level of back-related disability counts				
		Minor	Moderate	Severe	Total	***p-value***
Experiencing noticeable mechanical vibrations or shocks during work	No	63	3	6	72	
	Yes	32	8	7	47	***.023****
Carry vibrating tools during work	No	67	3	6	76	
	Yes	28	8	7	43	***.007****
Drive vehicles during work	No	62	4	6	72	
	Yes	33	7	7	47	***.095***

***The Chi-square statistic were interpreted as significant at the .05 level.**

4.6.6.1 Relationship between vibration risk factors and the level of back-related disability

Table 20 shows the odds ratios between vibrations risk factors and the level of back-related disability. The odds of having a severe back-related disability when one experiences noticeable mechanical vibrations is increased by about 3.28125 folds (*p=.012*).

Table 20: Relationship between vibration risk factors and the level of back-related disability

Vibration risk factors	Odds ratios	***p-value***
Experiencing in noticeable mechanical vibrations or shocks during work	3.28125	***.012226***

4.6.7 Associations between independent risk factors and level of back-related disability

Table 21 displays the tests for associations between four *independent risk factor* categories and the *level of back-related disability*. The risk factors: *stand for a prolonged time at work, sit for a prolonged time at work* and *walk for a prolonged time at work* were statistically significant with *p-values* of *.033, .015 and .020* respectively with most reporting minor levels of back-related disability.

Table 21: Associations between independent risk factors and back-related disability

Independent risk factors		Level of back-related disability counts				
		Minor	Moderate	Severe	Total	***p-value***
Work in uncomfortable postures	No	29	1	2	32	
	Yes	66	10	11	87	***.193***[a]
Stand for prolonged time at work	No	34	1	1	36	
	Yes	61	10	12	83	***.033***[a,*]
Sit for prolonged time at work	No	36	9	7	52	
	Yes	59	2	6	67	***.015***[*]
Walk for prolonged time	No	58	2	6	66	
	Yes	37	9	7	53	***.020***[*]

***The Chi-square statistic were interpreted as significant at the .05 level.**

4.6.7.1 Relationship between independent risk factors and the level of back-related disability

Table 22 displays the odds ratios between the independent risk factors and the level of back-related disability. The odds of having severe back-related disability are increased by about 6.131 (*p= .0018*) folds when one stands for prolonged time. However the odds of having severe back-related disability are reduced by about 3.22 (*p= .013*) when one sits for prolonged time at work.

Table 22: Relationship between independent risk factors and the level of back-related disability

Independent risk factors	Odds ratios	***p-value***
Stand for prolonged time at work	6.131146	***.018359***
Sit for prolonged time at work	0.305085	***.013758***
Walk for prolonged time	3.135135	***.017619***

4.7 Summary of results

The demographic results reported that most participants were female with most having missed between three to seven days of work in the previous year as a result of LBP while the majority of participants indicated that they were overweight. The results from the level of back-related disability indicated that most were suffering from minor disability, and that the majority of occupational risk factors were significantly associated with back-related disability. From the demographic variables, only the female gender was significant in determining the level of back-related disability. All the force exertions occupational risk factors were statistically significant, with *p-values* $<.05$. These results are further discussed in depth in Chapter 5.

CHAPTER 5. DISCUSSION

5.1 Introduction

This study sought to investigate the occupational risk factors for LBP and related disability among patients attending a private physiotherapy practice in Gaborone, Botswana. This chapter discusses the results and findings from the structured questionnaire and wherever possible, is explored in relation to the literature, therefore explaining the relevance and orientation of the current study in a wider research context.

5.2 Demographic profile of the study participants

From this study, there were more females (52%) than males affected by LBP and this concurs with previous literature (Biglarian et al., 2012; Novitasari et al., 2016). Reports from some studies indicate that females are at a higher risk of LBP than males with their higher prevalence rates being attributed to stress associated with hormonal changes, child bearing, osteoporosis and gynaecological problems (Carruth & Pryor, 2009; Hoy et al., 2012; Schneider et al., 2006).

This study revealed that most of the participants were between the ages of 31 to 40 years, which is consistent with other literature (Novitasari et al., 2016; WHO, 2003). The presence of LBP and its associated disability in this particular working age group significantly affects the economic viability of a country, as this age group are expected to contribute greatly to the economy since the third decade of life represent some of the most productive years of an individual's working life (Hoy et al., 2012).

Most of the participants in the current study setting were overweight (43.7 %) and obese (30.3%). Overweight and obesity are a public health concern due to their rapid increase in recent decades and their related health disorders such as cardiovascular diseases, diabetes and some cancers (Biglarian et al., 2012). It estimated that by 2020, type 2 diabetes and cardiovascular diseases will account for almost 75% of all deaths worldwide (Biglarian et al., 2012).

Most participants (35.3%) had between 10 to 19 years of work experience with the administration category having the highest number of patients with LBP with the association between work experience and the level of back-related disability being significant *($p= .008$).* Studies have suggested occupations with low levels of manual labour were associated with a lower than average prevalence of low back pain (Hengel et al., 2011; Szeto et al., 2009). The current study agrees with previous findings as indicated by the majority of respondents (79.8%) who reported minor levels of disability with almost half (46%) being in the administration and education categories which are more sedentary industries.

5.3 Extent of sick absenteeism from work due to occupational LBP

Absenteeism from work as a result of LBP is an essential indicator of its associated disability (Cunningham et al., 2006). It was important to determine the extent of absenteeism related to LBP and establish a baseline index for future studies. The current study had over half of the participants (57.2 %) missing work for more than three days in the past year due to LBP. A similar study on the productive age population-based in Indonesia reported lower figures, indicating that 20.6% of participants had missed between one to three days of work due to low back pain, while 5.2% had missed more than three days of work (Novitasari et al., 2016). An explanation for the differences in days off work may be increased financial pressure forcing individuals to go to work despite not being well. In addition, Botswana has paid sick-leave hence the tendency of workers to take time off easily when they are not well. Absenteeism could be considered high from the study and can equate to reduced productivity, which can impact on the economic growth of the country.

5.4 The level of back-related disability among the patients in the study setting

The majority of study participants (79.8%) reported minor back-related disability levels, with most (89.1%) indicating that they change position frequently to try and get their backs comfortable. These findings are comparable with a study in India amongst Pondicherry drivers, which also reported low levels of back-related disability and a high positive response rate (69.2%) in changing position frequently to make the back more comfortable (Jaiswal, 2013). These levels of back-related disability could be under reported in developing countries, were workers may have little protection from employment-related injuries, such as access to workers compensation and medical boarding. In addition, there may also be inadequate health and safety regulations, and when they are available, are not enforced. Despite their injuries, workers many need to continue with their regular duties to have a source of income, making it difficult to take time off work to heal. This is of concern as the workers risk further disability by continuing to work despite their injuries.

5.5 Relationship between occupational risk factors and the level back-related disability among the study participants

Workers are commonly exposed to awkward or static work postures, repetitive movements, prolonged periods of walking or standing, vibrating tools, manual handling and labour intensive tasks (Ganiyu et al., 2015; Mafuyai et al., 2014). This repeated contact often puts them at risk of developing LBP, with the resulting disability being activity limiting, effecting their capacity for work and conduct ADLs, as reflected by the Roland-Morris Disability Questionnaire (RDQ) (Davidson, 2014).

All risk factors under force exertions were statistically significant in determining the level of back-related disability, the results being consistent with previous studies that indicated force exertions as being predictors of LBP (Li et al., 2012; Osborne et al., 2013). An explanation for this significant association could be that almost half of the participants were from the transport, mining, construction and agriculture industries which are linked to high force exertions.

Standing, sitting and *walking* for prolonged time were risk factors under statistic loads that were associated with severe back-related disability, as indicated by significant *p values*. Sedentary occupations are very prevalent, partly due to the focus on service-oriented occupations, with statistics reporting that people spend an average of 10 hours out of a 24-hour day sitting, making prolonged sitting a potentially significant static work hazard (McCrady & Levine, 2009; Roffey et al., 2010b). It has been suggested that prolonged sitting exerts pressure on the vertebral discs, particularly the third lumbar vertebrae and reduces the lumbar lordosis causing an increase in muscular activity, ischial pressure and intradiscal pressure all of which may cause disc degeneration, disc rapture or herniation therefore potentially precipitates LBP (Sheeran et al., 2012). Some studies have pointed out that prolonged walking or standing may cause significant compression in vertebral endplate and intervertebral discs, as well as raising the intradiscal pressure, potentially triggering the degeneration of discs and therefore precipitate LBP (Sheeran et al., 2012).

Evidence from a review on causal assessment of occupational bending or twisting and LBP, reports that these two factors in general are unlikely to independently cause LBP (Wai, Roffey, Bishop, Kwon, & Dagenais, 2010a). Parallels can be drawn between these findings and current study results in which the risk factors of *bend slightly with trunk*, *bend heavily with trunk* and t*wist heavily with trunk*, which were part of dynamic loads, were not found to be statistically significant. Evidence of the biological plausibility on the effects of occupational bending and or twisting in relation to injury of lumbar tissues is still limited (Kwon et al., 2011).

Under 'ergonomic environmental conditions', only the variables: 'not enough room around to perform work' *(p=.025)*, 'difficulty in exerting enough force because of uncomfortable postures' *(p=.002)*, 'too few facilities to lean on during work' *(p=.002)*, 'trouble in reaching things with your tools' *(p=.006)*, 'sometimes slip or fall during work' *(p=.002)* were statistically significantly related to LBP disability. The remaining variables namely: 'not enough room to perform work' and 'drive vehicles during work' were not statistically significant. These results are a cause for concern because many employers probably have poor knowledge on adjusting the work environment to suit the needs of the worker. Activities that involve the use of vibrating machinery, poor ergonomics resulting in slips, falls or limited working space are thought to place undue stress on the spine, soft tissue structures which increases the intradiscal pressure, putting discs at risk of degeneration or herniation, and simultaneously causes discomfort and pain in the soft tissue structures (Campo et al., 2008; van den Heuvel et al., 2004; Videman et al., 2005).

A number of studies have confirmed that knowledge and awareness of adjusting the work environment to suit the needs of the worker are vital to prevent the development of WRMDs including LBP (Damanhuri et al., 2014; Khan et al., 2012; Mahmud et al., 2011). In some developing nations, the extensive subprime industrial working conditions, ignorance of ergonomic issues, training and educational programmes, coupled with the fact that about 80 percent to 90 percent of the population are involved in 'heavy work' escalates the burden of LBP, resulting in annually inflated healthcare-related costs (Erick & Smith, 2011; Hoy et al., 2012). Many cases of LBP are preventable to a certain extent with physiotherapists playing an integral role, being specially trained to evaluate the relationship between work tasks and the environment, as well as studying the negative effects of working under suboptimal conditions. The implications are that physiotherapists ought to play an active role in facilitating proper ergonomic design at work by manipulating the environment and modifying work to limit awkward positioning of the body as preventive measures of LBP.

5.6 Relationship between demographic profile of the study participants and back-related disability

Using the univariate logistic regression analysis test for the current study, significant associations with back-related disability were noted in the female gender. The odds of having severe back-related disability are increased by approximately 163 % for females *(p-value= .043613).* Parallels can be drawn to results of a study in Botswana on the prevalence and risk factors for LBP among teachers, where female gender was positively associated with low back pain disability (Erick & Smith, 2014). Females are often responsible for the house duties, which can be physically taxing, and has been highlighted by some authors as the reason for the gender differences in the prevalence of WRMDs (Punnett & Herbert, 2000).

However, this study did not report a significant association between BMI and back-related disability. Similarly, a Chinese working age population study did not find a significant association between BMI and back-related disability (Li et al., 2012).

The researcher however failed to locate studies revealing work experience and back-related disability. However, it would seem that the cumulative effect of the high occupational exposure in the early years of productive age would result in significant disability in later years. Further research is require to understand how work experience and age impact on LBP disability.

CHAPTER 6. CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS

6.1 Introduction

This chapter concludes the study and gives recommendations and limitations based on the study-findings.

6.2 Conclusion

This chapter addresses the extent to which the research problem has been addressed and the aim achieved by reviewing the findings of the five objectives. It outlines the limitations and significance of the study, as well as providing recommendations for future research.

In addressing the aim and the objectives, the study successfully profiled the demographics of the participants indicating that from among the 119 participants, the majority were females (52%) with a mean age of 35.85 years (SD=9.742). Most had between 10 to19 years of work experience (35.3%). The majority of the individuals with LBP were overweight (43.7%). Minor levels of back-related disability were reported by most (79.8%) while the majority (57.2%) had missed between three to seven days of work in the previous year as a result of LBP. Furthermore, results from the study revealed that dynamic loads, static loads, repetitive loads, ergonomic environmental conditions, vibrations, prolonged standing, prolonged sitting, prolonged walking are occupational risk factors significantly associated with LBP. The odds of having severe back-related disability are increased approximately 163 % for females *(p-value= .043613).*

6.3 Significance

The information obtained in this study was significant in that it determined the occupational risk factors associated with LBP and the related disability. The study contributes to future research by identifying determinants of exposure which will allow for better targeting of prevention efforts because these work-place factors can be modified and ergonomic improvements can be implemented.

The implications of the presence of occupational risk factors for LBP and its associated disability call for private physiotherapists to be actively involved in ergonomics training and improvements that can mitigate the presence of occupational risk factors with the hope of improving optimal worker participation at work. In addition, the physiotherapists can create education programs to raise awareness of these risk factors at work.

6.3 Limitations of the study

The study had the following limitations:

The use of a self-administered questionnaire introduces recall bias inherent to this type of data collection, leading likely to lead to an over-estimation of more recent and serious low back pain disability.

As a cross-sectional study, only associations can be established while inferences of causality cannot be made.

Psychosocial factors, such as low job control and satisfaction were not investigated, and these may play a role in the development of LBP among workers.

The study may lack external validity as the study sample is restricted to one private physiotherapy clinic in Gaborone Botswana and findings may not be generalizable to other private practices in the general population in Botswana.

6.4 Recommendations

Taking into account the findings of the study, the following recommendations are made:

Future Studies

Participant observation should be included in future studies in order to enhance the accuracy of reported occupational risk factors for LBP.

Further research using longitudinal studies to establish inferences of causality.

Further risk factor analysis with a focus on dose-exposure and cumulative effects should be included in future research.

Inclusion of psychosocial risk factor analysis, such as low job control and satisfaction as these may play a role in the development of LBP among workers.

Conducting studies that include more varied participants from other private practices and even government hospitals to make findings more generalizable and more representative of Botswana.

Use of well-defined variables.

Government

To have policies in place to address the different risk factors associated with LBP in the workplace.

To prioritise ergonomics training in the emerging industries associated with an increasing back-related disability.

To promote and fund education materials on preventing obesity and promoting exercise.

Employers

Employers should allow room for modification of duties in the event of an injury, provide ergonomic friendly work environments, regular education and training for employees on OHS, provide appropriate health supervision to females in particular as they are at an increased risk of LBP.

6.5 Summary of chapter

Investigating occupational factors of LBP would assist in making policies that address the different risk factors of LBP particularly in females and the 30 to 39 years age group as these are the commonly affected. In addition, industries with increased risk of LBP can be prioritised in terms of ergonomic interventions to help curb the escalating burden of LBP and facilitate optimal worker participation whose indefinite benefits would go a long way in enhancing the economy.

REFERENCES

Arain, M., Campbell, M. J., Cooper, C. L., & Lancaster, G. A. (2010). What is a pilot or feasibility study? A review of current practice and editorial policy. *BMC Medical Research Methodology, 10*(1), 67-74.

Ariens, G. A., van Mechelen, W., Bongers, P. M., Bouter, L. M., & van der Wal, G. (2000). Physical risk factors for neck pain. *Scandinavian Journal of Work, Environment & Health, 26*(1), 7-19.

Aylward, M., Bratt, D., Beaumont, D., Craig, L., Ellis, N., & Emrys, G. (2010). Realising the Health Benefits of Work. Australasian Faculty of Occupational & Environmental Medicine Position Statement. Retrieved from http://www.healthbenefitsofwork.com.au. Retrieved on 16 January 2017.

Azodo, C., Ezeja, E., & Ehikhamenor, E. (2011). Occupational violence against dental professionals in southern Nigeria. *African Health Sciences, 11*(3), 486-492.

Balagué, F., Mannion, A. F., Pellisé, F., & Cedraschi, C. (2012). Non-specific low back pain. *The Lancet, 379*(9814), 482-491.

Bener, A., Dafeeah, E. E., & Alnaqbi, K. (2014). Prevalence and correlates of low back pain in primary care: what are the contributing factors in a rapidly developing country? *Asian Spine Journal, 8*(3), 227-236.

Bergner, M., Bobbitt, R. A., Carter, W. B., & Gilson, B. S. (1981). The Sickness Impact Profile: development and final revision of a health status measure. *Medical Care, 19*(8), 787-805.

Bernard, B. P. (1997). Musculoskeletal disorders and workplace factors: a critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and low back.. *National Institute for Occupational Safety and health.* Cincinnati, OH: U.S. Department of Health and Human Services. Publication 97-141.

Biglarian, A., Seifi, B., Bakhshi, E., Mohammad, K., Rahgozar, M., Karimlou, M., & Serahati, S. (2012). Low back pain prevalence and associated factors in Iranian population: findings from the national health survey. *Pain Research and Treatment, 2012*(65), 3060. doi:10.1155/2012/653060

Black, C. (2008). *Review of the health of Britain's working age population: working for a healthier tomorrow*. Retrieved fromwww.workingforhealth.gov.uk. Date of retrieval 23 January 2018.

Bongers, P. M., de Winter, C. R., Kompier, M. A., & Hildebrandt, V. H. (1993). Psychosocial factors at work and musculoskeletal disease. *Scandinavian Journal of Work, Environment & Health, 19*(5), 297-312.

Buchbinder, R., Blyth, F. M., March, L. M., Brooks, P., Woolf, A. D., & Hoy, D. G. (2013). Placing the global burden of low back pain in context. *Best Practice & Research Clinical Rheumatology, 27*(5), 575-589.

Bullock, M. I. (1990). *Ergonomics: the physiotherapist in the workplace* (Vol. 6): Churchill Livingstone.

Burton, K., & Erg, E. (2005). Corrigendum to “How to prevent low back pain” [Best Practice & Research Clinical Rheumatology 19 (2005) 541–555]. *Best Practice & Research Clinical Rheumatology, 19*(6), 1095.

Campo, M., Weiser, S., Koenig, K. L., & Nordin, M. (2008). Work-related musculoskeletal disorders in physical therapists: a prospective cohort study with 1-year follow-up. *Physical Therapy, 88*(5), 608-619.

Carruth, A. K., & Pryor, S. K. (2009). Self-reported back pain among farm women in southeast Louisiana. *Workplace Health & Safety, 57*(6), 232-238.

Casazza, B. A. (2012). Diagnosis and treatment of acute low back pain. *American Family Physician, 85*(4), 343-350.

Chan, S. C., Ferguson, S. J., & Gantenbein-Ritter, B. (2011). The effects of dynamic loading on the intervertebral disc. *European Spine Journal, 20*(11), 1796-1812.

Claiborne, N., Vandenburgh, H., Krause, T. M., & Leung, P. (2002). Measuring quality of life changes in individuals with chronic low back conditions: a back education program evaluation. *Evaluation and Program Planning, 25*(1), 61-70.

Claus, A., Hides, J., Moseley, G. L., & Hodges, P. (2008). Sitting versus standing: does the intradiscal pressure cause disc degeneration or low back pain? *Journal of Electromyography and Kinesiology, 18*(4), 550-558.

Cunningham, C., Flynn, T., & Blake, C. (2006). Low back pain and occupation among Irish health service workers. *Occupational Medicine, 56*(7), 447-454.

D’Ambrosia, P., King, K., Davidson, B., Zhou, B. H., Lu, Y., & Solomonow, M. (2010). Pro-inflammatory cytokines expression increases following low-and high-magnitude cyclic loading of lumbar ligaments. *European Spine Journal, 19*(8), 1330-1339.

Damanhuri, Z., Zulkifli, A., Lau, A., & Zainuddin, H. (2014). Low back pain among office workers in a public university in Malaysia. *International Journal of Public Health and Clinical Sciences, 1*(1), 99-108.

Davidson, M. (2014). Roland-Morris Disability Questionnaire. *Encyclopedia of Quality of Life and Well-Being Research*, 29, pp. 5587-5590: Springer.

Dembe, A. E. (2001). The social consequences of occupational injuries and illnesses. *American Journal of Industrial Medicine, 40*(4), 403-417.

Deyo, R. A., Battie, M., Beurskens, A., Bombardier, C., Croft, P., Koes, B., &Waddell, G. (1998). Outcome measures for low back pain research: a proposal for standardized use. *Spine, 23*(18), 2003-2013.

Deyo, R. A., & Centor, R. M. (1986). Assessing the responsiveness of functional scales to clinical change: an analogy to diagnostic test performance. *Journal of Chronic Diseases, 39*(11), 897-906.

Driscoll, T., Jacklyn, G., Orchard, J., Passmore, E., Vos, T., Freedman, G. & Punnett, L. (2014). The global burden of occupationally related low back pain: estimates from the Global Burden of Disease 2010 study. *Annals of the Rheumatic Diseases, 73*(6), 975-981.

Ekpenyong, C., Udokang, N., Akpan, E., & Samson, T. (2012). Double burden, non-communicable diseases and risk factors evaluation in sub-Saharan Africa: The Nigerian experience. *European Journal of Sustainable Development, 1*(2), 249.

Elders, L., & Burdorf, A. (2001). Interrelations of risk factors and low back pain in scaffolders. *Occupational and Environmental Medicine, 58*(9), 597-603.

Erick, P. N., & Smith, D. R. (2011). A systematic review of musculoskeletal disorders among school teachers. *BMC Musculoskeletal Disorders, 12*(1), 1.

Erick, P. N., & Smith, D. R. (2014). Low back pain among school teachers in Botswana, prevalence and risk factors. *BMC Musculoskeletal Disorders, 15*(1), 359-372.

Foster, N. E. (2011). Barriers and progress in the treatment of low back pain. *BMC medicine, 9*(1), 1. doi:10.1186/1741-7015-9-108

Frymoyer, J. W., Nelson, R. M., Spangfort, E., & Waddell, G. (1991). Clinical tests applicable to the study of chronic low-back disability. *Spine, 16*(6), 681-682.

Ganiyu, S. O., Olabode, J. A., Stanley, M. M., & Muhammad, I. (2015). Patterns of occurrence of work-related musculoskeletal disorders and its correlation with ergonomic hazards among health care professionals. *Nigerian Journal of Experimental and Clinical Biosciences, 3*(1), 18-23.

Govindu, N. K., & Babski-Reeves, K. (2014). Effects of personal, psychosocial and occupational factors on low back pain severity in workers. *International Journal of Industrial Ergonomics, 44*(2), 335-341.

Grotle, M., Brox, J. I., & Vøllestad, N. K. (2005). Functional status and disability questionnaires: what do they assess: a systematic review of back-specific outcome questionnaires? *Spine, 30*(1), 130-140.

Harcombe, H., McBride, D., Derrett, S., & Gray, A. (2010). Physical and psychosocial risk factors for musculoskeletal disorders in New Zealand nurses, postal workers and office workers. *Injury Prevention, 16*(2), 96-100.

Hartvigsen, J., Morsø, L., Bendix, T., & Manniche, C. (2010). Supervised and non-supervised Nordic walking in the treatment of chronic low back pain: a single blind randomized clinical trial. *BMC Musculoskeletal Disorders, 11*(1), 30.

Helfenstein Junior, M., Goldenfum, M. A., & Siena, C. (2010). Occupational low back pain. *Revista da Associação Médica Brasileira, 56*(5), 583-589.

Hengel, K. M. O., Visser, B., & Sluiter, J. K. (2011). The prevalence and incidence of musculoskeletal symptoms among hospital physicians: a systematic review. *International Archives of Occupational and Environmental Health, 84*(2), 115-119.

Hildebrandt, V., Bongers, P., Van Dijk, F., Kemper, H., & Dul, J. (2001). Dutch Musculoskeletal Questionnaire: description and basic qualities. *Ergonomics, 44*(12), 1038-1055.

Hoogendoorn, W. E., van Poppel, M. N., Bongers, P. M., Koes, B. W., & Bouter, L. M. (1999). Physical load during work and leisure time as risk factors for back pain. *Scandinavian Journal of Work, Environment & Health, 25*(5), 387-403.

Hoy, D., Bain, C., Williams, G., March, L., Brooks, P., Blyth, F., & Buchbinder, R. (2012). A systematic review of the global prevalence of low back pain. *Arthritis & Rheumatism, 64*(6), 2028-2037.

Hoy, D., March, L., Brooks, P., Woolf, A., Blyth, F., Vos, T., & Buchbinder, R. (2010). Measuring the global burden of low back pain. *Best Practice & Research Clinical Rheumatology, 24*(2), 155-165.

Hsieh, C., Phillips, R. B., Adams, A. H., & Pope, M. H. (1992). Functional outcomes of low back pain: comparison of four treatment groups in a randomized controlled trial. *Journal of manipulative and Physiological Therapeutics, 15*(1), 4-9.

Hu, H., Chou, Y.-J., Chou, P., Chen, L., & Huang, N. (2009). Association between obesity and injury among Taiwanese adults. *International Journal of Obesity, 33*(8), 878-884.

ILO. Ratifications of ILO conventions. www.ilo.org.dyn.normlex.en

Jaiswal, A. (2013). Low Back Pain and Work-Related Risk Factors among Drivers of Pondicherry. *Journal of Scientific Footprints, 1*(2), 7-16.

Järvikoski, A., Mellin, G., Estlander, A.-M., Härkäpää, K., Vanharanta, H., Hupli, M., & Heinonen, R. (1993). Outcome of two multimodal back treatment programs with and without intensive physical training. *Clinical Spine Surgery, 6*(2), 93-98.

Johanning, E., Landsbergis, P., Fischer, S., Christ, E., Göres, B., & Luhrman, R. (2006). Whole-body vibration and ergonomic study of US railroad locomotives. *Journal of Sound and Vibration, 298*(3), 594-600.

Joppe, M. (2000). The Research Process. Retrieved from http://www.ryerson.ca/~mjoppe/-p.htm

Joubert, G., Ehrlich, R., Katzenellenbogen, J., & Abdool Karim, S. (2007). Epidemiology: a research manual for South Africa. *Cape TownSouth Africa: Oxford University Press Southern Africa*.

Karppinen, J. (2007). New perspectives on sciatica. *Immune and Glial Regulation of Pain.*, 385-406.

Khan, R., Surti, A., Rehman, R., & Ali, U. (2012). Knowledge and practices of ergonomics in computer users. *JPMA-Journal of the Pakistan Medical Association, 62*(3), 213-217.

Kirkaldy-Willis, W. H., Burton, C. V., & Cassidy, J. D. (1992). The site and nature of the lesion *Managing Low Back Pain. 3rd ed. New York* (pp. 121-126): Churchill Livingstone.

Kok, J. d., Deijl, C., & Veldhuis-Van-Essen, C. (2013). Is Small Still Beautiful? *Literature review of recent empiricalevidence on the contribution of SMEs to employment creation. Berlin, Germany: German Ministry for Economic Cooperation and Development*.

Kopec, J. A., & Esdaile, J. M. (1995). Functional disability scales for back pain. *Spine, 20*(17), 1943-1949.

Kwon, B., Roffey, D., Bishop, P., Dagenais, S., & Wai, E. (2011). Systematic review: occupational physical activity and low back pain. *Occupational Medicine, 61*(8), 541-548.

Lankhorst, G., Van de Stadt, R., Vogelaar, T., Van der Korst, J., & Prevo, A. (1981). Objectivity and repeatability of measurements in low back pain. *Scandinavian Journal of Rehabilitation Medicine, 14*(1), 21-26.

Li, J. Y., Sheng, W., He, L. H., Wu, S. S., Lei, Y., Yu, S. F., & Di HUANG, Y. (2012). Risk factors of low back pain among the Chinese occupational population: a case-control study. *Biomedical and Environmental Sciences, 25*(4), 421-429.

Lin, C.-W. C., McAuley, J. H., Macedo, L., Barnett, D. C., Smeets, R. J., & Verbunt, J. A. (2011). Relationship between physical activity and disability in low back pain: a systematic review and meta-analysis. *Pain, 152*(3), 607-613.

Luttmann, A., Jäger, M., Griefahn, B., Caffier, G., & Liebers, F. (2003). Preventing musculoskeletal disorders in the workplace. Retrieved from http://www.who.int/iris/handle/10665/42651

Maduagwu, S., Sokunbi, G., Bwala, M., Akanbi, O., Jajere, A., Jaiyeola, O., & Ojiakor, A. (2015). Work-Related Musculoskeletal Disorders Among Self Employed Sewing Machine Operators in Maiduguri, Nigeria. *Occupational Medicine & Health Affairs, 3*(5), 1-5.

Mafuyai, M., Babangida, B., Mador, E., Bakwa, D., & Jabil, Y. (2014). The increasing cases of lower back pain in developed nations: a reciprocal effect of development. *Academic Journal of Interdisciplinary Studies, 3*(5), 23-29.

Mahmud, N., Kenny, D. T., Zein, R. M., & Hassan, S. N. (2011). Ergonomic training reduces musculoskeletal disorders among office workers: results from the 6-month follow-up. *The Malaysian Journal of Medical Sciences: MJMS, 18*(2), 16-26.

Manchikanti, L. (2000). Epidemiology of low back pain. *Pain Physician, 3*(2), 167-192.

March, L., Smith, E. U., Hoy, D. G., Cross, M. J., Sanchez-Riera, L., Blyth, F., & Woolf, A. D. (2014). Burden of disability due to musculoskeletal (MSK) disorders. *Best Practice & Research Clinical Rheumatology, 28*(3), 353-366.

Marras, W. (2000). Occupational low back disorder causation and control. *Ergonomics, 43*(7), 880-902.

McCrady, S. K., & Levine, J. A. (2009). Sedentariness at work: how much do we really sit? *Obesity, 17*(11), 2103-2105.

McGill, & Stuart. (2015). *Low Back Disorders, 3E* (3 ed.): Human Kinetics.

Moyo, D., Zungu, M., Kgalamono, S., & Mwila, C. D. (2015). Review of occupational health and safety organization in expanding economies: the case of southern Africa. *Annals of Global Health, 81*(4), 495-502.

Murray, C. J., & Lopez, A. D. (2013). Measuring the global burden of disease. *New England Journal of Medicine, 369*(5), 448-457.

Nkhata, L. A., Esterhuizen, T. M., Siziya, S., Phiri, P. D., Munalula-Nkandu, E., & Shula, H. (2015). The Prevalence and Perceived Contributing Factors for Work-Related Musculoskeletal Disorders Among Nurses at the University Teaching Hospital in Lusaka, Zambia. *Science, 3*(4), 508-513.

Nopkesorn, T., & Supasit Pannarunothai, M. (2011). Prevalence of low back pain among rice farmers in a rural community in Thailand. *J Med Assoc Thai, 94*(5), 616-621.

Novitasari, D. D., Sadeli, H. A., Soenggono, A., Sofiatin, Y., Sukandar, H., & Roesli, R. M. (2016). Prevalence and Characteristics of Low Back Pain among Productive Age Population in Jatinangor. *Althea Medical Journal, 3*(3), 469-476.

Nusbaum, L., Natour, J., Ferraz, M. B., & Goldenberg, J. (2001). Translation, adaptation and validation of the Roland-Morris questionnaire-Brazil Roland-Morris. *Brazilian Journal of Medical and Biological Research, 34*(2), 203-210.

Nutter, P. (1987). Aerobic exercise in the treatment and prevention of low back pain. *Occupational medicine (Philadelphia, Pa.), 3*(1), 137-145.

Okokon, I., John, E., Udonwa, N., Oku, A., & Asibong, U. (2016). Correlates and Predictors of Low Back Pain Disability and its Impact on Health-Related Quality of Life in a Family Practice Clinic in Calabar, South-South Nigeria. *Fam Med Med Sci Res, 5*(210), 2.

Osborne, A., Finnegan, G., Blake, C., Meredith, D., McNamara, J., Phelan, J., & Cunningham, C. (2013). An evaluation of low back pain among farmers in Ireland. *Occupational Medicine, 63*(1), 53-59.

Parot-Schinkel, E., Descatha, A., Ha, C., Petit, A., Leclerc, A., & Roquelaure, Y. (2012). Prevalence of multisite musculoskeletal symptoms: a French cross-sectional working population-based study. *BMC Musculoskeletal Disorders, 13*(1), 122-133.

Pedersen, M. T., Essendrop, M., Skotte, J. H., Jørgensen, K., & Fallentin, N. (2004). Training can modify back muscle response to sudden trunk loading. *European Spine Journal, 13*(6), 548-552.

Pelham, T. W., White, H., & Lee, S. W. (2005). The etiology of low back pain in military helicopter aviators: prevention and treatment. *Work, 24*(2), 101-110.

Pope, M. H., Goh, K. L., & Magnusson, M. L. (2002). Spine ergonomics. *Annual Review of Biomedical Engineering, 4*(1), 49-68.

Punnett, L., & Herbert, R. (2000). Work-related musculoskeletal disorders: is there a gender differential, and if so, what does it mean. *Women and Health, 38*(6), 474-492.

Punnett, L., Prüss-Ütün, A., Nelson, D. I., Fingerhut, M. A., Leigh, J., Tak, S., & Phillips, S. (2005). Estimating the global burden of low back pain attributable to combined occupational exposures. *American Journal of Industrial Medicine, 48*(6), 459-469.

Rambabu, T., & Suneetha, K. (2014). Prevalence of work related musculoskeletal disorders among physicians, surgeons and dentists: a comparative study. *Annals of Medical and Health Sciences Research, 4*(4), 578-582.

Rapoport, J., Jacobs, P., Bell, N. R., & Klarenbach, S. (2004). Refining the measurement of the economic burden of chronic diseases in Canada. *Chronic Diseases and Injuries in Canada, 25*(1), 13-21.

Riihimäki, H. (1991). Low-back pain, its origin and risk indicators. *Scandinavian Journal of Work, Environment & Health, 17*(2), 81-90.

Roffey, D. M., Wai, E. K., Bishop, P., Kwon, B. K., & Dagenais, S. (2010a). Causal assessment of awkward occupational postures and low back pain: results of a systematic review. *The Spine Journal, 10*(1), 89-99.

Roffey, D. M., Wai, E. K., Bishop, P., Kwon, B. K., & Dagenais, S. (2010b). Causal assessment of occupational sitting and low back pain: results of a systematic review. *The Spine Journal, 10*(3), 252-261.

Roffey, D. M., Wai, E. K., Bishop, P., Kwon, B. K., & Dagenais, S. (2010c). Causal assessment of occupational standing or walking and low back pain: results of a systematic review. *The Spine Journal, 10*(3), 262-272.

Roland, M., & Fairbank, J. (2000). The Roland-Morris disability questionnaire and the Oswestry disability questionnaire. *Spine, 25*(24), 3115-3124.

Roland, M., & Morris, R. (1983). A study of the natural history of back pain: part I: development of a reliable and sensitive measure of disability in low-back pain. *Spine, 8*(2), 141-144.

Russel, E., Carter, R., Lubinsky, J., & Domholdt, E. (2005). *Rehabilitation research: principles and applications* (4 ed.): St. Louis: Elsevier Saunders.

Salvendy, G. (2012). *Handbook of human factors and ergonomics* (Vol. 4): John Wiley & Sons.

Schneider, S., Randoll, D., & Buchner, M. (2006). Why do women have back pain more than men?: A representative prevalence study in the Federal Republic of Germany. *The Clinical Journal of Pain, 22*(8), 738-747.

Sealetsa, O., & Thatcher, A. (2011). Ergonomics issues among sewing machine operators in the textile manufacturing industry in Botswana. *Work, 38*(3), 279-289.

Seoke, S., & Kamungoma-Dada, I. (2014). Occupational health and safety management systems-a review of practices in enterprises in Botswana. *Occupational Health Southern Africa, 20*(6), 14-19.

Sheeran, L., Sparkes, V., Caterson, B., Busse-Morris, M., & van Deursen, R. (2012). Spinal position sense and trunk muscle activity during sitting and standing in nonspecific chronic low back pain: classification analysis. *Spine, 37*(8), E486-E495.

Shiri, R., Karppinen, J., Leino-Arjas, P., Solovieva, S., & Viikari-Juntura, E. (2010). The association between obesity and low back pain: a meta-analysis. *American Journal of Epidemiology, 171*(2), 135-154.

Shokunbi, G. O. (2014). Acupuncture and Ergonomic interventions in the management of carpal tunnel syndrome among industrial workers-Case studies. *Nigerian Journal of Medical Rehabilitation, 17*(1), 1-5.

Smeets, R., Köke, A., Lin, C. W., Ferreira, M., & Demoulin, C. (2011). Measures of function in low back pain/disorders: Low Back Pain Rating Scale (LBPRS), Oswestry Disability Index (ODI), Progressive Isoinertial Lifting Evaluation (PILE), Quebec Back Pain Disability Scale (QBPDS), and Roland-Morris Disability Questionnaire (RDQ). *Arthritis care & research, 63*(S11), S158-S173.

Statistics-Botswana. (2016). *Annual report 2015/2016*. Retrieved from www.statsbots.org.bw. Date of retrieval 20 February 2018.

Stevens, M. L., Lin, C. C., & Maher, C. G. (2016). The Roland Morris Disability Questionnaire. *Journal of Physiotherapy, 62*(2), 116.

Szeto, G. P., Ho, P., Ting, A. C., Poon, J. T., Cheng, S. W., & Tsang, R. C. (2009). Work-related musculoskeletal symptoms in surgeons. *Journal of occupational rehabilitation, 19*(2), 175-184.

Thabane, L., Mbuagbaw, L., Zhang, S., Samaan, Z., Marcucci, M., Ye, C. & Kosa, D. (2013). A tutorial on sensitivity analyses in clinical trials: the what, why, when and how. *BMC Medical Rresearch Methodology, 13*(1), 92-104.

Tilg, H., & Moschen, A. R. (2006). Adipocytokines: mediators linking adipose tissue, inflammation and immunity. *Nature Reviews Immunology, 6*(10), 772-783.

van den Heuvel, S. G., Ariëns, G. A., Boshuizen, H. C., Hoogendoorn, W. E., & Bongers, P. M. (2004). Prognostic factors related to recurrent low-back pain and sickness absence. *Scandinavian Journal of Work, Environment & Health, 30*(6), 459-467.

Van Deursen, L., Van Deursen, D., Snijders, C., & Wilke, H. (2005). Relationship between everyday activities and spinal shrinkage. *Clinical Biomechanics, 20*(5), 547-550.

van Dieën, J. H., & Toussaint, H. M. (1993). Spinal shrinkage as a parameter of functional load. *Spine*, *18*(11), 1504-1514.

Van Tulder, M., Malmivaara, A., & Koes, B. (2007). Repetitive strain injury. *The Lancet, 369*(9575), 1815-1822.

Vargas-Prada, S., Serra, C., Martínez, J. M., Ntani, G., Delclos, G. L., Palmer, K. T., & Benavides, F. G. (2013). Psychological and culturally-influenced risk factors for the incidence and persistence of low back pain and associated disability in Spanish workers: findings from the CUPID study. *Occup Environ Med, 70*(1), 57-62.

Videman, T., Ojajärvi, A., Riihimäki, H., & Troup, J. D. (2005). Low back pain among nurses: a follow-up beginning at entry to the nursing school. *Spine, 30*(20), 2334-2341.

Wai, E. K., Roffey, D. M., Bishop, P., Kwon, B. K., & Dagenais, S. (2010a). Causal assessment of occupational bending or twisting and low back pain: results of a systematic review. *The Spine Journal, 10*(1), 76-88.

Wai, E. K., Roffey, D. M., Bishop, P., Kwon, B. K., & Dagenais, S. (2010b). Causal assessment of occupational lifting and low back pain: results of a systematic review. *The Spine Journal, 10*(6), 554-566.

WHO. (2003). The burden of musculoskeletal conditions at the start of the new millennium. (0512-3054).

WHO. (2007). Steps to health: A European framework to promote physical activity for health.

WHO. (2015). Obesity and overweight, Fact sheet No311.

Widanarko, B., Legg, S., Stevenson, M., Devereux, J., Eng, A., Cheng, S., & Pearce, N. (2011). Prevalence of musculoskeletal symptoms in relation to gender, age, and occupational/industrial group. *International Journal of Industrial Ergonomics, 41*(5), 561-572.

Wieser, S., Horisberger, B., Schmidhauser, S., Eisenring, C., Brügger, U., Ruckstuhl, A., & Tamcan, Ö. (2011). Cost of low back pain in Switzerland in 2005. *The European Journal of Health Economics, 12*(5), 455-467.

Wilke, H. J., Neef, P., Caimi, M., Hoogland, T., & Claes, L. E. (1999). New in vivo measurements of pressures in the intervertebral disc in daily life. *Spine, 24*(8), 755-762.

Yilmaz, E., & Dedeli, O. (2014). Effect of physical and psychosocial factors on occupational low back pain. *Health Science Journal, 6(4),598-609.*

APPENDICES

Appendix A: UKZN Ethical Clearance

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

16 September 2016

Ms NV Chihumbiri (214577373)
Discipline of Physiotherapy
School of Health Science
noreenchi@gmail.com

Study Title: Exploring occupational risk factors of low back pain among patients attending a private physiotherapy practice in Gaborone, Botswana.
Degree: MSc
BREC REF NO: BE331/16

EXPEDITED APPLICATION

A sub-committee of the Biomedical Research Ethics Committee has considered and noted your application received on 27 May 2016.

The study was provisionally approved pending appropriate responses to queries raised. Your response received 14 September 2016 to queries raised on 27 July 2016 have been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given full ethics approval and may begin as from 16 September 2016.

This approval is valid for one year from **16 September 2016.** To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2015), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx.
BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

The sub-committee's decision will be **RATIFIED** by a full Committee at its next meeting taking place on 11 October 2016.

[redacted] We would appreciate receiving copies of all publications arising [redacted] Ethics Committee

[redacted]
Postgraduate administrator: [illegible]

Biomedical Research Ethics Committee
Professor J Tsoka-Gwegweni (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001 Durban 4000
Telephone: +27 (0) 31 260 2486 **Facsimile:** +27 (0) 31 260 4606 **Email:** brec@ukzn.ac.za
Website: [illegible]

1910 - 2010
100 YEARS OF ACADEMIC EXCELLENCE

Founding Campuses: Edgewood, Howard College, Medical School, Pietermaritzburg, Westville

Appendix B: Ministry of Health and Wellness, Botswana. Health Research and Development Division clearance letter

TELEPHONE: 363 2766
FAX: 391 0647
TELEGRAMS: RABONGAKA
TELEX: 2818 CARE BD

Republic of Botswana

MINISTRY OF HEALTH
PRIVATE BAG 0038
GABORONE

REFERENCE NO: HPDME 13/18/1 X (637) **11 July 2016**

Health Research and Development Division

Notification of IRB Review: **New application**

Ms. Noreen Vimbiso Chihumbiri
P O Box 402264
Gaborone
Botswana

Protocol Title:	**EXPLORING OCCUPATIONAL RISK FACTORS OF LOW BACK PAIN AMONG PATIENTS ATTENDING A PRIVATE PHYSIOTHERAPY PRACTICE IN GABORONE, BOTSWANA**
HRU Approval Date:	11 July 2016
HRU Expiration Date:	10 July 2017
HRU Review Type:	HRU reviewed
HRU Review Determination:	Approved
Risk Determination:	Minimal risk

Dear Ms. Chihumbiri

Thank you for submitting new application for the above referenced protocol. The permission is granted to conduct the study.

This permit does not however give you authority to collect data from the selected sites without prior approval from the management. Consent from the identified individuals should be obtained at all times.

The research should be conducted as outlined in the approved proposal. Any changes to the approved proposal must be submitted to the Health Research and Development Division in the Ministry of Health for consideration and approval.

Furthermore, you are requested to submit at least one hardcopy and an electronic copy of the report to the Health Research, Ministry of Health within 3 months of completion of the study. Approval is for academic fulfillment only. Copies should also be submitted to all other relevant authorities.

Continuing Review
In order to continue work on this study (including data analysis) beyond the expiry date, submit a Continuing Review Form for Approval at least three (3) months prior to the protocol's expiration date. The Continuing Review Form can be obtained from the Health Research Division Office (HRDD), Office No. 7A.7 or Ministry of Health website: www.moh.gov.bw or can be requested via

e-mail from Mr. Kgomotso Motlhanka, e-mail address: kgmmotlhanka@gov.bw As a courtesy, the HRDD will send you a reminder email about eight (8) weeks before the lapse date, but failure to receive it does not affect your responsibility to submit a timely Continuing Report form

Amendments
During the approval period, if you propose any change to the protocol such as its funding source, recruiting materials, or consent documents, you must seek HRDC approval before implementing it. Please summarize the proposed change and the rationale for it in the amendment form available from the Health Research Division Office (HRDD), Office No. 7A 7 or Ministry of Health website: www.moh.gov.bw or can be requested via e- mail from Mr. Kgomotso Motlhanka, e-mail address: kgmotlhanka@gov.bw . In addition submit three copies of an updated version of your original protocol application showing all proposed changes in bold or "track changes".

Reporting
Other events which must be reported promptly in writing to the HRDC include:

- Suspension or termination of the protocol by you or the grantor
- Unexpected problems involving risk to subjects or others
- Adverse events, including unanticipated or anticipated but severe physical harm to subjects.

If you have any questions please do not hesitate to contact Mr. P. Khulumani at pkhulumani@gov.bw, Tel +267-3914467 or Lemphi Moremi at lamoremi@gov.bw or Tel: +267-3632754. Thank you for your cooperation and your commitment to the protection of human subjects in research.

[redacted]cretary

MINISTRY OF HEALTH
RESEARCH DIVISION
2016 -07- 11
P/BAG 0038
GABORONE
REPUBLIC OF BOTSWANA

Appendix C: Letter requesting permission to conduct research at Ergo-Physiotherapy Clinic

Plot 18702, Phase 2

Gaborone,

Botswana.

Tel: +267 75505265

20 September 2016

The Manager,

Ergo-Physiotherapy Clinic,

Unit 16 Medswana House,

Post Office Box 60256,

Gaborone,

Botswana.

Dear Madam

RE: PERMISSION TO CONDUCT RESEARCH AT YOUR CLINIC.

I am a physiotherapist currently studying towards a Master's Degree in Health Sciences with the University of KwaZulu-Natal in South Africa. In partial fulfilment of the requirements of this degree, I am required to conduct a research study and my topic is, "Exploring Occupational risk factors of low back pain among patients attending a private Physiotherapy practice in Gaborone, Botswana". Please find attached copies of the proposal, the questionnaire and the letter of acceptance of my research proposal by the authorities of the Ministry Of Health and Wellness, Botswana and University of KwaZulu-Natal, South Africa.

I am kindly requesting for permission to collect data from patients with low back pain from your clinic. It is anticipated that the study results would help in better understanding the risk factors and causes of LBP in order to formulate primary prevention and subsequent management strategies aimed at curbing the burden of the problem. Participation in the study is voluntary and all collected information would be treated with utmost confidentiality. The results of this study would be made available to the clinic, Ministry of Health and Wellness, Botswana as well as the University of KwaZulu-Natal.

If any further information is needed with regards to this study please do not hesitate to contact me on +267 75505265 or the research supervisors Doctor Thayananthee Nadasan on +27(31)2607939, nadasant@ukzn.ac.za; Mr Ntsikelelo Pefile on +27(31) 2607181 alternatively email at pefilen@ukzn.ac.za or the Research Office at BREC@ukzn.ac.za or telephone 27 31 2602486.

I am looking forward to a positive response from you.

Yours Faithfully

Noreen Chihumbiri

Appendix D: Permission to conduct research at Ergo-Physiotherapy Clinic

ERGO-PHYSIOTHERAPY CLINIC

P.O BOX 60256
GABORONE
BOTSWANA

UNIT 16 MEDSWANA HOUSE

TEL: (+267) 3710048
FAX: (+267) 3710049
CELL: (+267)77424768
(+267)72790998

YOUR NEEDS FIRST

27 September 2016

Biomedical Research Ethics Committee

Westville Campus,

Govan Mbeki Building

Attention: Professor Tsoka-Gwegweni (Chairperson)

Dear Sir

RE: <u>RESEARCH PERMISSION LETTER - NOREEN V CHIHUMBIRI</u>

This letter serves as confirmation that Noreen V Chihumbiri (Student Number: 214577373) contacted Ergo Physiotherapy Clinic requesting permission to undertake her data collection on "Exploring occupational risk factors for low back pain among patients attending a private physiotherapy clinic".

Miss Chihumbiri was granted permission and will be carrying out data collection from the 28th of November 2016 to the 9th of December 2016 at Ergo Physiotherapy Clinic, Medswana house, Gaborone.

The Manager and team of Ergo Physiotherapy Clinic would like to take this opportunity to wish Noreen well with her thesis and future endeavors.

JEAN MUNANDI

PHYSIOTHERAPY MANAGER

[redacted]**HERAPY CLINIC**

MEDSWANA HOUSE

ERGO PHYSIOTHERAPY CLINIC
MEDSWANA HOUSE
PLOT NO: 50360
MACHEL DRIVE
GABORONE
TEL:3710048 FAX:3710049

Appendix E: Informed Consent

Dear Participant

My name is Noreen Chihumbiri and I am currently enrolled at the University of KwaZulu- Natal. As part of the requirements of the program I am inviting you to take part in this study designed to obtain information on Occupational Risk Factors in the work place that expose patients to risk of developing low back pain. Findings from the study may help add to the body of knowledge on occupational low back pain prevention strategies and also ease the economic and psychological burdens associated with back pain.

All information obtained is for research purpose only and would be treated with utmost confidentiality. Your participation in this study is voluntary and your signed consent is required, you also have the right to withdraw from the study at any time you choose to without suffering any penalty or loss. If you have any question regarding this study, please feel free to ask or contact the researcher at Noreen Chihumbiri, Telephone +267 75505265 or the research supervisors Doctor Thayananthee Nadasan on +27(31)2607939, nadasant@ukzn.ac.za; Mr Ntsikelelo Pefile on +27(31) 2607181 alternatively email at pefilen@ukzn.ac.za or the **BIO-MEDICAL RESEARCH COMMITTEE** at BREC@ukzn.ac.za or telephone +27 (31) 2602486.

Your help in responding to this study is greatly appreciated.

Thank you for your cooperation and assistance.

Consent: Now that the study has been explained and I understand the purpose, I would be willing to take part in the study.

....

Signature of Participant/Date Signature of researcher/Date

Appendix F: Data Collection Tool

INVESTIGATING OCCUPATIONAL RISK FACTORS OF LOW BACK PAIN AMONG PATIENTS ATTENDING A PRIVATE PHYSIOTHERAPY PRACTICE IN GABORONE, BOTSWANA.

This questionnaire is to be completed by the participant after signed and written consent to be part of the study is granted. Putting down your name is not necessary in order to maintain the questionnaire anonymous. Information collected would be used solely for the purposes of research.

Instructions

Please fill in the blank spaces provided.

Select the appropriate response(s) by putting a tick (√) in the block provided next to the question.

Please don't write your name on the questionnaire to maintain it anonymous.

Thank you for your cooperation.

Section A: Demographic Information

Kindly answer the following questions by writing in the spaces provided or by putting a tick (√) in the appropriate box.

1. Gender a. [ ] Male b. [ ] Female

2. How old are you? ....

3. What is your height (m)? ....

4. What is your body weight (Kg)? ....

5. What is your BMI?.......................................

4. What is your current occupation category?

[ ] Clinic [ ] Construction[ ] Transport[ ] Mining

[ ] Teaching and Training [ ] Office work[ ] Agriculture

5. For how long have you been working?...................................(years).

6. In the past year, how many days have you been absent from work because of low back pain?

[ ] 0 days [ ] 1-2 days [ ] 3-7 days [ ] >7 days

Section B: The Roland-Morris Disability Questionnaire

When your back hurts, you may find it difficult to do some of the things you normally do.

This list contains sentences that people have used to describe themselves when they have back pain. When you read them, you may find that some stand out because they describe you *today*.

As you read the list, think of yourself *today*. When you read a sentence that describes you today, put a tick against it. If the sentence does not describe you, then leave the space blank and go on to the next one. Remember, only tick the sentence if you are sure it describes you today.

-I stay at home most of the time because of my back.

-I change position frequently to try and get my back comfortable.

-I walk more slowly than usual because of my back.

-Because of my back I am not doing any of the jobs that I usually do around the house.

-Because of my back, I use a handrail to get upstairs.

-Because of my back, I lie down to rest more often.

-Because of my back, I have to hold on to something to get out of an easy chair.

-Because of my back, I try to get other people to do things for me.

-I get dressed more slowly then usual because of my back.

-I only stand for short periods of time because of my back.

-Because of my back, I try not to bend or kneel down.

-I find it difficult to get out of a chair because of my back.

-My back is painful almost all the time.

-I find it difficult to turn over in bed because of my back.

-My appetite is not very good because of my back pain.

-I have trouble putting on my socks (or stockings) because of the pain in my back.

-I only walk short distances because of my back.

-I sleep less well because of my back.

-Because of my back pain, I get dressed with help from someone else.

-I sit down for most of the day because of my back.

-I avoid heavy jobs around the house because of my back.

-Because of my back pain, I am more irritable and bad tempered with people than usual.

-Because of my back, I go upstairs more slowly than usual.

-I stay in bed most of the time because of my back.

Section C:

The following information would be used to determine the relationship between your low back pain symptoms and work tasks. Please answer the following questions by ticking(√) the appropriate response in the block provided next to each question.

Do you in your work often have to

1. lift heavy loads (more than 5 kg)? [ ]YES [ ]NO

2. pull or push heavy loads (more than 5 kg)? [ ]YES [ ]NO

3. carry heavy loads (more than 5 kg)? [ ]YES [ ]NO

Do you in your work often have to lift

4. in an awkward posture? [ ]YES [ ]NO

5. with the load far from the body? [ ]YES [ ]NO

6. with a twisted trunk? [ ]YES [ ]NO

7. with the load above chest-height? [ ]YES [ ]NO

8. a load that is hard to hold? [ ]YES [ ]NO

9. a very heavy load (more than 20 kg)? [ ]YES [ ]NO

Do you in your work often have to

10. stand for a prolonged time? [ ]YES [ ]NO

11. sit for a prolonged time? [ ]YES [ ]NO

12. walk for a prolonged time? [ ]YES [ ]NO

13. stoop for a prolonged time? [ ]YES [ ]NO

Do you in your work often have to

14.bend slightly with your trunk? [ ]YES [ ]NO

15. bend heavily with your trunk? [ ]YES   [ ]NO

16. twist slightly with your trunk? [ ]YES   [ ]NO

17. twist heavily with your trunk? [ ]YES   [ ]NO

18. bend and twist with your trunk? [ ]YES [ ]NO

Do you in your work often have to

19. work in a slightly bent posture for a prolonged time? [ ]YES   [ ]NO

20. work in a heavily bent posture for a prolonged time? [ ]YES   [ ]NO

21. work in a slightly twisted posture for a prolonged time? [ ]YES   [ ]NO

22. work in a heavily twisted posture for a prolonged time? [ ]YES   [ ]NO

23. work in a bent and twisted posture for a prolonged time? [ ]YES [ ]NO

Do you in your work often have to

24. work in uncomfortable postures? [ ]YES [ ]NO

25. work in the same postures? [ ]YES [ ]NO

Do you in your work often have to

26. always make the same movements with your trunk? [ ]YES [ ]NO

Do you in your work often have to

27.make sudden, unexpected movements? [ ]YES [ ]NO

28. perform short, but maximal force-exertions? [ ]YES [NO]

29. exert great force on tools or machinery? [ ]YES [ ]NO

Do you in your work often not have

30. enough room around you to perform your work properly? [ ]YES [ ]NO

31. enough room above you to perform your work without bending? [ ]YES [ ]NO

Do you in your work often have

32. difficulty in exerting enough force because of uncomfortable postures? [ ]YES   [ ]NO

33. too few facilities to lean on during your work? [ ]YES   [ ]NO

34. trouble in reaching things with your tools? [ ]YES [ ]NO

35. Do you sometimes slip or fall during your work? [ ]YES [ ]NO

36. Do you in your work experience noticeable mechanical vibrations or shocks?

[ ]YES [ ]NO

37. Do you carry vibrating tools during your work? [ ]YES [ ]NO

38. Do you drive vehicles during your work? [ ]YES [ ]NO

39. Is your work physically very taxing? [ ]YES [ ]NO

____

(Researcher) Signature

Thank you for participating in the study.