

A study to determine the type, prevalence, risk factors and coping strategies of physiotherapists experiencing work related neuro-musculoskeletal disorders in KwaZulu-Natal.

Submitted in fulfilment of the requirement for the degree:

Masters in Physiotherapy

School of Physiotherapy

Faculty of Health Sciences

University of KwaZulu-Natal

2014

Hayley Candice Pillay

Abstract

Work related neuro-musculoskeletal disorders (WRNMD) account for the greatest burden of all types of injuries, and is a key area of concern in the health care sector. Physiotherapy often requires various labour intensive tasks and techniques, which may be done repetitively for prolonged periods. There is little data available on occupational injuries of Physiotherapists in KwaZulu-Natal Province, South Africa. The impact, effect and consequences of the dynamics and nature of physiotherapy needs to be assessed with particular focus on the neuro-musculoskeletal system of the physiotherapist, when executing the various techniques of physiotherapy practice. The aim of the study was to determine the prevalence of work related neuro-musculoskeletal disorders experience by physiotherapists, to identify the anatomical sites most affected, and to describe risk factors that contribute to injury and the coping strategies they use to overcome them.

Study design: This study was a cross sectional point prevalence descriptive study using self administered questionnaires, with open- and closed-ended questions. A convenience sample was used of all physiotherapists practicing in the public and private sectors in KwaZulu-Natal were included, this constituting a sample of 681 professionals.

Results: Of the 205 physiotherapist who participated, 86% reported having had incurred work related WRNMD. They reported that 38.5% of injury occurred in the first five years following graduation. The neck (33.2%) and the lower back (31.2%) were the anatomical areas most affected. The techniques associated with massage, mobilisation, manipulation, chest physiotherapy and general rehabilitation were found to have a significant relationship with prevalence of WRNMD (p value $< .05$). Physiotherapists practicing in the public sector hospitals showed a greater prevalence to injury compared to those in the private sector. Transferring dependent patients was described as a major risk by 62.5% of physiotherapist. Modifying the physiotherapist's posture or patient's treatment position was seen as the common effective strategy.

Conclusion: The prevalence of WRNMD amongst physiotherapists is relatively high, with the neck and lower back being predominant sites of injury, the main risk factors being lifting or transferring of dependent patients, with the number of years of experience being a contributing factor. Those practicing in the clinical fields of chest, neurology and orthopaedics are more likely to incur WRNMD. The results of this study indicate that particular attention should be given to techniques of manual handling and to hand- intensive manual therapy techniques. Current coping strategies most used were modifying the patient's position or the physiotherapist's posture during treatment.

Specific strategies should be developed by physiotherapists, with regards to how many hours it is safe to perform certain physiotherapy techniques e.g. percussion, or the number of patients that require labour intensive treatment such, as massage or manipulation, could be treated in a time period. This study highlights the fact that physiotherapists are presenting with work related neuro-musculoskeletal disorders which may pose a significant threat to the length of the physiotherapist's career, their general well being, and the maintenance of a viable work force for healthcare organisations.

Abbreviations

AIDS	-	Acquired Immune Deficiency Syndrome
CTD	-	Cumulative Trauma disorder
HIV	-	Human Immunodeficiency Virus
HPCSA	-	Health Professions Council of South Africa
KZN	-	KwaZulu-Natal
No.	-	Number
OCD	-	Occupational cervicobradial disorder
OOS	-	Occupational overuse syndrome
RSA	-	Republic of South Africa
RSI	-	Repetitive strain model
SA	-	South Africa
SASP	-	South African Society of Physiotherapy
UK	-	United Kingdom
USA	-	United States of America
WRNMD	-	Work related neuro-musculoskeletal disorders

Preface

This study represents original work by the author and has not been submitted in any form to another university. Where use was made of the work of others, it has been duly acknowledged in the text. The research described in this commentary was carried out in the province of KwaZulu- Natal, under the supervision of Dr S.S Maharaj.

.....

Hayley Pillay

2013

Acknowledgements

I would like to extend my sincere thanks and gratitude to:

Dr S.S Maharaj, my supervisor for his guidance and supervision.

Karishma Bilala for assistance and support with typing.

My loving husband, Leonel for his inspiration and encouragement.

My beautiful children Leon, Leah and Reid for their patience and support.

Eleda Ramohohlelo, my amazing domestic helper, for her loving care of my children during this period of research.

My Mother, Mariamma, for also helping me with my children during this period of research.

Carrin Martin for professionalism and expertise with editing of the research.

My Lord and Saviour Jesus Christ, for his ever present divinity, wisdom and grace in my life.

I dedicate my work to the memory of my late father, Sylvester Edward Pillay.

Table of contents

	Page
Abstract	(i)
Abbreviations	(iii)
Preface	(iv)
Acknowledgements	(v)
Table of contents	(vi)
List of tables	(xi)
List of figures	(xi)
Annexure	
Chapter 1. Introduction	
1.1 Introduction	1
1.2 Background	2
1.3 The Motivation for study	3
1.4 The problem statement	4
1.5 The research question	4
1.6 Aims and objectives	4
1.7 Significance of study	5
1.8 Outline of study	5
Chapter 2. Literature Review	
2.1 Introduction	7
2.2 Pathology of WRNMD experienced by physiotherapists	7
2.2.1 Pathophysiology of Work related neuro-musculoskeletal injuries	9
2.3 Prevalence of WRNMD among physiotherapists	10
2.3.1 WRNMD among other health care professionals	11
2.3.2 Health care in the public and private health care sector	12
2.4 Risk factors associated with WRNMD among physiotherapists	14

2.4.1	Prevalence of symptoms related to years of experience	15
2.5	Anatomical areas commonly affected	16
2.6	The relationship between the prevalence of injury and the techniques of physiotherapy used in a clinical area.	18
2.7	International strategies to reduce WRNMD	20
2.7.1	Coping strategies	20
2.7.2	Strategies utilized Managers	21
2.7.3	Principles of Ergonomics in relation to WRNMD	22
2.8	Occupational health services for health care workers in South Africa	25
2.9	Summary	27
Chapter 3- Methodology		
3.1	Introduction	28
3.2	Ethical considerations	28
3.3	Research design	28
3.4	Study population	28
3.5	Study sample	29
3.6	The inclusion criterion	29
3.7	Pilot study	30
3.8	Data collection procedures	30
3.9	Data management and confidentiality	31
3.10	Data analysis	31
3.11	Reliability and validity	32
Chapter 4. Results		
4.1	Introduction	33
4.2	Demographic characteristics	33
4.3	Objective 1: To establish the type and prevalence of WRNMD of physiotherapists in KZN And compare the prevalence in the public and private sectors	34
4.4	Objective 2: To describe the risk factors contributing to WRNMD	36
4.4.1	The relationship between the number of years of experience as a physiotherapist and the prevalence of WRNMD	38

4.5	Objective 3: To determine the physiotherapist's anatomical areas commonly affected, as a result of WRNMD	39
4.6	Objective 4. To Determine the Relationship between the Prevalence of injury and techniques of physiotherapy used in a Clinical area.	40
4.7	Objective 5: To describe the coping strategies of physiotherapists, who are affected by WRNMD	41
Chapter 5. Discussion		
5.1	Introduction	43
5.2	Objective 1. To Establish the Prevalence and Type of WRNMD of Physiotherapists in KZN and to Compare the Prevalence of WRNMD in the Public and Private sectors	43
5.3	Objective 2. To Describe the Risk Factors contributing to WRNMD and the Relationship between the Number of Years of Experience as a Physiotherapist and the Prevalence of WRNMD	49
5.4	Objective 3. To Determine the Physiotherapist's Anatomical Areas Commonly Affected, as a result of WRNMD.	53
5.5	Objective 4. To Determine any Relationship between the Prevalence of Injury and Techniques of physiotherapy being done in a Clinical area.	55
5.6	Objective 5. To Describe the Coping Strategies of Physiotherapists who are Affected by WRNMD	58
Chapter 6. Conclusion		
6.1	Introduction	64
6.2	Limitations	67
6.3	Recommendations	68
6.4	Summary	69
	References	71
	Appendices	76

List of Tables

<u>Table</u>	<u>Title</u>	Page
4.1.	Demographic data collected	33
4.2.	Prevalence of WRNMD in relation to gender	34
4.3.	The comparison between the public and private health care sector in relation to WRNMD	35
4.4.	Table describing Contributing risk factors to WRNMD	37
4.5.	Period of injury	38
4.6.	Frequency table of anatomical areas as a result of WRNMD	
4.7	The relationship of the clinical areas, techniques of physiotherapy and the prevalence of WRNMD with significance	39
4.8	Strategies used by physiotherapists in coping with WRNMD	41
4.9.	Consequences of WRNMD on physiotherapists	42

List of Figure

<u>Figure</u>	<u>Title</u>	
4.1.	Prevalence of work related neuro-musculoskeletal disorders	34

CHAPTER 1. INTRODUCTION

1.1 Introduction

Physiotherapy is a profession devoted to the promotion, rehabilitation and restoration of health through the application of clinical expertise and knowledge of the profession. The practice of physiotherapy often requires the use of labour intensive techniques when delivering patient care. It is common for physiotherapists to perform these techniques frequently in a day, often involving repetitive movement such as percussion and high force manual techniques that exert direct pressure on certain joints during treatments e.g. massage or percussion. These techniques may be conducted in awkward positions and postures during certain manoeuvres (Nordin et al, 2011).

A number of tasks can be physically challenging such as: transferring, lifting or carrying dependant patients (with spinal injuries or lowered level of consciousness); assisting patients with gait (stroke, fractures or amputation with walking); providing manual resistance (strengthening of amputee stumps); assisting patients with mat activities (proprioceptive neuromuscular facilitation) and lifting heavy electrotherapy equipment. These are part of the scope of practice in physiotherapy and place the physiotherapists at risk for both acute and cumulative work related musculoskeletal disorders (Bork et al, 1996). Occupational disorders have not only physical, psychological and social consequences but also have economic and security impacts when they reach a certain level of severity (Shaik et al, 2011), substantiating findings in Australia, that one in six physiotherapists moved within or left the profession as result of work related musculoskeletal disorders (Cromie et al, 2000).

The term work related neuro-musculoskeletal disorders (WNRMD) refers to a wide range of inflammatory, degenerative disorders, disorders that result in pain and functional impairment. They arise when individuals are exposed to activities that significantly contribute to their development or exacerbation of symptoms, but may not be the sole cause of the musculoskeletal disorder (Barnes et al, 2007). To date, little is known about the nature and extent of WRNMD in the Republic of South Africa (RSA), more specifically in the province of KwaZulu-Natal Province (KZN).

1.2 Background

The healthcare industry has the highest occurrence of occupational injuries compared to any other service sectors (Bork et al, 1996). The results of international surveys in physiotherapy being part of this industry indicate a high prevalence of occupational injuries, mainly of the neuro-musculoskeletal system, despite physiotherapist's knowledge of ergonomics, body mechanics, injury prevention and kinetic handling (Adegoke et al, 2008; Glover et al, 2005; Salik and Ozcan, 2004; Cromie et al, 2000).

The problem of WRNMD among physiotherapists has been described by Igumbor et al (2003), as 'virulent' and a significant problem to the profession, having physical impacts and psycho-social effects. Klusmann et al (2008) stated that practitioners may suffer from an impairment of general well-being due to WRNMD, which may impact on their level of productivity as well as the personal and social lives.

In RSA, the public sector physiotherapists are employed in provincial hospitals, special needs and non-governmental organisations, with their conditions of employment and remuneration based on public-service policy, as set by the state. Private-sector physiotherapists have private-practice employment, and their conditions of service and remuneration follow the basic conditions of employment act with private remuneration by patients and medical aid schemes (Maharaj, 2013).

According to the population census conducted in 2011, KZN had second highest provincial population at 10 267 300, and had 681 registered physiotherapists, resulting in a ratio of 1 practitioner for 15 076 people (SA Statistics, 2012). Although there is presently no nationally recommended ratio, of practitioner to patient, this study would provide data, to understanding the dynamics of the profession, so that measures could be taken to determine a suitable ratio of practitioner to patient. KZN has the highest HIV prevalence in the country (South Africa HIV and Aids Statistics, 2010), this condition results in patients being susceptible to developing various diseases and infections, for which some may require physiotherapy as an essential part of their treatment plan e.g. chest physiotherapy for pneumonia. The implications of this pandemic in RSA, for physiotherapists, who form an integral part of the health care system, are that, they receive many referrals for physiotherapy services. This increased demand for physiotherapy services, particularly in the public health sector, has led to shortages of physiotherapists, who are no longer able to meet the demands of the increasing patient

load (Maharaj and Rangiah, 2010). The impact of this increasing population who require rehabilitation services on the neuro-musculoskeletal health of physiotherapists has yet to be determined.

1.3 Motivation for the study

The researcher was employed in the public sector at a tertiary level hospital at which fourteen physiotherapists were employed. There were high work-load discrepancies between senior and junior physiotherapy staff members, which was compounded during times of staff leave e.g. sick leave or absenteeism. In addition, senior physiotherapists with more years experience had more administrative tasks than junior staff members, who were allocated to clinical areas that were physically demanding.

The researcher was later employed at a public service district level hospital, serving the large community of Phoenix. There were only two physiotherapists and one physiotherapy assistant, as a result of which, the researcher experienced considerable stress, fatigue and WRNMD due to attending to large volumes of patients, which was compounded when the researcher's colleague took leave.

The researcher is currently self-employed in the private sector, which is driven by consumer or patient satisfaction and expectations. Physiotherapists have often to comply with these expectations and satisfactions as their income is derived from this sector. The number of patients treated in the private sector is directly proportional to the income of the practitioner, which could result in the practitioners working harder, and this may contribute to WRNMD. The researcher has been afflicted by WRNMD and has anecdotal knowledge of complaints of other practitioners in the public and private sectors. WRNMD among physiotherapists has also been reported to be a significant problem in other studies conducted internationally (Salik and Ozcan, 2004; Cromie et al, 2000).

1.4 Problem Statement

Studies in South Africa have focussed on hand and lower back symptoms of physiotherapists e.g. (Barnes et al, 2007), but this underestimates the range of problems incurred by physiotherapists due to the nature and scope of the profession. In addition, physiotherapists are employing general ergonomic principles and coping strategies while treating patients in KZN, but WRNMD still appears to be a significant problem. No surveys have been done in KZN in the private and public sectors to determine the type of WRNMD incurred, prevalence, contributing risk factors and coping strategies of physiotherapists experiencing WRNMD, as well as to compare the public and private practice of physiotherapists in relation to WRNMD.

1.5 The Research Question

What is the nature, contributing factors and extent of WRNMD? How do physiotherapists cope with WRNMD in KZN, and are there any differences in prevalence of WRNMD between those physiotherapist working in private and public sectors?

1.6 Aims and Objectives

The Aim of the study was to determine the prevalence and type of WRNMD, the risk factors and coping strategies of physiotherapists in KZN.

The study had the following Objectives:

1. To establish the prevalence and type of WRNMD of physiotherapists in KZN and to compare the prevalence of WRNMD in the public and private sectors.
2. To describe the risk factors contributing to WRNMD and the relationship between the number of years of experience as a physiotherapist and the prevalence of WRNMD.
3. To determine the physiotherapist's anatomical areas commonly affected by WRNMD.
4. To determine if any relationship exists between the prevalence of injury and the techniques of physiotherapy used in a clinical area.
5. To describe the coping strategies of physiotherapists who are affected by WRNMD.

6. To make appropriate recommendations based on this study, if the prevalence of WRNMD is found to be significant.

1.7 Significance of study

The results of this study would provide important information to the profession about WRNMD and will indicate the extent to which physiotherapists are being affected in KZN. This information would enable guidelines or policies to be compiled to help prevent WRNMD as none are currently available. Areas of clinical practice that are physically demanding will be identified. In addition, physiotherapy modalities or techniques that are associated and contribute to WRNMD will be identified and as well as the coping strategies used by physiotherapists to overcome WRNMD.

1.8 Outline of study

This research will be presented in the following five chapters:

Chapter 2. Literature review: The literature relating to WRNMD studies done internationally, the prevalence, types of WRNMD and comparisons of the public and private sector in relation to WRNMD are reviewed. The literature on risk factors and the commonly affected anatomical areas associated with WRNMD will also be reviewed. In addition, literature on the relationship between the prevalence of injury and the type of physiotherapy being done in a clinical area and the coping strategies in relation to WRNMD is reviewed.

Chapter 3. Methodology: This chapter describes the methodology used to conduct the study and includes of the study, the study population and sample of study. The data collection tool, data management, data analysis, reliability and validity of study are also presented. Ethical considerations and confidentiality are also reflected.

Chapter 4. Results: The results of the study are presented with respect to the study objectives in tabular and graph form. Each table is accompanied with a summary of the main findings of the results.

Chapter 5. Discussion: The discussion of the study results are presented with respect to the objectives and are reviewed in relation to local and international literatures.

Chapter 6. Conclusion: The summary of the study is presented in the conclusion with limitations and recommendations.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

Literature was obtained from journal articles, books, internet and other related sources which address the issues of WRNMD studies done internationally. This covered pathologies of injuries, their prevalence, comparison between the public and private sector in relation to WRNMD. This is followed by a review of risk factors associated with WRNMD and any relationship between the prevalence of WRNMD and the number of years of professional experience. The anatomical areas commonly affected, the relationship between the prevalence of injury and the techniques of physiotherapy used in a clinical area and the coping strategies are also reviewed.

2.2 Pathology of WRNMD Experienced by Physiotherapists

Physiotherapists perform physiotherapy techniques frequently in a day, often these techniques requires repetitive movement, such as percussion, and high force manual techniques that exert direct pressure on certain joints, during treatments e.g. massage, lifting. These techniques may be conducted in awkward positions and postures during certain manoeuvres (Nordin et al, 2011). Therefore, the practice of physiotherapy requires the performance of many labour- intensive tasks related to the delivery of patient care (Barnes et al, 2007). Such repetitive labour -intensive tasks, results in direct exertion of the neuro-musculoskeletal system of physiotherapists and may consequently result in WRNMD.

WRNMD is a syndrome incorporating several discrete associated conditions and types of injuries. Examples of these conditions are swelling, tendinitis, carpal tunnel syndrome, cubital tunnel syndrome, thoracic outlet syndrome, stenosing tenosynovitis, intersection syndrome, golfer's elbow or medial epicondylitis, tennis elbow or lateral epicondylitis, radial tunnel syndrome, focal dystonia, lower back pain, sciatica and rotator cuff injuries (Glover et al, 2005). Injuries of the musculoskeletal and nervous system may be caused by repetitive tasks, forceful exertions, vibration, mechanical compression which is pressing against hard surfaces and sustained or awkward positions (Holder et al, 1999). WRNMD are considered a soft tissue pain syndrome, which is derived from a disorder of the muscles and tendons. Tendons are soft tissue connective tissue, consisting of parallel collagen fibers embedded within an extracellular matrix.

This organised structure allows tendons to withstand and transmit large forces between muscle and bone (Tony et al, 2004). As tendons are subjected to repeated motion and degeneration over time, they are prone to both acute and chronic injuries.

According to Ranney et al (1995) symptoms of WRNMD include:

- short bursts of pain in arm, back, shoulders, neck, wrists, hands or thumbs.
(Typically diffuse i.e. spread over many areas)
- pain worse with activity
- weakness or lack of endurance

Tony et al (2004) cited that the contraction and relaxation of muscles allow for movement to occur at a joint, with the overuse or strain of muscles, leading to the injury of the musculature, muscles shorten and can potentially scar in a shortened position as a result of injury or exercise, the shortening process often being exaggerated at rest. Therefore, muscles that work repeatedly in a particular action eventually shorten and over time will develop some form of scar formation, which are described as microinfarcts, or trigger points (Tony et al, 2004). The 'neuroplastic strain model' as described by Klussman et al (2008), states that highly frequent repetitive movements cause micro-lesions that accumulate in the affected neuro-musculoskeletal structures and lead to movement related pain, therefore such activities are contributors to the prevalence of injury. In traumatic cases, muscles will shorten and scar in a much more accelerated period of time and often more severely.

Muscles become super-sensitive, and ultimately persistently shortened with eventual scarring, when their nerve conduction is partially interrupted (Helliwell and Taylor, 2004). For example, if the nerve supply to the forearm extensors is interrupted by a disk compressing the C4 or C5 nerve root, the forearm extensors will persistently shorten and cause chronic tennis elbow. Shortened muscles around a joint will often change the static position of normal movement of the joint. Furthermore, persistent compression of the joint may occur and contribute to an abnormal and accelerated wear pattern of cartilage and eventually the joint. Joint pain, stiffness and decreased range of motion are common side effects, with the destruction of the joint and osteoarthritis being predictable complications over time (Helliwell and Taylor, 2004).

2.2.1 Pathophysiology of Work Related Neuro-Musculoskeletal Injuries

The pathophysiology of overuse injuries is based on the idea that tissues adapt to the stresses placed on them over time, these stresses include shear, tension, compression, impingement, vibration, and contraction. Mechanical fatigue within tendons, ligaments, neural tissue and other soft tissue result in characteristic changes, depending on their individual properties. This fatigue is theorized to initially lead to adaptations of these tissues (Tony et al, 2004). As the tissues attempt to adapt to the demands placed on them, they can incur injury unless they have appropriate time to heal. The rate of injury simply exceeds the rate of adaptation and healing in the tissue. Evidence also suggests that chemical mediators are involved in the initiation and propagation of overuse injuries (Tony et al, 2004).

The following theory by Barr and Barbe (2002) is noted:

Nerve tissues are at particular risk for ischemic injuries, which leads to characteristic changes in the nerve itself. The timeline generally begins with subperineurial oedema, followed by thickening of the perineurium, thickening of the internal and external epineurium, thinning of the peripheral myelin, and, eventually, axonal degeneration. One hypothesis is that the development of muscular pain originates from the nearly continuous activation of low-threshold motor units that occur in muscles performing continuous or slow, repetitive tasks, causing depletion of adenosine 5'-triphosphate (ATP) in those fibers. With sufficient ATP, sarcoplasmic reuptake of Calcium ions could be reduced, resulting in high concentrations in the cytosol, allowing Calcium ions dependant activation of phospholipase, the generation of free radicals and damage to the muscle fibers involved. This theory has rational physiological basis, but it remains to be proven.

Further Barr and Barbe (2002) adds that, multiple studies have shown that, patients with more significant work-related, upper extremity disorders exhibit more muscular activity on electromyography (EMG) findings. Increasing data in, in vitro and in vivo human and animal models show that there are tissue-level changes associated with repetitive stress. Prostaglandin E2 has been found to be present in high quantities in overuse tissues in rat and chicken models. This mediator has been suggested to influence cell proliferation, increase collagenase, and decrease collagen synthesis. Increasing loads on these tissues alters the amount of nitric oxide and prostaglandin E2.

However, another hypothesis based on rat-model observations suggests that overuse may lead to an under-stimulation of tendon cells, rather than to overstimulation. Alterations in the regulations of genes within tendons undergoing overuse have been shown in rat model. These changes include up-regulation of genes associated with cartilage, and down-regulation of genes associated with tendon. This suggests that overuse may cause a morphologic alteration of tendon tissue, causing it to become more cartilaginous. Moderate (40 N) and high (60 N) cyclic loads are reported to create an acute neuromuscular disorder characterized by delayed hyperexcitability and an inflammatory state in the lower back. Microtears within muscle tissue have been shown to be related to higher repetition loads (Barr and Barbe, 2002).

Various nomenclatures are used to label and characterize work related neuro-musculoskeletal disorders such as (Klussman et al, 2008): repetitive strain injury, repetitive stress injuries, repetitive motion injuries (RSI), occupational overuse syndrome (OOS), occupational cervicobrachial disorder (OCD) and cumulative trauma disorder (CTD).

2.3 Prevalence of WRNMD among Physiotherapists

In the United Kingdom (UK), Glover et al (2005) found a career prevalence of WRNMD to be 68% and reported that only a minority of injuries were reported. Under-reporting of injuries undermines official action, an “invisible” problem is harder to solve. West and Gardner (2001), stated that more emphasis needs to be placed on reporting of injuries by physiotherapists themselves so that a more appropriate injury surveillance method could be developed and implemented by the profession.

Physiotherapists form an integral part of the health care team, who are participate in the preventative, therapeutic and rehabilitative care of patients and therefore many studies of WRNMD among physiotherapists have been conducted internationally. Nigerian physiotherapists surveyed by Adegoke et al (2008) had a 91.3% prevalence of injury among physiotherapists. In the UK, Glover et al (2005) found a 68% career prevalence among physiotherapists. Igumbor et al (2003) found a 56% prevalence of work related low back pain among physiotherapists in Zimbabwe. In Australia, Cromie et al (2000) found a 91% prevalence of WRNMD among physical therapists.

Salik and Ozcan (2004), found a 85% prevalence of WRNMD in Turkey and in the United States of America (USA), Bork et al (1996) found a 61% prevalence of WRNMD among physical therapists. The variations in the percentages may be due to the fact that physiotherapists have been found to be exposed to different epidemiological and psychosocial factors in different countries (Salik and Ozcan, 2004). In Bloemfontein, Barnes et al (2007) found a 67% prevalence of low back pain among physiotherapists.

In the USA, Holder et al (1999) conducted a study of occupational musculoskeletal injuries with randomly selected physical therapists and assistants. The assistants reported similar WRNMD to the physical therapists, as well as a high prevalence of musculoskeletal injuries. The scope of practice of physical therapy assistants also involves labour intensive work such as lifting and transferring dependent patients, assisting in gait, lifting of cumbersome equipment and providing manual resistance.

2.3.1 WRNMD among Other Health Care Professionals

Musculoskeletal injuries account for the greatest burden of all injury types in healthcare (Collins et al, 2004). WRNMD, particularly of the lower back among the nursing profession, has been widely researched and documented. Their profession is often associated with heavy emotional and physical work and they are exposed to a combination of mechanical and psychosocial stressors at work. Working positions are often uncomfortable, due to lack of space or movement restriction caused by special circumstances such as dialysis units, operating theatres, intensive care units. It has been found that nurses have to walk and stand during most of their shift, in many instances for more than six hours at a time (Hinmikaiye and Bamishaiye, 2012).

Lifting patients was found to be the leading source of injury for nurses. Collin et al (2004) conducted a study on musculoskeletal injuries in a nursing home and found that nurses perform transfers in small bathrooms and rooms cluttered with medical equipment. The most physically demanding tasks for the nurses were transferring physically dependent patients to and from toilets, in and out of beds/chairs, repositioning patients in bed, and transfers for bathing and weighing patients. Collin et al (2004) added that a shortage in the nursing workforce, coupled with excessively high back rate injury, raises serious concerns about the capacity of the nursing work force to

care for the expanding population, particularly with the rapidly increase number of older people, which is also currently occurring in South Africa, (South African Statistics, 2012).

A prevalence of 78% of lower back pain was also found among theatre nurses, who assist surgeons, the surgical teams, and tend to the health and care of the patients (Hinmikaiye and Bamishaiye, 2012). Another health care profession afflicted with work related musculoskeletal injuries are dental surgeons. In dentistry, bad working habits, repetitive scaling, root planning and uncomfortable physical postures contribute greatly to musculoskeletal disorders, stresses and loss of productivity. Dentistry causes significant occupational health problems and a positive correlation between the number of patients attended to per day, and pain experienced in the back, wrist and hip/ thigh, was found (Shaik et al, 2011).

Diagnostic Medical Sonographers and vascular technologists were other groups of health care professions surveyed by Evans et al (2009) for WRNMD. Results from the study indicated that 90% of the respondents were scanning in pain, with shoulder pain being the most common area of complaint. Older and more experienced sonographers had more finger, hand and wrist pain than other groups. Pain was related to the pressure applied to the transducer, abduction of the arm, twisting of the neck and trunk. The incidence of WRNMD remained high despite the availability of ergonomic equipment and education being provided by application specialists.

2.3.2 Health Care in Public and Private Health Care Sector

In RSA there are two sectors from which health care can be sought. The public and the private health care sector. The South African public health care sector is funded by the state and results from a combination of factors: the legacy of apartheid, issues of poverty, income inequalities and AIDS, and that health care is skewed in favour of the private sector (Gavin and McIntyre, 1998). The public health care system has therefore historically, been poorly funded relative to its needs. KZN has the highest prevalence of HIV, (South Africa HIV and Aids Statistics, 2010). HIV/AIDS lends to patients being susceptible to the development of various diseases and infections.

The implications of this pandemic in RSA, for physiotherapists, who form an integral part of the health care system, are that they may receive many referrals for physiotherapy services. This increased demand for physiotherapy services, particularly in the public health sector, has led to shortages of the current number of physiotherapists, who are no longer able to meet the demands of the increasing patient load (Maharaj and Rangiah, 2010). Currently, the impact of HIV/AIDS and tuberculosis has placed an additional burden on public health therapists within an over-burdened and under-resourced public health system (Chetty and Maharaj, 2013).

The public health care system in KZN provides health care for the population of KZN, if medical health care is not sought by individuals in the private health sector. KZN, as a province, according to SA Statistics (2012), has the second highest population in S.A, with a population of 10 267 300. According to Statistics SA (2011) the findings from the General Household survey (2011) revealed that 77.2% of households use public health care facilities in KZN. At the time of this study, according to the Health Professions Council of South Africa, there were 681 physiotherapists practicing in KZN in both the public and private healthcare sectors. Therefore if consideration is made to the population of KZN, the percentage treated in the public sector and the number of physiotherapists practicing in KZN, a certain shortage of physiotherapists in KZN is noted. The public health care sector therefore has an increased burden coupled with the highest prevalence of HIV, in providing health care for its population.

Additionally, there is a higher than expected number of people who are aged 80 years and older in S.A, (SA Statistics, 2012). The lack of adequate funding in the public health sector to meet the demands of the population leads consequently to poor staffing, and thus possible high work load issues for physiotherapists. High work- loads have been described by Jensen et al (2012) as a key risk factor to the prevalence of WRNMD.

The lack of adequate funding in the public sector relative to the private sector (Gavin and McIntyre, 2008), may result in the lack of or shortage of equipment or appropriate equipment. The shortage of equipment or appropriate equipment creates a potential risk factor for the prevalence of WRNMD (Collins et al, 2004). The lack of equipment means physiotherapist are then forced to do more manual labour, e.g. manually lifting patients, using massage for pain instead of electrotherapy.

The private health care sector is generally well funded and equipped to meet the demands of this sector (Gavin and McIntyre, 2008). The sector is driven by individuals subscribing membership to a medical aid fund. Health care is sought by these individuals at private health facilities and private practitioners. These facilities and practitioners are remunerated by the medical aid schemes. A number of medical aid schemes or health insurance schemes are available in South Africa. These schemes are intended to protect individuals against risk of incurring expenses when they fall ill or to pay for preventative treatments (Statistics SA, 2011). Each medical aid or medical benefit scheme or private health insurance scheme has range of options from which individuals can choose. Medical schemes in South Africa governed by the Council for Medical Schemes Act, (Act No. 131 of 1998), Statistics SA, (2011).

The results of the General Household Survey, (2011), Statistics SA, (2011), revealed that 8 057 559 individuals in South Africa are covered by Medical aids representing 16.0% of the total population. In KZN only 12.2% of individuals were covered by medical aids, (Statistics SA, 2011). Physiotherapists practicing in the private health care sector have to derive their income from this 12.2% of the population in KZN. The number of patients treated is directly related to the income of the practitioner e.g. physiotherapists, (Cromie et al, 2000), thus there is a possibility of over-working to be better remunerated and therefore the susceptibility of physiotherapists to develop WRNMD. The private sector is also driven by patient satisfaction and physiotherapists have often to work harder to meet this challenge.

2.4 Risk Factors Associated with WRNMD among Physiotherapists

Physiotherapists may be exposed simultaneously to a number of risk factors, their interaction makes it difficult to identify the cause of injury (Kuorinka et al,1987).

Bork et al (1996) describes 17 associated risk factors that are divided into the following four categories:

1. Physiotherapy activities: 6 risk factors relating to specific activities e.g. lifting
2. Posture: 4 risk factors relating to the work posture or position e.g. bending or twisting.
3. Work-load issues: 4 risk factors relating to the frequency or repetitiveness of treatment and time management issues, such as scheduling and rest breaks.

4. Personal: 3 risk factors relating to the physical work capacity, state of health and knowledge.

Bork et al (1996) cited that biomechanical investigations have confirmed that lifting and transferring patients generates high spinal stresses. Transferring and lifting dependent patients is part of the scope of the physiotherapy profession, particularly during acute care, as in hospital settings and rehabilitation environments. Salik and Ozcan (2004), found the highest risk factor in WRNMD's among physiotherapists in Izmir, Turkey, to be transferring dependent patients, some of whom were physically heavy, or being in awkward positions when lifting. Lifting of dependent patients is related to the development of lower back symptoms and is a commonly accepted injury, as supported by research, particularly in nursing (Collins et al, 2004; Hinmikaiye and Bamishaiye, 2012).

In surveying WRNMD among dentists, Shaik et al (2011) postulated that the physical posture of the operator should be such that all the muscles are in a relaxed, well-balanced and neutral position. Postures outside this position are likely to cause musculoskeletal discomfort. Bending, twisting, working in cramped and constrained areas, reaching way or working away from your body, and working near your physical limit have all been described as postures that are contributors to injury (Bork et al, 1996). The lack of height adjustable beds, bedside steps, obese patients, patients with decreased level of consciousness or uncooperative patients may not always make it possible for physiotherapists to maintain good posture while performing treatments. Maintenance of awkward positions by physiotherapists, are sometimes done for the duration of treatment sessions.

Awkward postures for prolonged periods have been described by Holder et al (1999) as a risk factor for WRNMD. Campo et al (2008) cited physiotherapists who reported to bent or twisted postures had 5.74 times higher odds of developing WRNMD and also noted a trend of increasing lower back WRNMD across increasing levels of bent postures.

2.4.1 Prevalence of Symptoms Related to Years of Experience

Many studies have shown an increased prevalence of symptoms among younger physiotherapists occurring within the first five years following graduation (Glover et al, 2005; Salik and Ozcan, 2004; Adegoke et al, 2008). Literature has suggested that less experienced physiotherapists are reluctant to seek assistance with physically demanding tasks, and they lack the experience to use a variety of techniques to avoid repeated exposure for labour intensive modalities. Cromie et al (2000) surveyed that older physical therapists were moving to a less physically demanding area of work e.g. administration and refers to this as a survivor bias. Younger physiotherapists and newly qualified graduates appear to be most in need of intervention services aimed at reducing injury rates (Glover et al, 2005).

2.5 Anatomical Areas Commonly Affected

A number of anatomical areas appear to be specifically at risk of being injured during routine activities for physiotherapists. These are the wrists, hand and thumb, the shoulder joints, neck and the lower back, each of which will be reviewed.

The hand, wrist and thumb are sites of common occurrence of WRNMD among physiotherapists (Bork et al, 1996). During the normal practice of the physiotherapy, the use of the hand, especially the thumb is common in techniques such as massage, mobilization and manipulation, thus creating a potential problem for WRNMD. Cromie et al (2000) found an association between thumb symptoms and mobilization and manipulation techniques given its popularity in current physiotherapy. A study conducted by Wajon and Ada (2003), reported an 83% complaint of thumb pain among physiotherapists aggravated by performing manipulative therapy techniques. The common techniques responsible for aggravating symptoms were unilateral and central postero-lateral glides. Wajon and Ada (2003), suggested that physiotherapists change their choice of treatment techniques to alleviate symptoms, and further suggested that the correct alignment of the thumb be used during the performance of spinal and manipulative therapy techniques. West and Gardner (2001) noted that 25% of physiotherapists surveyed in North and Central Queensland Australia had experienced hand injuries during their career and there is a marked predisposition for females to develop osteoarthritis of the first carpo-metacarpal joint (base of thumb).

Chest or respiratory physiotherapy may often entail highly repetitive movement occurring at the wrist and elbow coupled with a certain amount of force for effective treatment, and the shoulder being held at a certain level. Highly frequent repetitive movements cause micro lesions that accumulate in the affected neuro-musculoskeletal structures and lead to movement related pain (Ranney et al, 1995). Latko et al (1999) also found that repetitive work of the upper limbs lead to discomfort, tendonitis and carpal tunnel syndrome of the upper limb.

The shoulder joint positions the upper limb in the optimal position for effective treatment, e.g. massage and chest physiotherapy, and also offers stabilization for such activity. The shoulder joint is made up of two joints viz. the glenohumeral joint and the acromioclavicular joint. These joints are held together by extensive ligaments and muscle attachments. The trapezius muscle is a large diamond shaped muscle resembling a trapezium, it arises from the superior nuchal line of the occipital bone, the ligament nuchae and the spinous process of the cervical (neck) and thoracic spines. From its origins, it inserts on the shoulder girdle, the superior part of the trapezius muscle supports the upper limb, the intermediate fibers retracts the scapulae, and the inferior region medially rotates and depresses the scapulae (shoulder blade) (McMinn et al, 1993). The muscle offers stabilization and is used in the movement of the shoulder, and with its origin in the spine, may explain the contribution of WRNMD to neck pain experienced by physiotherapists. The poor, stooping posture often adopted by physiotherapists while treating patients, could also contribute to symptoms of the neck. Musculoskeletal symptoms of the upper extremities and the neck were surveyed in visual display terminal workstation workers in Germany (Klussmann et al, 2008). The study indicated neck symptoms in 55% and shoulder symptoms in 38% of respondents.

Lower back pain has also been found to be a major area of complaint by several researchers (Adegoke et al, 2008; Cromie et al, 2000; Barnes et al, 2007; Glover et al, 2005; Salik and Ozcan, 2004). Lifting and transferring dependent patients has been described by Salik and Ozcan (2004), to be the major contributor to lower back pain. The adult human form is an awkward form to lift or carry, as it has no handles, is not rigid and is susceptible to severe damage if mishandled or dropped. When lying in a bed, a patient is placed inconveniently for lifting, the weight and placement of such a load would be tolerated by few industrial workers (Collin et al, 2004).

The influence of lower back pain, physical work load and increased body mass index has been researched by Jensen et al (2012), who concluded that being overweight and obese does not increase the risk for developing lower back pain among health care workers. Jensen et al (2012) cited new episodes of lower back pain as being related to the level of physical work-load. Thus prevention of lower back pain among health care workers ought to focus on alleviating the high physical work-loads related to those jobs. Physiotherapists lift and transfer patients in spinal rehabilitation units, for example quadriplegics, in neurological rehabilitation units eg, patients with dense strokes, in intensive care units (ventilated patients up the bed), in orthopaedic units (patients with amputations) and in frail care or nursing homes. These lifts are often performed several times a day, and contribute to the highly physical work-loads.

2.6 Relationship between the Prevalence of Injury and Physiotherapy Techniques used in a Clinical Area

From the literature, the prevalence of injury varied with the area of clinical practice within the physiotherapy profession (Igumbor et al, 2003; Cromie et al, 2000; Holder et al, 1999). Specific types of work related exposure are associated with the development of musculoskeletal pathologies (Grieco et al, 1998). The underlying assumption is that a particular clinical speciality area has inherent risks because practitioner's uses a limited number of techniques although the mode of practice and patients may vary (Bork et al, 1996).

Physiotherapists working in private practice, sports physical therapy or paediatrics had an increased odds of developing WRNMD, with the therapists working in private practice reporting more neck, upper back, elbow, wrist and hand symptoms than therapists working in other areas (Cromie et al, 1999). Bork et al (1996) describes the greater prevalence of lower back symptoms among hospital based physiotherapists, which may be attributed to the level of physical dependence of patients e.g. patients with spinal injuries, ventilated patients. Patients in hospital settings are more acute and may have more extensive injuries than patients seen in the ambulatory setting e.g. physiotherapy out-patient department where patients are fairly independent and are seeking treatment for a particular ailment e.g. ankle sprain.

The study by Barnes et al (2007) revealed that 42 % of respondents complained of lower back pain while working in a hospital setting, where a fair amount of chest physiotherapy is done. Barnes et al (2007) cited a relationship between the cardio thoracic work setting and the task of chest physiotherapy, which often involves bending over patients, lifting patients up the bed, and reaching away from the body to perform techniques, especially in obese patients. These awkward postures are often maintained for prolonged periods during chest physiotherapy and thus pose as a risk factor to WRNMD (Holder et al, 1999). In private practice, many physiotherapists spend many hours administrating their practices, in the public sector, head's of physiotherapy department have also to administrate. Barnes et al (2007) surveyed that 87.5% of respondents reported lower back injuries when performing administrative tasks.

Treatment of the elderly in nursing homes is part of the profession of physiotherapy in terms of rehabilitation of stroke patients, maintenance of strength and mobility of the elderly, prophylactic and therapeutic chest physiotherapy. Many tasks therefore involve transferring, lifting, bending, manual assistance and resistance as in strengthening, making them susceptible to WRNMD (Bork et al, 1996).

Physiotherapists may not always have the opportunity to change their clinical areas of employment or employment opportunities easily, as Adegoke et al (2008) suggested that the economic vagaries and palpable financial insecurity in Nigeria have made practitioners stay within the profession, despite its high risk of WRNMD. In contrast, West and Gardner (2001) conducted a study of occupational injuries in North and Central Queensland Australia, where 55% of the respondents experienced WRNMD. The authors stated that physiotherapists who worked in various settings with different types of patients had a certain amount of freedom to steer their careers into areas where their injuries were not aggravated. This meant that they could leave working at a rehabilitation facility where more lifting causing lower back injuries is done, and work in a neonatal/ paediatric unit where the upper limbs are predominantly used in chest physiotherapy.

Employment opportunity may be linked to the level of development of the country (Salik and Ozcan, 2004), which could be seen in the contrasting employment opportunities in Nigeria (Adegoke et al, 2008) and in Australia (West and Gardner, 2001).

Unfortunately, the South African health care system may not always provide physiotherapists the opportunity to steer their career away from injury. Occupational diseases have not only physical, psychological and social consequences but also economic and security impacts when they reach a level of severity that directly affects work capacity, causing absenteeism and early retirement (Shaik et al, 2011).

2.7 International Strategies to Reduce WRNMD

A number of strategies can be used to reduce the effects of WRNMD on physiotherapists. These include coping strategies to reduce the opportunity for injuries to occur, management strategies that relate more to the role that organisations can play in this regard.

2.7.1 Coping Strategies

Coping strategies are used by physiotherapists to enable them to continue practicing despite its inherent risks. The following strategies are used by physiotherapists (Holder et al, 1999):

a. Outsourcing strategy

Shifting all or part of a therapist's workload to another person e.g. the use of physiotherapy assistants, obtaining help when transferring, or using hoists

b. Preventative strategy

Preventing a potential injury from occurring e.g. modifying therapists positions, bed height, or warming up before performing a technique

c. Reactive strategy

Developed in response to injury or perceived risk of injury, and entails using a different part of the body to administer a technique e.g. using the elbow instead of thumb for trigger point therapy

d. Interaction of strategies

Interaction of strategies involves the use of more than one strategy to avoid injury or re-injury. The study done by Cromie et al (1999) in a metropolitan area indicated that when physiotherapists are able to work in a range of settings with different types of patients, they have a certain amount of freedom to work in areas where their injuries are not aggravated. An example is where physiotherapists may leave working at a rehabilitation facility where

considerable lifting occurs and work in a physiotherapy out-patient department where more 'hands -on therapy' is used, such as in massage and manipulation techniques.

2.7.2 Strategies utilized by Managers

According to guidelines as developed by the Department of Labour in the USA (2003), the following management strategies can reduce WRNMD:

a. Job rotation

Allowing physiotherapists to rotate to various specialty areas within the work setting, within a specific time period (e.g. rotation between ICU and neurology wards), thus leading to job enlargement.

b. Job Enlargement

Performing different tasks over a period of time in the work setting to promote variety and reduce exposure to repetitive actions or prolonged positions (study showing positive correlation between specific injuries and specific areas of specialty (Cromie et al, 2000)).

c. Job Enrichment

Given job goals but allowed more choices in how to accomplish these goals, such as using various modalities of physiotherapy e.g. hydrotherapy as opposed to manual strengthening for joints.

d. Reduce Pace

Correct distribution of staff, especially to areas of high physical demands, and reduce the patient workload if possible.

e. Work place exercise

Stretch breaks or exercise breaks incorporated into the work day.

f. Disability Accommodation

Those with disabilities or injuries are accommodated and become more productive members of the workforce within their ability.

g. Early injury reporting

Employees are encouraged to report symptoms early when they are easiest to treat.

h. Adequate staffing and equipment

Ensuring adequate and correct staffing of physiotherapists and physiotherapy assistants, especially to areas of high physical demand, as well as correct and adequate equipment for various specialty areas e.g. hoists, adjustable beds, walking aids.

Colin et al (2004) surveyed musculoskeletal injuries among nurses in a nursing home and recommend that repositioning be done through the use of friction reducing sheets. Mechanical lifts, such as a full-body lift or stand-up lift, should be used depending on the physical dependency of patient. Using mechanical lifting equipment to lift patients increases a patients comfort and feeling of security compared to manual methods. While health care facilities in KZN may not be in a financial position to afford such equipment, Hinmikaiye and Bamishaiye (2012) postulates that the costs of training, updating or purchasing specialised equipment are easily justifiable in terms of savings made by avoiding loss of nurses to absenteeism and preventing potential danger to patients. This could be applied to the physiotherapy profession, which also use such equipment. Colin et al, (2004) stated that barriers to purchasing lifting equipment may include cost concerns, patient comfort, security when using equipment and the time required to use such equipment. Their study confirmed that it is possible to overcome these barriers by achieving staff buy-in and compliance with policies requiring the use of the lifting equipment. Colin et al (2004) further stated that the expenses effectively recovered the initial capital investment in equipment and training in slightly less than three years, and potentially more quickly if indirect cost were considered.

2.7.3 Principles of Ergonomics in relation to WRNMD

Ergonomics is the science of designing work spaces, machines and tasks with capabilities and limitations of the human body in mind in order to improve people's efficiency (USA Department of Labour, 2003). The USA Department of Labour estimates that more than 10 million Americans were working in the health care industry by the year 2000, making it the third largest employer in the that country. Ironically, the health care industry had an employee injury rate higher than other service industry (Bork et al, 1996). Established ergonomic guidelines for space, equipment, furniture and environmental conditions should also be mandatory in the design of physiotherapy work places.

The USA Department of Labour published an article on the 'Ergonomics for the prevention of Musculoskeletal disorders' in 2003, as a guideline. A multifaceted plan encompassing four major overlapping areas were identified: management of practice, ergonomics, education and training, and fitness. By applying basic principles of ergonomics, the physiotherapist can take steps towards a safer, more productive work environment, such as in the following areas:

a. Ergonomic survey of work area

Survey work tasks and work procedures so that programs/solutions can be customized for the specific problem areas of the physiotherapist. Identify problems and establish if they can be redesigned or modified to prevent injuries

b. Potential problem areas

A number of positions present problems:

- Work to low

For physiotherapist who stand with head and neck forward, shoulders rounded and lower back in a forward bent position, adjust the bed height if possible

- Work to high

Continuous work at or above shoulder level can be stressful. Tasks should not exceed a 45° angle away from the sides or the front of the body. Lower the work height or raise the worker. Use raised work platforms or stair platform ladders that are safer than step ladders

- Work to far away

Repetitive forward reaching at arm's length is very stressful. All work should be performed in a manner allowing efficient use of the arms and shoulders without creating a long lever arm that transfer excessive force to the neck, arm and back. The least stressful work position involves working between shoulder and waist level with elbows at a 90° angle and angled less than 45° away from the sides or front of the body.

- Work activities in confined areas

If there is limited space for physiotherapists to manoeuvre and move objects, they would twist their spine to accomplish the task. Adequate floor space should be provided to enable the physiotherapist to pivot when lifting or

moving an item. Conveyors and slides can be used to change the direction of material flow.

- Prolonged standing on hard surfaces

A foot rail, box or stool can allow workers to slightly elevate one foot and reduce stress on the body. The use of proper foot wear may also reduce stress on legs and back.

- Manual Lifting

Reduced by using lifting tables, hoists, transfer tables based on 5 principles:

1. Minimize weight or bulk
2. Minimize vertical and horizontal lifting distance
3. Provide sufficient time for stressful tasks
4. Manual handling of awkward or oversized load can be dangerous - ask for help or use assistive device.
5. Use proper foot wear when transferring.

c. Education and training in ergonomics

Professionals in fields such as medicine and allied healthcare area are at particular risk of their skills and knowledge becoming obsolete due to accelerated growth of knowledge, changing disease profiles, new products and continually emerging legal and ethical issues. There is a perception that undergraduate education did not fully prepare an individual for working life or life-long competence (Payne, 1993). There is a 'half-life' concept of five years for medicine, which is the estimated time taken for knowledge to become out-of-date (Maharaj, 2013). There is therefore a need to encourage physiotherapists to maintain and continue with continuous professional development programs (CPD), so as to enhance their knowledge and capabilities in treating patients. Maharaj (2013) concluded that mandatory CPD programmes, as an engagement of learning, maintains, develops and enhances knowledge and skills of clinical practice of physiotherapists.

d. Physical Fitness

It is sometimes difficult for people to think that they should exercise when they are already tired from work. However, hard work and exercise are not always accomplishing the same thing. Most individuals have too much of one type of activity or exercise and usually not enough of another. Many people work hard

all day, yet are still very stiff and are in poor cardiovascular condition. An exercise program should emphasize the type of exercise that is lacking (Klussman et al, 2008). Physiotherapists should be encouraged to review their personal standards of fitness, nutrition and stress control. The harmful effects of smoking and its relationship to back pain should be emphasized (Miezejewski and Kumar, 1997). Fitness should be encouraged to improve psychological and physical tolerance of pain and stress. The respondents in a study conducted by Passier and McPhail (2011), suggests potential corporate strategies to facilitate health and fitness of staff, which should be mandatory and performed during work time. Other suggestions by Passier and McPhail (2011), were fit for job assessments such as, an annual fitness assessments for those in physically demanding roles and musculoskeletal screening of staff working in high risk clinical areas.

e. Policies

All physiotherapists need to familiarise themselves with requirements of the legislation governing occupational health and safety in their jurisdiction. As a minimum, they should know the principles of risk management and be able to apply hazard identification, risk assessment, control and review in their work place (Cromie et al, 2001). In South Africa, an act of Parliament was passed in 1993, (*The Occupational Health and Safety Act.No.85 of 1993*). This legislation provides for more protection for employees and outlines the responsibilities of employer to ensure that the work place is safe and healthy (A Guideline booklet for Occupational Health Services, in South Africa, 2003).

2.8 Occupational Services for Health Care Workers in South Africa

The definition of “Occupational health” as per the World Health Organisation (WHO) is “to provide and maintain the physical, mental and social well being of all workers and not merely absence of disease”. A review of the National Occupational Health and Safety Council of South Africa, compiled by Benjamin and Greef report (1997), suggested that the practice of occupational health and safety across industries in South Africa is uncoordinated, fragmented and a burden on resources. It suggested that occupational accidents and work-related ill health imposes a considerable cost on the South African economy and society. The Provisional Health Restructuring committee

resolved in 1999, to “establish Occupational services for staff of the Department of Health, render assistance to other government departments in this regard and provide Occupational Health services for the general public at health facilities with health districts” (National Department of Health, 2003).

The definition of an Occupational Health service was:

A service established in or near a place of employment for the purpose of:

- Protecting the workers against any health hazards that may arise out of the work, or conditions in which it is carried on;
- Contributing towards the workers physical and mental adjustment, in particular, by adapting the work to the workers, and their assignments to jobs for which they are suited and
- Contributing to the establishment and maintenance of the highest possible degree of physical and mental well being of the workers.

By definition of the Occupational Health services, physiotherapists would certainly benefit from this service, as their physical health and general state of well-being will be maintained, given that the nature of physiotherapy is physically demanding. This service may assist in reducing WRNMD among physiotherapists.

2.9 Summary

The literature discussed has revealed that WRNMD is an existing global problem for physiotherapists. The pathophysiology of repetitive strain injuries indicates that physiotherapists would be susceptible to injury due to the repetitive labour intensive nature of the techniques of physiotherapy. Physiotherapist's commonly affected anatomical areas, were also reviewed in relation to the techniques of physiotherapy in clinical areas.

The implications of South Africa's expanding population, HIV, the South African Health care system (both private and public) and other risk factors were reviewed from literature, in relation to its possible contribution to WRNMD of physiotherapists. The strategies and principles employed by physiotherapists in order to continue with their profession were also reviewed and the need for an Occupational Health service program was also discussed.

Chapter 3. Methodology

3.1 Introduction

This chapter describes the methodology used to conduct the study. It explains the design of the study, the study population and sample of study. The data collection tool, data management, data analysis, reliability and validity of study are also presented. Ethical considerations and confidentiality are also reflected.

3.2 Ethical considerations

Approval was obtained from the Biomedical Research Ethics committee of University of KwaZulu-Natal to conduct the study (BE249/010) (Appendix A). Support and permission for the study was obtained from the Department of Health of KwaZulu-Natal (Appendix D,E,F) and the South African Society of Physiotherapy (SASP), (Appendix B) (Appendix C). Permission was obtained from the SASP to use their database of names, email address and postal addresses.

3.3 Research design

The study was a cross sectional prevalence survey, using a self-administered questionnaire with open and close ended questions, conducted among physiotherapists in KZN, a province of the RSA. A cross sectional survey of a population is a collection of data from a sample of individuals, as a basis for inferring the characteristics of the population from which the sample comes. Cross sectional studies are used to determine prevalence. They can be one-off or repeated at intervals, thereby providing means of monitoring changes in the population in response to policy change (Mann, 2003).

3.4 Study Population

The study population consisted of all the physiotherapists practicing in the private and public sectors throughout KZN, who were registered with the Health Professional Council of SA (HPCSA). In RSA, public sector physiotherapists are employed in provincial hospital, special needs schools and non- governmental organisations, with their conditions of employment and remuneration based on public service policy, as set

by the state. Those employed in private sector use the conditions of employment and remuneration guidelines as indicated in the *Basic Conditions of Employment Act (No. 75 of 1997)*, with private remuneration by patients and medical aid schemes.

It is important to note that physiotherapists could practice in the public sector and private sector simultaneously, at the time of the study.

According to the Health professions Council 681 physiotherapists were registered as practitioners in KZN at the time of the study of whom approximately 64% were registered with the South African Society of Physiotherapy (SASP). Permission was obtained from the SASP to use their database of names, email addresses and postal addresses. These records were used to forward surveys to the physiotherapists via the post, email and physically hand-deliver the surveys to the physiotherapists.

To incorporate physiotherapists from those not registered with the SASP, the researcher posted and emailed and physically hand delivered surveys to public hospital, public out-patient facilities and specialised schools/clinics, and non- governmental organisations where physiotherapists were employed.

3.5 The inclusion criterion

Physiotherapists included of the study had to be registered with the Health Profession Council of South Africa and currently practicing.

The sample size needed for the survey was 194 to ensure a 90% confidence level and 5% margin of error, this was determined by the statistician as recommended by Bartlett et al (2001). The study received 205 responses, of which 78% practiced in the public sector, 11.7% practiced in the private sector and 10.2% practiced in both sectors.

3.6 Data collection Tool

The instrument was a self administered questionnaire (Appendix J), developed by the researcher using the Standardised Nordic Questionnaire for analysis of musculoskeletal symptoms (Kuorinka et al, 2007) and questionnaire developed by Igumbor et al (2003), as a guide. The survey instrument was designed to elicit information in the following areas, as reflected in Objectives 1 - 5:

Socio-demographic data: age, gender, work status and sector of employment.

Objective 1: close-ended questions on the prevalence and open-ended questions on the type of WRNMD.

Objective 2: close-ended questions on risk factors, number of years experience

Objective 3: close-ended questions on anatomical areas

Objective 4: Likert scale questions on techniques in clinical areas

Objective 5: close and open-ended questions on coping strategies

The close ended questions required the participants to either answer “yes” or “no”. The open ended questions required the participants to offer suggestions to reduce WRNMD.

3.7 Pilot study

A pilot study was done amongst twenty four physiotherapists practicing in the public and private sectors, in the eThekweni municipality region to ensure reliability of the questionnaire. These results were not included in the final outcome of the study. Minor modifications which included adjustment of the numbering of the questions and general presentation of the questionnaire were made to the research tool before the study was conducted.

3.8 Data collection procedures

The study was conducted from August 2012 till April 2013, i.e. over a nine month period. Self-administered questionnaires (Appendix J), with return postage paid envelopes included, so as to obtain a better response, were posted to participants. Questionnaires were also emailed, as well as hand delivered to some participants. A letter stating the purpose of the study and assuring confidentiality was included (Appendix G, H, I). To maximize questionnaire return rate, a letter from the president of the SASP (Appendix B), as well as a letter from the chairperson of the KZN branch of the SASP (Appendix C), indicating their support of the study was attached to each questionnaire. A letter of permission for study was also obtained from the Department of Health of KZN and attached to the questionnaire (Appendix D,E,F), when it was obtained from the Department. In addition, a hand signed cover letter, (Appendix G) was used and postage paid pre-addressed envelope was included with questionnaire together with the letters of support for study (Appendix B,C,D,E,F).

To follow up on non-respondents, each questionnaire was coded with a unique number that corresponds to a master list of names. After a month, a second questionnaire was mailed to all non-respondents. Telephone calls were also made to various heads of physiotherapy departments with the request to please encourage staff to complete questionnaires, emphasizing the importance of the study to the profession of physiotherapy. Telephone calls were also made to physiotherapists practicing in the private sector, to also encourage them to complete questionnaire and express gratification for time spent completing questionnaire.

3.9 Data Management and confidentiality

A letter ensuring confidentiality was attached to each questionnaire. During the research process, the researcher used a personal post office box and computer, to receive completed surveys. The researcher also collected completed surveys personally from physiotherapists, public and private facilities where physiotherapists practised. These completed questionnaires were stored in a locked cabinet, in an office, to which only the researcher had access. The digital data was stored on a password protected computer, to which only the researcher, supervisor and statistician had access which ensured confidentiality.

3.10 Data Analysis

Completed questionnaires were coded and the data extracted from the completed questionnaires and entered into an excel spreadsheet from where it was exported into Statistical Package for Social Sciences (SPSS version 21) for analysis. The data were analysed as follows. The demographic data was analysed using frequency tables. Pearson chi-square test was used to test for association between the prevalence of WRNMD among physiotherapists practicing in private practice as compared to the public sector. Contributing risk factors that are more likely to be the cause WRNMD were described using a descriptive frequency summary of responses, (major/moderate/minor). Frequency tables were used to analyze the years of experience of a physiotherapist and the prevalence of WRNMD, as well as the commonly affected anatomical areas. Mann Whitney test was used to test for an association between prevalence of injury and techniques of physiotherapy used in

clinical areas of practice/specialty. A p value of, $p < 0.05$ was deemed as statistically significant. Coping strategies used by physiotherapists affected by WRNMD was expressed using descriptive frequency summary of responses (always/sometimes/never).

Open-ended questions were subjected to qualitative content analysis, which is defined as a systematic replicable technique for compressing many words into fewer contents categories, with key concepts and responses grouped under common or similar themes. The thematic analysis focuses on identity themes and patterns that form a picture of participant's collective expressions of experiences, guided by the aims of the study (Nyagah and Frantz, 2006).

3.11 Reliability and Validity

The Standardised Nordic questionnaire contains standard questions for the analysis of musculoskeletal symptoms in an occupational health context. The questions are forced choice variants and can be self administered. The reliability of the questionnaire has been shown to be acceptable (Kuorinka et al, 2007). Specific characteristics of work strain are reflected in the frequency of the responses (Kuorinka et al, 2007). A self-administered questionnaire is a valid and relatively inexpensive way to establish risk identification information for an occupational group (West and Gardner, 2001). The questionnaire was however adapted to the South African context due to our unique health care system, with questions being included relating to the public and private sectors of employment. Face validity was obtained via the researcher's feedback from the pilot study, among peers, in which the content appeared valid.

CHAPTER 4. RESULTS

4.1 Introduction

This chapter presents the results of the study with respect to the study objectives. Six hundred and eighty one questionnaires were sent to physiotherapists in KZN and 205 physiotherapists responded. The researcher analyzed these 205 questionnaires (n=205), which was a response rate of 31%.

4.2 Demographic Characteristics

As shown in Table 4.1, from the 205 responses, 122 (59.5%) of respondents were aged between 22-32 years and 83 (40.5%) of respondents were aged between 33-65 years with an average age of 32 years. 183 (89.3%) were female physiotherapists and 185 (90.2 %) of physiotherapists worked full- time. 74 (36.1%) of physiotherapist's had post graduate training. Over 160 (78%) worked in the public sector and 21 (10.3%) worked in both sectors.

Table 4.1 Socio-demographic data. (n=205)

Category	Variable	n(%)
Age of respondents	22-32	122 (59.5)
	33-65	83 (40.5)
Post graduate training		74 (36.1)
Gender	Female	183 (89.3)
	Male	22 (10.7)
Sector of employment	Public sector	60 (78)
	Private sector	24 (11.7)
	Both Public and private sectors	21 (10.3)
Status of employment	Full time	185 (90.2)
	Part time (locum/casual)	20 (9.8)

4.3 Objective 1. To Establish the Prevalence and Type of WRNMD of Physiotherapists in KZN and Compare the Prevalence in the Public and Private Sectors

a) Prevalence of WRNMD

Of the 205 respondents, 177 (86.3%) reported experiencing WRNMD (Figure 4.1), with the female and male prevalence being similar at 158 (86.3%) and 19 (86.4%) respectively (Table 4.2).

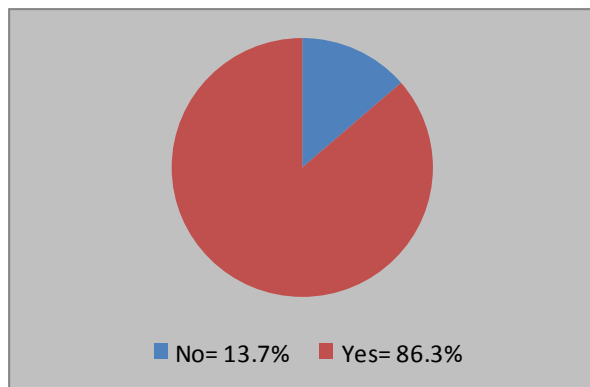


Figure 4.1 Prevalence of WRNMD.

Table 4.2 Prevalence of WRNMD in relation to gender. (n=205)

Gender	No.	Prevalence (n%)
Female	183	158 (86.3)
Male	22	19 (86.4)

b) Type of WRNMD

Regarding the type of WRNMD, physiotherapists indicated that the most common type of injury was muscle spasm (43.8%) followed by tendonitis (10.4%) and peripheral joint pain (9.9%).

c) Comparison of public and private sector

Table 4.3 presents the comparison of public sector in/out patient treatments and private health care sectors in/out patient treatments in relation to the prevalence of WRNMD among physiotherapists. A Pearson Chi Square test of association was used to assess the relationship between the treatment of in- patients in the public and private sector, in relation to WRNMD incurred by physiotherapists. A statistical significance of association was found with a p value of 0.005. Physiotherapists working in the public sectors were more likely to incur injuries while treating in-patients as compared to those in the private sector.

The Pearson Chi Square test of association was also used to assess the relationship between the treatment of out-patients in the public sector and private sector in relation to work related injuries of physiotherapists. There was no association, with a p value of 0.860 having been found.

Table 4.3 Comparison of public sector in/out patient treatments and private health care sectors in/out patient treatments in relation to the prevalence of WRNMD (n=177)*

		Public sector n (%)	Private sector n (%)	p value p<0.05**
In-patient	Yes	101 (57.1)	18 (10.2)	0.005
	No	76 (42.9)	159 (89.8)	
Out- patient	Yes	64 (36.1)	8 (4.4)	0.860
	No	113 (63.9)	169 (95.6)	

* (n=177) analysis done on those respondents reporting injury

** p <0.05 is considered significant

4.4 Objective 2. To Describe the Risk Factors contributing to WRNMD and the Relationship Between the Number of Years of Experience as a Physiotherapist and the Prevalence of WRNMD.

Regarding the risk factors described by physiotherapists, contributing to WRNMD, respondents affected by WRNMD (n=177) were asked to consider 17 risk factors that were identified by previous studies that contributes to the occurrence of injury as shown in Table 4.4. A Likert scale ranging from 1(major contributor) and 3 (minor contributor) was used to describe the frequency of responses of the risk factors considered to contribute to WRNMD.

The responses were divided into categories: physical activities, work-load issues and postural risk factors, to establish the role that these played as risk factors in WRNMD. Table 4.4 indicates that activities that relied on physical strength or ability were considered major contributors to WRNMD, with lifting or transferring patients being the highest at 111 (62.5%).

The work-load of physiotherapists, appears to suggest that, treating a large number of patients was considered to be a major contributor to WRNMD by 105 (59.6%), with insufficient rest breaks between patients being reported by nearly one third 56 (31.4%) of respondents. The highest minor contributor to WRNMD was inadequate training on injury prevention and therefore regarded as the least contributing factor.

The issues relating to posture of the physiotherapist while treating, such as: working close to physical limit 80 (45.1%), bending or twisting your back in an awkward way 79 (44.6%), working in awkward and cramped positions 77 (43.3%) and working in the same position for long periods 76 (42.7%) were also considered to be significant contributing risk factors by respondents.

Table 4.4 Contributing Risk factors to WRNMD (n=177)

No.	Risk factor	Major contributor n%	Moderate contributor n%	Minor contributor n%
1	Lifting or transferring of dependant patients	111 (62.5)	52 (29.3)	14 (8.2)
2	Continuing to work when injured	108 (61.1)	51 (28.6)	18 (10.3)
3	Treating a large number of patients in a day	105 (59.6)	46 (26.0)	26 (14.4)
4	Working at or close to your physical limit	80 (45.1)	74 (42.1)	23 (12.8)
5	Performing the same task over and over	79 (44.6)	84 (47.4)	14 (8.0)
6	Bending or twisting your back in an awkward way	79 (44.6)	68 (38.3)	30 (17.1)
7	Performing manual orthopaedic techniques	77 (43.4)	65 (36.6)	35 (20.0)
8	Working in awkward or cramped positions	77 (43.3)	61(34.7)	39 (22.0)
9	Working in the same position for long periods	76 (42.7)	79 (44.4)	22 (12.9)
10	Carrying, lifting or moving heavy materials or equipment	72 (40.5)	64 (36.4)	41 (23.1)
11	Unanticipated sudden movement of falls by patients	71 (40.0)	56 (31.4)	50 (28.6)
12	Not enough rest breaks during the day	56 (31.4)	58 (33.1)	63 (35.5)
13	Assisting patient during gait activities	48 (27.2)	71 (40.3)	58 (32.5)
14	Reaching or working a distance from your body	42 (23.7)	95 (53.8)	40 (22.5)
15	Working with confused or agitated patients	38 (21.3)	70 (39.6)	69 (39.1)
16	Work schedule	29 (16.5)	71 (40.0)	77 (43.5)
17	Inadequate training in injury prevention	16 (9.0)	65 (36.5)	96 (54.5)

4.4.1 The Relationship between the Number of Years of Experience as a Physiotherapist and the Prevalence of WRNMD

Table 4.5 shows that 68 (38.5%) incurred WRNMD in the first five years following graduation, while for 38 (21.5%), this occurred t 5-10 years after graduating. Most of the injuries 142 (79.5%) occurred within the first 10 years of practice.

Table 4.5 Period of injury. (n=177)

Period of injury	n (%)
Before training as physiotherapy student	4 (2.4)
When a physiotherapy student	36 (19.5)
In the first 5 years after graduating	68 (38.5)
5-10 years after graduating	38 (21.5)
>10 years after graduating	18 (10.2)
Unsure	13 (7.9)

4.5 Objective 3. To determine Physiotherapist's Anatomical areas Commonly Affected, as a Result of WRNMD

Table 4.6 shows the anatomical areas that were affected by WRNMD, with over 59 (33.2%) having suffered with neck pain and 55 (31.2%) with lower back pain. Regarding injuries that prevented them from working, 32 (18.5%) reported that lower back pain had been a problem, while 41 (23.4%) reported having neck pain and 41 (22.9%) had lower back pain that, prevented them from doing normal activities of daily living or leisure activities. Treatment by a doctor, physiotherapist or other health professional was sought by 84 (47.3%) experiencing neck pain and 70 (39.5%) who had lower back pain.

Table 4.6 Anatomical areas affected by Work related neuro-musculoskeletal disorders.

Anatomical area (n= 177)	n (%)
Neck	59 (33.2)
Lower back	55 (31.2)
Shoulders	28 (16.1)
Upper back	24 (13.7)
Wrist/Hand	20 (11.2)
Hips	15 (8.3)
Thumbs	10 (5.9)
Elbow	3 (1.5)
Knees	2 (1.4)

*Percentages of Table 4.6 may not add to 100% as physiotherapists may have incurred more than one injury

4.6 Objective 4. To Determine the Relationship between the Prevalence of injury and techniques of physiotherapy used in a Clinical area.

From the Appendix (J), the following clinical areas were identified viz. general hospital, cardio- thoracic unit, community health, paediatric unit, private practice, spinal unit, neurology unit, rehabilitation unit, nursing home/old age facility, orthopaedic unit, sports physiotherapy and other areas of practice. The Mann Whitney test was applied to the above clinical areas, in which physiotherapist’s practice and the following techniques of physiotherapy viz. massage/mobilization/manipulation, hydrotherapy, administration, chest/respiratory physiotherapy, neurological rehabilitation ,electrotherapy, orthopaedic rehabilitation and sports physiotherapy, to establish if any significance occurred in relation to the prevalence of WRNMD.

Table 4.7 The relationship of the clinical areas, techniques of physiotherapy and prevalence of WRNMD with significance. (n= 177)

	Mean rank		p value p< 0.05**
	Yes	No	
Chest physiotherapy in a general hospital (with all clinical areas)	69.53	48.53	.039
Neurological rehabilitation in a general hospital	89.42	60.52	.006
Orthopaedic rehabilitation in a general hospital	65.70	32.00	.005
Chest physiotherapy in a rehabilitation unit	10.00	5.00	.016
Manipulation/Mobilisation/Massage in an orthopaedic unit	11.50	2.00	.004

* Physiotherapists were more likely to experience WRNMD while working in the Clinical areas as listed in table 4.7 while performing the clinical activities as listed in table 4.7

* The other comparisons of clinical areas and techniques of physiotherapy in relation to WRNMD were not significant or had insufficient observations overall, or were without observations and therefore not incorporated into table.

** p< 0.05 is considered significant.

4.7 Objective 5. To describe the coping strategies of physiotherapists, who were affected by WRNMD.

Table 4.8 indicates that 91 (51.3%) of physiotherapists have described that they always modified the patient's position or their position in order to reduce strain on their body, while 84 (47.2%) made these changes of position sometimes. Adjusting the plinth or bed height was always done by 84 (47.6%) of respondents. The most common equipment used by physiotherapist to reduce strain on their body was an adjustable bed 110 (62.5%). The least adopted strategy was to warm up and stretch before manual techniques as a means to reduce injury.

Table 4.8 Strategies used by physiotherapists to cope with WRNMD. (n=177)

Actions to reduce strain	Always n (%)	Sometimes n (%)	Never n (%)
I modify patient position/my position	91 (51.3)	83 (47.2)	3 (1.5)
I adjust plinth or bed height	84 (47.6)	65 (36.9)	28 (15.5)
I get someone else to help me handle a heavy patient	69 (38.9)	90 (50.6)	18 (10.5)
I use a different part of my body to administer techniques	38 (21.4)	116 (65.8)	23 (12.8)
I select techniques that will not aggravate my discomfort	34 (19.3)	114 (64.1)	29 (16.6)
I use electrotherapy instead of manual therapy	23 (13.0)	87 (49.2)	67 (37.8)
I use rehabilitation technicians to perform physically stressed tasks	23 (13.0)	75 (42.4)	79 (44.6)
I pause regularly so I can stretch and change posture	16 (9.1)	77 (43.3)	84 (47.6)
I stop a treatment if it causes or aggravates my discomfort	11 (6.4)	96 (54.0)	70 (39.6)
I warm up and stretch before performing manual techniques	4 (2.2)	28 (15.7)	145 (82.1)

Table 4.9 shows the actions the practitioners took as a result of their WRNMD, with only 3 (1.5%) having lodged a claim with worker's compensation. Of the 177 (86%) who reported injuries, 108 (61.1%) continued working with discomfort. Only 5 (2.9%) changed their area of clinical practice, while 74 (42%) considered leaving the profession as a result of work related injuries.

Table 4.9 Consequences of work related neuro-musculoskeletal disorders on Physiotherapists (n=177)

Actions	n (%)
Lodging a claim with Workmen's Compensation Fund	3 (1.5)
Continued working with discomfort	108 (61.1)
Taken sick leave	59 (33.2)
Limited patient contact time	50 (28.3)
Changed clinical area of practice	5 (2.9)
Considering leaving the profession	74 (42)

* Percentages in Table 4.8 may not equal to 100% as some physiotherapists may have taken more than one action.

CHAPTER 5. DISCUSSION

5.1 Introduction

Neuro-musculoskeletal disorders account for the greatest burden of all injury types in health care, Collin et al (2004). Bork et al (1996) states, that physiotherapists are susceptible to neuro-musculoskeletal disorders due to the physically demanding nature and scope of the profession. In KZN, it has become increasingly evident to the researcher that WRNMD is a significant problem for physiotherapists. The aim of this study was to determine the prevalence, risk factors and coping strategies of physiotherapists experiencing WRNMD in KZN. The results are discussed in relation to its objectives and to other studies conducted internationally.

5.2 Objective 1. To Establish the Prevalence and Type of WRNMD of Physiotherapists in KZN and to Compare the Prevalence of WRNMD in the Public and Private sectors

This section will review the type and prevalence of WRNMD followed by a comparison of their prevalence between the public and private sectors.

Prevalence and Type of WRNMD

This survey revealed an 86% prevalence of WRNMD among physiotherapists practicing in KZN, indicating that it is a major problem to these professionals, which supports Barnes et al (2007) statement, that in their plight to treat others physiotherapists are being afflicted. As there are no epidemiological studies of WRNMD in the province of KZN, it is not possible to compare any trends within the province. The prevalence of 86% of WRNMD in KZN is similar to other countries, viz. 91% in Australia (Cromie et al, 2000), 91.3% in Nigeria (Adegoke et al, 2008), 85% in Turkey (Salik and Ozcan, 2004) but higher than the 68% in the UK (Glover et al, 2005) and 61% in the USA (Bork et al, 1996). These statistics indicate the emerging global problem and the epidemic extent of WRNMD among physiotherapists. Variations in results of WRNMD among physiotherapists in other countries may be linked to the level of development, the status of the profession of physiotherapy, and epidemiological factors (Salik and Ozcan, 2004). SA could be regarded as a developing nation, given its history and present commitment to development in the health care sector (Whittaker et al, 2011), these results could

offer WRNMD data that may reflect the current state of neuro musculoskeletal health of physiotherapists in SA while the health care sector is still in a state of development.

In this study, female physiotherapists accounted for 89.3% of the respondents, indicating that women were better represented than men in our data, this may be a reflection of the population from which our sample was drawn, however the prevalence of WRNMD in female and male physiotherapists was similar, with 86.3% and 86.4% reported respectively, although not equivalent by number. Anecdotally, males generally, have better physical attributes to deal with physical, labour- intensive work than their female counterparts. However, the repetitive, labour intensive nature of the physiotherapy profession, coupled with often high work-loads, creates a similar propensity to WRNMD for both male and female physiotherapists. The possible differing factor could be the effects of pregnancy, which only affects females, as problems of the sacro-iliac joint in pregnancy have been described by Bork et al (1996) to be a significant problem to female physiotherapists.

Regarding the type of WRNMD, most practitioners indicated that the major type of WRNMD was muscle spasm, followed by tendonitis and peripheral joint pains, this being similar in findings to the study of Salik and Ozcan (2004).

Physiotherapists are clinicians and are able to diagnosis neuro-musculoskeletal disorders. Given their knowledge and expertise, the majority of the physiotherapists surveyed in this study described their injuries as “muscle spasm”. Muscle spasm, tendonitis, and joint pains are indicative of the repetitive strain and overuse of the neuro-musculoskeletal system of these clinicians while treating their patients. The contraction and relaxation of muscles allow for movement to occur at a joint, with the overuse or strain of muscles leading to injury of musculature. Muscles shorten and can potentially scar in a shortened position as a result of injury or exercise, the shortening process often being exaggerated at rest. Therefore, muscles that work repeatedly in a particular action eventually shorten and over time, and will develop some form of scar formation, which are described as micro infarcts, trigger points (Tony et al, 2004) or muscle spasm. The possible reason as to why physiotherapists are overusing and straining their neuro-musculoskeletal system is due to the exposure to repetitive actions and prolonged positions as a result of the poor implementation and utilization of coping strategies and policies as recommended by the United States department of Labor (2003).

These would allow physiotherapists the opportunity to rotate through different clinical areas in work setting or allow physiotherapists to choose alternative techniques or the use of alternative body parts when treating. These strategies would allow musculature that is repetitively used in the tasks, to rest and heal and avoid the development of neuro-musculoskeletal pathologies as described by Grieco et al (1998). Muscle spasm, tendonitis and joint pains are conditions that are treatable therefore physiotherapists should also seek treatment when WRNMD are incurred.

The Public and Private health Care Sectors in Relation to Work related Neuro-Musculoskeletal Disorders

To further analysis WRNMD among physiotherapists, the private health care sector was compared to public health care sector in relation to the prevalence of WRNMD. In this study, the physiotherapists practicing in the public health sector presented with a greater prevalence of WRNMD, particularly in treating in-patients. However, it is important to note that there was a greater response to the survey from physiotherapists practicing in the public sector. The possible reason for a poorer response from the physiotherapists practicing in the private sector, despite the researcher's best efforts, is time constraints. In private practice there is anecdotally a "time is money concept" and therefore physiotherapists who practice in the private sector have limited time, because the number of patients the physiotherapists treat is directly related to their income, which was also postulated by Cromie et al (2000), in comparison to physiotherapists practicing in the public sector, who are not remunerated in accordance to the number of patients treated.

In the study respondents practising in the private sector also incurred injury despite the private health care sector being generally well funded and equipped to meet the demands of this sector (Gavin and McIntyre, 2008). The sector is driven by individuals subscribing membership to a medical aid fund. Health care is sought by these individuals at private health facilities and private practitioners. These facilities and practitioners are remunerated by the medical aid schemes. A number of medical aid schemes or health insurance schemes are available in South Africa. These schemes are intended to protect individuals against risk of incurring expenses when they fall ill or to pay for preventative treatments (Statistics SA, 2011).

The results of the General Household Survey, (2011), Statistics South Africa, (2011), revealed that 8 057 559 individuals in South Africa are covered by Medical aids representing 16.0% of the total population. In KZN 12.2% of individuals were covered by medical aids, Statistics South Africa, (2011). Physiotherapists practicing in the private health care sector have to derive their income from this 12.2% of the population in KZN. Cromie et al (2000) stated that the number of patients treated is directly related to the income of the practitioner, therefore there is a possibility of over-working to be better remunerated and thus the susceptibility of physiotherapists to WRNMD. The private sector is also driven by patient satisfaction and physiotherapists have often to work hard to meet this challenge. However physiotherapists in the private sector should consider their work-load and that their own well being should not be out-weighed by monetary gain, as Jensen et al (2012) stated that increase work-loads have a propensity to cause WRNMD.

To consider why physiotherapists were more afflicted in the public health care sector, the researcher reviewed the public health care system, which Gavin and McIntyre (2008), found was the result from a combination of factors: the legacy of apartheid, issues of poverty, income inequalities and AIDS, and that health care is skewed in favour of the private sector. The public health care system has therefore historically been poorly funded relative to its needs. KZN has the highest prevalence of HIV (South African Department of Health, 2010), this condition results in patients being susceptible to the development of various diseases and infections, a number of which require physiotherapy assistance e.g. chest physiotherapy for pneumonia.

The implications of this pandemic in SA for physiotherapists, who form an integral part of the health care system, are that the case load may increase for physiotherapy services. This increased demand, particularly in the public health sector, has led to shortages of physiotherapists, who are no longer able to meet the demands of the increasing patient load (Maharaj and Rangiah, 2010). The impact of HIV/AIDS and tuberculosis has placed an additional burden on public health therapists within an over-burdened and under-resourced public health system (Chetty and Maharaj, 2013), all which may contribute to the greater prevalence of WRNMD amongst physiotherapists practicing in the public sector.

The public health care system in KZN provides health care for the population of KZN, if medical health care is not sought by individuals in the private health sector. KZN, as a province, according to SA Statistics (2012), has the second highest population in S.A, with a population of 10 267 300. According to Statistics SA (2011), the findings from the General Household survey, (2011) revealed that 77.2% of households use public health care facilities in KZN. At the time of this study, according to the Health Professions Council of South Africa, there were 681 physiotherapists practicing in KZN in both the public and private healthcare sectors. Therefore if consideration is made to the population of KZN, the percentage utilizing the public health care sector and the number of physiotherapists practicing in KZN, a certain shortage of physiotherapists in KZN is noted. The public health care sector in KZN is placed under increased pressure, in caring for the second highest population of RSA coupled with the highest prevalence of HIV/AIDS and 77.2% of households in KZN utilizing public health care.

Additionally, there is a higher than average number of people who are aged 80 years and older in SA (South African Statistic, 2012), many of whom require physiotherapy assistance due to age-related disease. The lack of adequate funding in the public health sector to meet the demands of the population, leads to poor staffing and to possible high work- loads for physiotherapists and other healthcare practitioners. This has been described by Jensen et al (2012) as a key risk factor to the prevalence of WRNMD.

The lack of adequate funding in the public sector relative to the private sector (Gavin and McIntyre, 2008) could result in the lack of or shortage of appropriate equipment. This creates a potential risk factor for the prevalence of WRNMD, as it means that they are forced to use more manual labour, e.g. manually lifting patients, using massage for pain instead of electrotherapy (Collins et al, 2004). The other possible reason for the high prevalence of WRNMD among those practicing in the public health care sector is that an occupational health services programme for health care workers is still being developed by the South African National Department of Health (Department of Health, 2003).

The purpose of establishing the Occupational Health Programme will be to protect health care workers against any health hazards that may arise out of their work, and contribute to establishing and maintaining the highest possible degree of physical and

mental well-being of the practitioners. In particular, this will be done by adapting the work to the practitioners and their assignments to jobs for which they are suited. The importance of Occupational Health Service for health care workers is that the personnel of a health service is its most valuable asset, making it important to ensure that everything possible is done to help them provide the highest quality care. If health care workers are troubled by their own ill-health, or other stressful circumstances, they will not be able to give their attention to their work. In addition, apart from being good employment practice, no hospital or clinic can function if there is high incidence of ill health among its health care workers.

A good occupational Health Service will help minimise health and social problems for staff, to enable them to render a high quality of service to their patients. Consequently, this will minimise exposure to health hazards not related to their primary illness. Setting up well managed occupational health services makes good economic sense, as the reduction in costs due to preventing occupational related injuries and diseases would be more than offset the budget required.

The National Department of Health of South Africa and Provincial Health Departments are currently engaged in developing occupational health services. It is important to note that the South African National Department of Health, in the recent years, has shown a wavering commitment to improving the quality of health care and health care delivery (Whittaker et al, 2011). Despite the high prevalence of work related injuries among physiotherapists, in this survey, only 2.9% changed their clinical area of practice due to WRNMD. This could be attributed to the possible lack of opportunity in KZN to steer careers away from injury, as was suggested by West and Gardner (2001), and a need to maintain financial security despite incurring injuries due to the profession (Adegoke et al, 2008).

5.3 Objective 2. To Describe the Risk Factors contributing to WRNMD and the Relationship between the Number of Years of Experience as a Physiotherapist and the Prevalence of WRNMD.

The risk factors as described by the respondents with respect to WRNMD will be discussed, followed by establishing if there is any relationship between such prevalence of injuries and the number of years of experience.

Risk Factors

Physiotherapists may be exposed simultaneously to a number of different risk factors related to WRNMD. It is likely that risk factors may interact, making identification of the cause of injury difficult (Kuorinka et al, 1987) however there is a need to understand how these risk factors may relate to injury at anatomical sites.

The risk factors surveyed in this study indicated that 62.5% of physiotherapists describe the use their physical strength in lifting and transferring of dependent patients, to be major risk factor. This activity forms an important part of the scope of the physiotherapy profession, and is often performed in a working day, particularly during acute care, as in hospital settings and rehabilitation environments (Barnes et al, 2007). This finding of lifting and transferring of patients, to be considered as a major risk factor to WRNMD by physiotherapists, is similar to the findings of (Bork et al, 1996; Igumbor et al, 2003; Salik and Ozcan, 2004)

A possible explanation is that transferring and lifting of patients involves the use of many peripheral, spinal joints and accompanying musculature in order to facilitate the lift or transfer. It becomes important to consider that this transfer or lift may not always be in the same plane, e.g. horizontal to vertical plane as in lying to sitting and gravity may possibly be resisting the motion of transfer or lift, or the patient may be placed in an awkward position when lifting. The factors that further contribute to difficulty of lifting include size, weight, combativeness of patient and the propensity of patient to fall as the human form has no handles and lacks rigidity (Collins et al, 2004). However, Shaik et al (2011) states that the physical posture of the health care professional when performing a task should be such that all the muscles are in a relaxed, well balanced and in a neutral position, postures outside this neutral position are likely to cause neuro-musculoskeletal discomfort.

The different circumstances and contributing factors during which transfers and lifts occur may not always make it possible for physiotherapists to maintain this relaxed, balanced and neutral posture. Invariably physiotherapists may be prone to injury when transferring and lifting patients, as biomechanical investigations have confirmed that lifting and transferring patients generates high spinal stresses (Bork et al, 1996). All of which lends to the reason, why the neck and lower back were found to be the most prevalent site of injury in this survey, due to possible postural strain of the spine when lifting and transferring of patients. This concurs with the studies of Colins et al (2004), and Hinmikaiye and Bamishaiye (2012), which found that the lifting and transferring of dependent patients is related to the development of lower back symptoms and is a commonly accepted injury, particularly in nursing.

Postural risk factors such as bending, twisting, working in cramped positions, working in the same position for a long time and working near the physiotherapists physical limit have also been described as contributing to WRNMD, in this study, but to a lesser extent than physical activities suggesting that the work environment needs to be addressed with respect to needs to accommodate the activities of the physiotherapist. This is similar to the findings of West and Gardner (2001), and Passier and McPhail (2011), who adds that poor work postures limits physiotherapist's capacity to continue working in a physically demanding role.

Postural strain of physiotherapists is often incurred in many aspects of physiotherapy, an e.g. being the treatment of elderly patients. The growing number of people who aged 80 years and older in RSA (SA Statistics, 2012), creates many added referrals for physiotherapy due to age related disease. Many the forms of therapeutic and rehabilitation treatment are often needed in caring for geriatric patients such as mobilising, strengthening, lifting and neurologically rehabilitating. Physiotherapy treatments of geriatric patients are often influenced by the compliance, combativeness, mental state, medical condition, the level of physical fitness and the propensity to fall. Physiotherapists often strain their own posture and body when aiding patients to stand, mobilise or to ensure patients are safely transferred or lifted. Physiotherapists also sacrifice their own well being, by working at their physical limits in cramped nursing homes or other health care facilities, in order to ensure safe effective treatments.

The often lack of assistive equipment in various work settings e.g. height adjustable beds, bedside steps, may not always make it possible for physiotherapists to maintain good postures while performing treatments. Maintenance of awkward postures by physiotherapists is sometimes done for the duration of treatment sessions. Awkward postures for prolonged periods have been described by Holder et al (1999) as a risk factor for WRNMD. Campo et al (2008) cited that physiotherapists who reported to bent or twisted postures had 5.74 times higher odds of developing WRNMD. Postural strain endured by physiotherapists while performing techniques also contributes to spinal symptoms of the neck and lower back.

Work-load issues related to treating a large number of patients in a day, having insufficient breaks of rest, and work scheduling have also been described as factors contributing to WRNMD, in this study. In the study of Adegoke et al (2008), risk factors related to work-load issues was the major risk factor and relates this to the developing state of the country, with its understaffing problems.

High work-loads have been associated with the prevalence of WRNMD (Jensen et al, 2012). Considering the present state of the public health care system, it may not always be possible to avoid this high work-load issue. However, management of physiotherapy services and physiotherapists themselves should consider using principles of job rotation, job enlargement, reduction of pace of work, work-place exercise programs, application of ergonomic principles and having adequate equipment to help prevent WRNMD as highlighted in the United States Department of Labor Guidelines (2003). There is also a need by physiotherapists in the private sector to recognise that high work-loads contributes to WRNMD, as physiotherapists in the private sector are often anecdotally driven by monetary gain and therefore work harder to benefit thereof.

The physiotherapists indicated that the lack of training to prevent injuries was not a contributing risk factor (9%), suggesting that physiotherapists have knowledge on injury prevention e.g. ergonomic principles. However such training and knowledge in injury prevention has provided these professionals little immunity to the prevalence of WRNMD. It is therefore imperative that physiotherapists apply their knowledge of ergonomics, maintain their health and fitness in order to reduce the incurrence of injury.

Continuing to work when injured or in discomfort due to WRNMD was considered to a major risk by 61.1% of physiotherapists. This may have been as a result of high workload issues often experienced in the public health care sector (Maharaj and Rangiah, 2010) but also speaks of physiotherapist's willingness to put themselves at risk for the benefit of their patients. In contrast, physiotherapists in the private health care sector may also continue to work when injured or in discomfort due to their income being directly related to the number of patients treated (Cromie et al, 2000).

The Relationship between the Years of Experience and the Prevalence of WRNMD

The number of years of experience as a physiotherapist has been shown to be a potential contributor or risk factor to injury, with 38.5% of the physiotherapists in this study experiencing WRNMD in the first 5 years of practice. This corresponds with similar findings in the literature (Adegoke et al, 2008; Cromie et al, 2000; Holder et al, 1999; Bork et al, 1996; Glover et al, 2005), suggesting that physiotherapists tend to experience WRNMD early in their careers. Such injuries may be associated with lack of professional experience and skill they have, in the early years of their career. Cromie et al (2000) postulates that younger physiotherapists are reluctant to seek assistance with physically demanding tasks and this may contribute to their injuries.

Continued professional development (CPD) is considered to play an important role in meeting the learning needs of health professionals (Maharaj, 2013). Such developmental programmes would enable practitioners to keep up-to-date with changes in practice, possible new assistive devices and trends to help reduce the incurrence of injuries. As physiotherapists get older, they develop strategies for coping with the physical demands of the job and continue to treat patients (Holder et al, 1999). These strategies may include modifying treatment techniques, performing therapies that are less strenuous, and increasing the use of support staff e.g. physiotherapy assistants. It is seemingly important that these strategies be taught to less experienced physiotherapists through mentoring programmes, and CPD programmes. However, prospective physiotherapists must recognise the physical demands and constraints of the job (Cromie et al, 2001).

5.4 Objective 3. To Determine the Physiotherapist's Anatomical Areas Commonly Affected as a result of WRNMD.

Nine anatomical regions, as described by the Nordic Questionnaire was surveyed in relation to WRNMD (Kuorinka et al, 1987). In this survey, the neck was the most commonly affected anatomical area at 33.2% followed by the lower back at 31.2%. Other studies found the lower back followed by the neck to be the anatomical areas of most complaint (Adegoke et al, 2008; Cromie et al, 2000 and Salik and Ozcan, 2004). Although areas of the spine were the most affected in this study, other commonly injured areas were the shoulders, upper back, wrist, hand, elbow, hips and knees.

To consider why the neck was the most affected anatomical area, the activities of the physiotherapists during practice of the profession needs to be considered. Various modalities of physiotherapy such as massage, manipulation, mobilisation, percussion, vibration, manual strengthening all require use of the upper limbs of physiotherapist. Performing physiotherapy modalities of chest physiotherapy and massage/mobilisation/manipulation have been found in this study to contribute to the prevalence of WRNMD. Bork et al (1996) also cited that performing manual therapy exposes the upper limb to the risk factors associated with musculoskeletal as well as neurovascular disorders. The modalities of chest physiotherapy and massage/manipulation/mobilisation, involves the repetitive use of the hand, wrist and elbow, with the shoulder placing the hand, wrist and elbow in the optimal position for effective treatment and offering stabilization for such activity. The shoulder joint is made up of two joints viz. the glenohumeral joint and the acromioclavicular joint. These joints are held together by extensive ligaments and muscle attachments. The trapezius muscle is a large diamond shaped muscle resembling a trapezium, it arises from the superior nuchal line of the occipital bone, the ligament nuchae and the spinous process of the cervical (neck) and thoracic spines. From its origins, it inserts on the shoulder girdle, the superior part of the trapezius muscle supports the upper limb, the intermediate fibers retracts the scapulae, and the inferior region medially rotates and depresses the scapulae (shoulder blade) (McMinn et al, 1993). The muscle offers stabilization and is used in the movement of the shoulder, and with its origin in the spine, this may explain the contribution of WRNMD to neck pain as experienced by physiotherapists.

The physiotherapist is often stooped over patients while performing certain techniques of physiotherapy, e.g. chest physiotherapy on an obese patients or patients with decreased level of consciousness. This stooped posture, coupled with the repetitive strain on the musculature could further exacerbate the symptoms of the neck pain.

WRNMD of the lower back as well as the neck can be linked to the posture of the physiotherapist while treating patients. Postural risk factors can be described as the manner in which physiotherapists maintain their own physical posture while administering a treatment, as well as the duration of this adopted posture.

Physiotherapists work in cramped wards/units, nursing homes, specialised facilities, cluttered with beds and equipment (Collins et al, 2004). Physiotherapists have often to, manoeuvre and adopt awkward postures in constrained areas to accomplish their tasks. In this study, the following postural risk factors were identified by respondents, viz. working in cramped or awkward positions, in the same position for a long time, bending, twisting, reaching away from the body, and working near your physical limit. West and Gardner (2001), also found that the respondents whose major injury was the spine, considered working in the same position for long periods, static postures and bending/ twisting movements to be significant problems.

The neutral alignment of the spine (i.e. the cervical spine or neck, the thoracic spine or upper back and the lumbar spine or lower back) is essential in good posture (Shaik et al, 2011), however physiotherapists may not be able to maintain this alignment when performing physiotherapy techniques. The inability to maintain good posture while performing effective treatments leads to WRNMD, this also perhaps being one reason for the high rate of complaint of spinal symptoms of the neck and lower back.

The duration of physiotherapy treatments, especially in forms of rehabilitation, are often long. The high work-load often experienced means that these long treatment sessions are done on numerous occasions during the day. Awkward postures are often adopted in these long physiotherapy sessions, resulting in the increased spinal WRNMD as experienced by physiotherapists in this survey. Examples of this would be a physiotherapist assisting a paraplegic transfer from a wheel chair to low plinth, strengthening the patient's upper limbs and trunk, performing passive movements of lower limbs, facilitating rolling and bridging. Salik and Ozcan (2004), stated that the

higher prevalence of lower back symptoms among hospital based physiotherapists could also be attributed to the level of physical dependence of patients e.g. patients with spinal injuries, ventilated patients, and immobile patients.

5.5 Objective 4. To Determine if any Relationship(s) between the Prevalence of Injury and the techniques of physiotherapy used in a Clinical area

An association was found between the prevalence of WRNMD and certain physiotherapy techniques used in a clinical area, in which physiotherapists practice. A general hospital, neurological rehabilitation unit and orthopaedic rehabilitation unit were identified as clinical areas with specific techniques related to WRNMD, all having a p value of < 0.05 , which indicates that these clinical areas contribute to WRNMD.

A General hospital has many clinical departments as well as general areas, e.g. cardiothoracic unit, neurological unit, paediatric unit, surgical unit, orthopaedic unit. Chest physiotherapy is done in many, if not all of the units of the General hospital, due to its therapeutic, preventative and prophylactic benefits, however chest physiotherapy being done in a general hospital has been identified in this study as a physiotherapy technique associated with WRNMD. Chest physiotherapy involves the performance of specific physiotherapy techniques, such as, percussion, vibration, postural drainage, suctioning and bagging of ventilated patients, and respiratory education or breathing exercises of non ventilated patients. Chest physiotherapy may often entail highly repetitive movement occurring at the wrist and elbow coupled with a certain amount of force for effective treatment, and the shoulder being held at a certain level. Highly frequent repetitive movements cause micro lesions that accumulate in the affected neuro-musculoskeletal structures and lead to movement related pain (Ranney et al, 1995). Latko et al (1999) also found that repetitive work of the upper limbs lead to discomfort, tendonitis and carpal tunnel syndrome of the upper limb.

During chest physiotherapy the shoulder is held at a certain level in a sustained position, and the body held for a prolonged period or in an awkward position. Therefore, the spine is often held in a static position while in flexion and/or in rotation during the performance of chest physiotherapy, which is done frequently in a day.

Therefore it is reasonable to understand why physiotherapists consider chest physiotherapy, an aspect of physiotherapy that predisposes the physiotherapist to the incurrence of WRNMD as chest physiotherapy exposes the physiotherapist's upper limbs to repetitive movement, while the physiotherapist's body has often to incur postural strain. This concurs with the studies of (Barnes et al, 2007); West and Gardner (2001) who also found chest physiotherapy to be a major contributor to WRNMD among physiotherapists.

However Barnes et al (2007) found a prevalence of lower back symptoms amongst physiotherapists working in a cardiothoracic work setting where a fair amount of chest physiotherapy was being done. This may be due to physiotherapists bending over obese patients, turning patients with a decreased level of consciousness to perform techniques, such as postural drainage of lung, helping to move/turn the ventilated patients during the performance of the chest physiotherapy techniques, and sudden unanticipated movements of patients.

In an Orthopaedic unit, physiotherapy involves rehabilitating and treating patients who have a form of possible musculoskeletal problem. It may involve physiotherapists having to lift, transfer and help mobilise patients who have incurred fractures, amputations, joint replacement or repairs. Many techniques involved in such rehabilitation are labour-intensive, e.g. strengthening exercises.

Patients also tend to need a fair amount of assistance when initially mobilising after fractures, amputations or joint replacements, especially the elderly. These patients may sometimes incur falls when initially mobilising or may physically lean on physiotherapists while mobilising in order to maintain balance, all of which leads to postural strain on the physiotherapist.

Massage, manipulation and mobilisation may need to be performed on soft tissue injuries, spinal and peripheral joint complaints. In this survey, the use of the techniques of manipulation/mobilisation and massage revealed significance (p value < 0.05) in orthopaedic units. The use of the hand (Bork et al, 1996), especially the thumb (Wajon and Ada, 2003), is common in techniques such as massage, mobilization and manipulation, used often in out-patient facilities or orthopaedic units thus creating a potential problem.

Wajon and Ada (2003), and Cromie et al (2000) also found an association between thumb symptoms and mobilization and manipulation techniques, given its popularity in current physiotherapy. West and Gardner (2001), also found significant complaint of hand injuries and highlighted the extent to which physiotherapist are afflicted by hand pain as a result of their work. Therefore, the physiotherapy needs in the orthopaedic unit or specialised area is multifaceted, yet physical demanding. All of which may explain why it has been identified as a clinical area associated with WRNMD among physiotherapists.

Neurological rehabilitation may involve treating patients who have suffered a stroke, head injury, cerebral palsy, other neurological problems or neuro- anatomical problems, and who often have a decreased level of consciousness and cognizance. These factors may pose more physical dependence on the physiotherapists during treatments and may therefore be a contributor to the prevalence of WRNMD among physiotherapists (Salik and Ozcan, 2004). A fair amount of lifting and transferring is also done in this unit, as well as physiotherapy techniques such as proprioceptive neuromuscular facilitation, that are often done repetitively and often at the physical limits of the physiotherapists. These are postural risk factors (Bork et al, 1996) that may further contribute to WRNMD among physiotherapists.

Greico et al (1998) states that specific types of work-related exposures are associated with the development of neuro-musculoskeletal pathologies which may explain that tasks performed repeatedly within the different clinical speciality areas contribute to the presence or absence of WRNMD e.g. chest physiotherapy in an intensive care unit or lifting in a neurological unit. The underlying assumption is that a particular clinical speciality area has inherent risks because practitioner's use a limited number of techniques although the mode of practice and patients may vary (Bork et al, 1996).

5.6 Objective 5. To Describe the Coping Strategies of Physiotherapists who are Affected by WRNMD.

This section presents the coping strategies that physiotherapists in KZN utilize, followed by the consequences that WRNMD have on them.

Coping Strategies

The scope of practice of physiotherapy places the physiotherapist at risk for both acute and accumulative WRNMD (Bork et al, 1996). Despite these risks, physiotherapists form an integral part of the health care team and continue to provide an important service to the health care industry. Physiotherapists have therefore learned to cope and endure the rigours of this physically demanding profession by developing strategies to help reduce the occurrence of injury.

The manner in which physiotherapists continue to practice, with injury or in a manner to avoid injury, is regarded as a coping strategy. Holder et al (1999) describes four strategies viz. outsourcing, preventative, reactive and inter-action strategies, which should be used by physiotherapists in their career. Coping strategies enable physiotherapists to continue in their profession (Cromie et al, 1999) despite the risks of the profession.

In this study, the most common coping strategy was to modify either the patient's position or the physiotherapist's position as reported by 51.3% of physiotherapists. This is similar to the findings of Adegoke et al (2008). The modification of the physiotherapist's position could be done by using steps, a foot stool or sitting on a chair during a treatment session. The modification of the patient's position could be done by using height adjustable beds or a low rehabilitation plinth. Forty seven percent of physiotherapist modified the patient's height by adjusting the plinth or bed height to reduce strain on their body. These modifications could be viewed as a preventative strategy (Holder et al, 1999), as they prevent the physiotherapist from adopting poor posture, this being related to WRNMD (Bork et al, 1996). The modifications could also be seen as a reactive strategy (Holder et al, 1999), as physiotherapists could have previously been injured, experienced strain/ discomfort while treating patients in cramped areas or clinical settings ,or believe themselves to be injured, and react by

modifying their posture or patients posture. As the modification of position was described as the most common strategy utilised, physiotherapists have viewed this strategy as imperative to facilitate the productivity of their profession while trying to minimise their injuries.

The modification of position during practice also means that the physiotherapists are using their knowledge and principles of ergonomics to help reduce the strain on their bodies, while performing labour intensive tasks. The United States Department of Labor (2003) highlights the importance of using such ergonomic principles and created guidelines for the health care industry in the USA. Physiotherapists in KZN have noted the benefits of such principles of ergonomics and are using it despite no guidelines being presently available by the South African National Department of Health. By applying basic principles of ergonomics, the physiotherapists can take steps towards a safer, more productive work environment (United States Guide Lines for Nursing Homes, 2003).

The use of assistive devices and equipment, as highlighted in the modification of positions above (e.g. foot stool, height adjustable beds, lifts, hoists, transfer belts, repositioning sheets) as means of a coping strategy, has been found to be an effective tool in the alleviation and prevention of neuro-musculoskeletal disorders (Hinmikaiye and Bamishaiye, 2012). Assistive devices used during highly labour- intensive strenuous, such as lifting or transferring is crucial, if physiotherapists are to avoid or minimise strain on their bodies and enjoy the length of their career. The importance of having appropriate lifting, transferring, and assistive devices to help alleviate lower back has been highlighted in studies on the nursing profession and lower back pain (Collins et al, 2004; Hinmikaiye and Bamishaiye, 2012).

Devices or equipment that provide resistance, strengthening or range of movement exercises are also important tools needed by physiotherapists, as they form an alternative to manual repetitive movement of the physiotherapist. These tools invariable help prevent micro-lesions on the neuro system of the physiotherapist, which are caused by highly frequent repetitive movements, and lead to movement related pain (Ranney et al, 1995).

Equipment which is used in treatment therapies such as ultrasound therapy machines, transcutaneous electrical nerve stimulators or interferential therapy machines are also important as they provide alternatives to manual labour, in the treatment of conditions and ailments such as pain or swelling. However such equipment however, can sometimes be cumbersome and heavy to carry, especially when treating sparsely dispersed hospitalised patients. Hinmikaiye and Bamishaiye (2012) stated that the cost of training, updating and purchasing specialized equipment (lifts, back belts, electronic adjustable beds) are easily justifiable in terms of the savings made in avoiding absenteeism, the loss of staff and potential damage to patients.

Nineteen percent of respondents selected techniques and modalities for reasons other than the patient's needs, namely self preservation as indicated by Cromie et al (2000), to maintain their own well being and thereby enable them to continue working in this physically demanding profession. Selecting techniques that will not initiate or aggravate the therapist's discomfort, or using alternate body part to administer technique indicates that, the physiotherapists have a number of options to use in treating patients (Cromie et al, 2000). These include using electrotherapy versus massage and manipulation, or the elbow instead of the thumb for trigger point therapy. The range of options may expand with experience and in response to injury, which may partly explain the higher prevalence of symptoms among younger physiotherapists, as supported by the literature (Adegoke et al, 2008; Cromie et al, 2000; Holder et al, 1999; Bork et al, 1996; Glover et al, 2005).

An alternate explanation as to why physiotherapists select techniques and modalities for reasons other than the patient's need, is possibly high work-loads. An e.g. patients that may require more labour intensive treatments such a massage or ultrasound therapy are treated in group sessions of exercise classes or hydrotherapy classes. Although group sessions may not be the appropriate treatment for the patient, it is a means of offering physiotherapy services when physiotherapists are experiencing high work-loads, staff shortages etc.

The strategy least used in this study to reduce injury was to warm up and stretch before manual techniques. Sang and Woletz (2010), studied industry specific work place stretching programmes and found benefits thereof, but there is still disagreement about

the effectiveness of stretching to prevent WRNMD. It is the researcher's view that physiotherapists may regard this strategy as an inefficient strategy, given their knowledge of ergonomics and their assessment of the physical nature of the occupation. There is also the issue of time constraints, where physiotherapists may not always have time to warm-up or stretch before, the administration of techniques, given their often high work-load.

As a coping strategy, 38.9 % sought help when handling a heavy patient, further indicating, that physiotherapists are employing ergonomic principles when treating patients. In seeking assistance, 13% of practitioners in this study used physiotherapy assistants or rehabilitation technicians to perform physically stressed techniques. The use of supportive staff could also be seen as an outsourcing strategy (Holder et al, 1996). Appropriate distribution of work-load through adequate staffing, and proper work allocation (physiotherapists and physiotherapy assistants), in line with patient expectations, is regarded as an effective organisational coping strategy (Passier and McPhail, 2011). As the effects of high physical work-load often experienced by physiotherapists influences their WRNMD (Jensen et al, 2012), staff should be given the opportunity to rotate work positions in different clinical areas. Taking on less physically demanding clinical roles, interspersed with non-clinical tasks and treating mixed patient types (both conditions and levels of impairment) (Passier and McPhail, 2011). This would allow musculature that is repetitively used in the tasks, to rest and heal, to avoid the development of neuro-musculoskeletal pathologies as described by Grieco et al (1998).

CPD and training programmes are also an important strategy in combating WRNMD among physiotherapists, as professionals in the fields, such as in medicine and allied healthcare, are at particular risk of their skills and knowledge becoming obsolete due to accelerated growth of knowledge in their areas of expertise, changing disease profiles, new products and continually emerging legal and ethical issues. There is also a perception among physiotherapists that undergraduate education did not fully prepare them for working life or lifelong competence. Therefore, the importance of CPD is viewed as a strategic instrument to keep health professionals skills and knowledge up-to-date (Maharaj, 2013), and impart knowledge on developments in the profession e.g. advancing ergonomic principles, new products aimed at reducing manual labour.

This is supported by Passier and McPhail (2011,3) who suggested education on topics such as “training in alternate handling and postures and gaining further knowledge of less physically demanding, yet effective treatment techniques, manual handling training specific to clinical settings, and training regarding the use and application of equipment”. These could be viewed as key tools to curb WRNMD among physiotherapists.

Other suggestions made by respondents was to maintain their own physical health and fitness, wear comfortable shoes, have more physiotherapy assistants to assist with patients, and work with better equipment, this is also supported by Jensen et al (2012), who also notes such suggestions . Physiotherapist’s maintenance of their own physical fitness and health as a strategy to reduce WRNMD would enable them to undertake work tasks (Passier and McPhail, 2011). Fitness should be encouraged to improve psychological and physical tolerance to pain and stress, (Guidelines for Nursing Homes, 2003), and practitioners should be encouraged to review their personal standards of fitness, nutrition and stress control.

Overall, physiotherapists in KZN are being highly afflicted by WRNMD due to the amount of intensive, manual labour needed for implementation of physiotherapy techniques. The developing economy of South Africa may mean that physiotherapist have to maintain their financial security despite incurring injury. Physiotherapists are therefore enduringly employing coping strategies, which they deem to be crucial to the maintenance of their physical well being and thus the sustainability of their careers. It would however seem that the inherent physically demanding nature of the profession out-weigh the benefits of these coping strategies as the prevalence of WRNMD is high.

Consequences of work related neuro-musculoskeletal disorders on Physiotherapists.

Occupational diseases have not only physical, psychological and social consequences but also economic and security impacts when they reach a level of severity (Shaik et al, 2011), which may explain why 42% of participants in this study, considered leaving the profession due to WRNMD. Given that there is already a shortage of rehabilitation staff in the province (Maharaj and Rangiah, 2010), this possible exodus from the profession would have severe consequences for the health care industry, as physiotherapy forms an integral part of many treatment plans. In the study of Cromie et al (2000), 1 in 6

physiotherapists moved within or left the profession of physiotherapy as result of WRNMD. In this study, it was found that 61.1% of physiotherapists continued working with discomfort, which could lead to practitioners suffering from an impairment of general well-being (Klussman et al, 2008), which may further impair their level of productivity as well as their personal and social lives.

This study also found that in order to cope with WRNMD, 33.2% had taken sick leave, and 28.3% had limited patient contact time. The physically demanding nature of the physiotherapy has placed such a burden on the health and well being of these professionals, that there has been a need to utilise their sick leave benefit and limit some of their patient contact time. However in combating this significant prevalence of WRNMD (Cromie et al 2001), suggests that physiotherapists need to chose career paths congruent with their physical abilities.

CHAPTER 6. CONCLUSION

6.1 Introduction

While international studies have indicated that practitioners experience WRNMD, no study had been undertaken in KZN about the nature and extent of WRNMD among physiotherapists in KZN. Studies of WRNMD in other countries indicate that physiotherapists are at risk for WRNMD. The extent of WRNMD internationally suggests that this would also be a problem in the province. The aim of the study was therefore to establish the prevalence and type of these injuries, describe contributing risk factors and coping strategies which was done through a number objectives. This chapter reviews the findings of the research question, and presents the limitations and recommendations. It concludes with an overview of the significance of these findings for practitioners in the KZN and possibly the rest of RSA.

KZN a province of RSA, has a population of 10 267 300, according to South African Statistics (2012), this population being the second highest in the country. KZN has also been burdened with the highest HIV prevalence in the country and therefore there are added referrals for physiotherapy treatments. At the time of this study, 681 physiotherapists were practicing in KZN and tasked to provide a service to this population. The ratio of the population to physiotherapist stood at 15 077:1, although no official acceptable ratio has been formulated, the present ratio would seem to contribute to the relatively high prevalence of 86.3% of WRNMD among physiotherapists in KZN. Relevant authorities and institutions should consider measures to improve such a fairly in- proportionate ratio, if the relatively high prevalence of WRNMD among physiotherapists is to be curtailed. Given that the SA is a developing country, physiotherapists may not always have adequate opportunities to steer their careers into less physically demanding roles and have therefore opted to maintain their financial security despite the inherent risks of the profession of physiotherapy. This was evident as 61.1% of physiotherapists continued working with discomfort, in this study.

The prevalence of 86.3% of WRNMD found among the responding practitioners, in KZN correlates to those in other countries. There is therefore a need to also identify measures to prevent WRNMD from occurring, or putting in place effective treatment efforts that do not compromise physiotherapist's ability to work in their profession.

This study found a greater prevalence of WRNMD among physiotherapists practising in the public sector as compared those practising in the private sector, although this may have been influenced by the fact that a greater percentage of respondents worked in this environment. It is also important to note that, the findings from the General Household survey (2011) revealed that 77.2% of households use public health care facilities in KZN, which has been historically poorly funded relative to its needs. Therefore physiotherapists practicing in the public sector may experience high workloads coupled with staff shortages, inadequate and inappropriate equipment, issues that internationally, have been found to contribute to WRNMD. Although the present government has made strides to improve the public health care sector, there is a need for the Provincial Dept of Health to consider the dynamics of the physiotherapy profession when formulating policies on organisational strategies, staffing, equipping physiotherapy departments and developing work environments that are ergonomically suitable.

The neck and lower back were the most affected injury sites, while problems to the shoulder, upper back, hand/wrist, elbow, hips and knees were also identified. This indicates that the spine is the main anatomical area compromised by the requirements of the profession. The spine functions to protect the spinal cord and associated nerves, allow movement and flexibility, it forms a structural base to the rib attachments which protects the heart and a structural foundation to the shoulder and pelvic girdles, therefore injuries of the spine highlights the need to seriously address causes of injury.

The main types of injury were muscle spasm, tendonitis and joint pains, suggesting that there is repetitive strain of the musculature. This may be due to physiotherapists not being able to rotate to different areas within a work setting, and reduce the exposure to repetitive actions and prolonged positions, which were found to contribute to WRNMD.

Further, physical ailments do not allow physiotherapist to enjoy a quality of life and sense of general well being, and is imperative if they are to be active and economically productive members of society. However it is also important for physiotherapists to maintain a certain level of health and fitness as physiotherapists are aware of the physically demanding nature of the profession. A fair comment documented by a respondent in the study of Barnes et al (2007) that "physiotherapists do not always

practice what they preach” indicating a discrepancy between knowledge and its application.

The risk factor that most concerned physiotherapists was the transferring of dependent patients. The adult human form is an awkward form to transfer or lift, and is susceptible to severe damage if dropped or mishandled. Yet transferring of patients is part of the scope of practice of physiotherapy in many clinical areas and work settings. It involves the use of many peripheral, spinal joints and accompanying musculature of the physiotherapist in order to facilitate the transfer or lift. Transferring of dependent patients doesn't only depend on the capabilities of the physiotherapists but also on other factors such as the level of consciousness of patient, combativeness of patient and the propensity of the patient fall. It is therefore understandable why physiotherapist consider transferring to be a crucial risk factor to WRNMD. Bio-medical investigations have confirmed that lifting and transferring also contributes to spinal stress, which may be reason for the high prevalence of neck and low back symptoms of physiotherapists in this study.

Physiotherapists tend to experience WRNMD early in their career, i.e. the first five years after graduating. Such injuries may be associated with lack of professional experience and skill they have, in the early years of their career and the reluctance to seek assistance with physically demanding tasks that may contribute to their injuries. This suggests the need for specific training during their undergraduate years and appropriate mentoring after qualifying, as it is apparent that the inherent nature of the profession predisposes physiotherapists to WRNMD. Such training and mentorship programmes could offer physiotherapists valuable information on maintaining a certain level of self preservation while still performing effective treatments, so that they could fulfil the length of their career.

Physiotherapists practicing in the clinical fields of chest, neurology and orthopaedics were found to have a significant prevalence of injury. The results of this study indicate that particular attention should be paid to the appropriate work-load and time spent in these clinical fields, as techniques of manual handling of patients and hand-intensive manual therapies are labour intensive and opportune to the incurrence of WRNMD. The correct implementation of organisational coping strategies, e.g. correct distribution of

work-load through adequate staffing and proper work allocation in line with patient's expectation in these clinical fields could help curb WRNMD of physiotherapist.

The self-protective behaviour or strategy most commonly used by respondents was to adjust their position or the patient's position, to help reduce strain on physiotherapist's body. These modifications of position could be done using equipment eg. height adjustable beds or foot stools. This self protective strategy could be viewed as a preventative strategy or reactive strategy. It has possibly been viewed as an efficient strategy to help facilitate effective treatments while trying to reduce the incurrence of injury, by physiotherapists in KZN. Such modifications of position, also reveals that physiotherapists have knowledge of ergonomic principles and are employing them. However this knowledge and the physiotherapist's clinical expertise appear not to constitute an immunity to WRNMD, as there is still a high prevalence thereof.

It is the researcher's view that prospective students of physiotherapy fully understand the profession and physiotherapist's choose clinical fields congruent to their physical abilities, as well as maintain a certain level of fitness, because physiotherapy is a physically demanding profession. However the researcher is of the opinion that with advancements in science and technology, better technological advanced equipment would be developed, to assist physiotherapists with certain physiotherapy techniques. Such advanced assistive equipment could become an integral part of assisting in the scope of practice of physiotherapy, so as to lessen the physical strain and burden on physiotherapists.

6.2 Limitations

Some of the limitations of this study were that, a self-reporting survey questionnaire was used, which may result in individuals exaggerating their symptoms. The second limitation was that the participants were mainly from the public sector, and the results may not offer a true reflection of those physiotherapists practicing in the private sector. Thirdly, the sample was restricted to KZN, which is a large, densely populated province, with urban, semi urban and rural areas that may limit the transferability of findings to other provinces which have different staff profiles and access to equipment or lack of equipment. Another limitation is that only a small percentage of participants were men, and the high number of women may have resulted in a gender bias. These limitations need to be addressed in future research.

6.3. Recommendations

As result of the study, the following recommendations are made:

1. Physiotherapists should fully employ their knowledge of principles of ergonomics when treating patients, as the spine of the physiotherapists has been found to be comprised by the requirements of the profession of physiotherapy.
2. Continuous professional development programmes should provide knowledge on ongoing developments and strategies to prevent WRNMD.
3. Physiotherapists should steer their career congruent to their physical abilities to prevent injuries and also maintain a certain level of fitness.
4. Management of physiotherapy practices and departments should utilize Organisational strategies, Preventative strategies, Reactive strategies and an interaction of strategies such as:
 - having adequate staff and rotating staff through physically demanding clinical areas, i.e. clinical areas requiring chest physiotherapy, orthopaedic and neurological rehabilitation,
 - adequate and appropriate, equipment of physiotherapy departments and clinical areas
 - facilitating mentorship programmes among senior and junior physiotherapists, so that valuable experience on the how to recognise and prevent WRNMD is imparted to junior physiotherapists,
 - allowing physiotherapists more choices in treatment techniques, so there is possibly a reduction in overuse of certain musculature.
 - reduce patient workload if possible
 - rest / stretch/ exercise breaks to be incorporated in a day
 - encourage physiotherapists to report symptoms early
5. The South African National Department of Health should formulate specific guidelines for health care workers with regards to ergonomics and 'safe practice' principles. Physiotherapists, who themselves fully understand their own profession, should be pivotal in development of such principles and strategies, so as to curb the prevalence of WRNMD
6. Prospective physiotherapy students need to be made aware of the inherent risk factors of the profession, for the development of WRNMD. In addition they should also consider their own physical attributes and capabilities when considering physiotherapy as a choice of career.

7. Principles of ergonomics and coping strategies related to WRNMD among physiotherapists should be part of the curriculum at an undergraduate level.
8. The correct ratio of physiotherapists for a population needs to be determined by relevant authorities.

Further research is needed to identify those aspects of the job and associated practices that contributes to the greatest injury with a view to formulating preventative strategies. There is little statistical information regarding the dose relationship between a specific physiotherapy technique and the number of hours it is safe to perform it, and how much time should be allowed for the muscle and joint incurring repetitive motion to rest or heal. Such measures will preserve the health of workers in an occupation devoted to promotion and restoration of health, and in so doing, will uphold the World Health Organisation' s definition of Occupational health, i.e. to promote and maintain the physical, mental and social well being of all workers and not merely the absence of disease.

6.4 Summary

Physiotherapists form an important part of the overall health care profession. With an increasing number of patients requiring rehabilitative care due to an increasing elderly population and a high prevalence of HIV/AIDs positive persons, these practitioners need to maintain their own health to be able to provide appropriate care to others. As this study has indicated that many practitioners are affected by WRNMD, policies need to be developed to advise, as well as guide physiotherapists on ergonomics and strategies, as has been done in other countries. In addition, health care facilities need to address issues of staffing, equipment and managerial skills to help prevent WRNMD. Specific attention needs to be paid to those clinical areas and modalities of treatment that have been associated with WRNMD, with a view to finding measures to help reduce the prevalence of WRNMD. Incorporating issues that specifically deal with WRNMD in the curriculum will create awareness among new graduates about the potential for problems to occur, and enable them to take steps to prevent them.

This study has provided important new knowledge for the profession, and indicates areas that need to be further researched. Above all, it has indicated areas that need to be addressed to improve the quality of life of physiotherapists, given the high

prevalence of WRNMD in KZN. Preventing injuries and treating those that do occur will ensure that physiotherapists remain in the profession and provide their patients with the most appropriate care.

REFERENCES:

1. Adegoke BOA, Akodu AK, Oyeyemi AL 2008. Work-related musculoskeletal disorders among Nigerian physiotherapists. *Biomed Central Musculoskeletal Disorders* 9: 112
2. Barnes R, Birch J, Cloete MM, Joubert L, Usher AC, Nel M 2007. The incidence of work-related low back pain among currently practicing physiotherapists in Bloemfontein. *South African Journal of Physiotherapy* 63: 9 -13
3. Barr A, Barbe MF 2002. Pathophysiological Tissue Changes associated with repetitive movement: A review of the evidence. *Physical Therapy* 82: (2) 173-187
4. Bartlett JE, Kotrlik JW, Higgins CC 2001. Organizational Research: Determining the appropriate sample size in survey research. *Information technology, Learning and Performance Journal* 19: 43-50
5. Bork BE, Cook TM, Rosecrance JC, Engelhardt KA, Thomason ME, Wauford IJ, Worley RK 1996. Work-related musculoskeletal disorders among physical therapists. *Physical Therapy* 76: (8) 827- 835
6. Campo M, Weiser S, Nordin M 2008. Work-related musculoskeletal disorders in physical therapists: a Prospective cohort study wit 1-year follow up. *Physical Therapy* 88: (5) 608-619
7. Chetty V, Maharaj SS (2013). Collaboration between health professionals in the era of antiretroviral therapy. *Journal of the Association of Nurses in AIDS Care* 24: (2) 166-175
8. Collins JW, Wolf L, Bell J, Evanoff B 2004. An evaluation of the “best practices” musculoskeletal injury prevention program in nursing homes. *Journal of Injury Prevention* 10: 206-211
9. Cromie JE, Robertson VJ, Best MO 2000. Work-related musculoskeletal disorders in physical therapists: Prevalence, severity, risks and responses. *Physical therapy* 80: 336-351
10. Cromie JE, Robertson VJ, Best MO 2001. Occupational health and safety in physiotherapy: Guidelines for practice. *Australian Journal of Physiotherapy* 47: 43-51

11. Department of Labour, Republic of South Africa. *Basic conditions of employment Act (No. 75 of 1997)*
12. Evans k, Roll S, Baker J 2009. Work-Related Musculoskeletal disorders among registered diagnostic medical sonographers and vascular technologists. *Journal of Diagnostic Medical Sonography* 25: (6) 287-299
13. Gavin HS, McIntyre DE 2008. South Africa: a 21st century apartheid in health and healthcare? *The Medical Journal of Australia* 189: (11) 637-640
14. Glover W, McGregor A, Sullivan C, Hague J 2005. Work related musculoskeletal disorders affecting members of the Chartered Society of Physiotherapy. *Journal of Physiotherapy* 91: 138-147
15. Grieco A, Molteni G, De Vito G, Sias N 1998. Epidemiology of musculoskeletal disorders due to biomechanical overload. *Ergonomics* 41: (9) 1253-1260
16. Guidelines for Nursing Homes 2003. Ergonomics for the prevention of musculoskeletal disorders. United States Department of Labor (www.osha.gov/ergonomics/guidelines/nursinghome/final_nh_guidelines.html)
17. Helliwell PS, Taylor WJ 2004. Repetitive strain injury. *Post graduate Medical Journal* 80: 438 -443
18. Hinmikaiye CD, Bamishaiye EI 2012. The incidence of low back pain among theatre nurses: A case study of the University of Ilorin and Obafemi Awolowo University Teaching Hospital. *International Journal of Nursing Science* 2: (3) 23-28
19. Holder NL, Clark HA, Diblasio JM, Hughes CL, Scherpf JW, Harding L, Shepard KF 1999. Cause, prevalence and response to occupational injuries reported by physical therapists and physical therapy assistants. *Physical Therapy* 79: 642-652
20. McMinn RMH, Hutchings RT, Pegington J, Abrahams P 1993. Human anatomy 3rd edition. Wolfe Publishing Ltd, London.
30. Igumbor EU, Useh U, Madzivire DM 2003. An epidemiological study of work-related low back pain among physiotherapists in Zimbabwe. *South African Journal of Physiotherapy* 59: 7-14

31. Jensen JN, Holtermann A, Clausen T, Mortensen OS, Carneriro IG, Andersen LL 2012. The greatest risk for low back pain among newly educated female health care workers, body weight or physical workload. *Biomed Central Musculoskeletal Disorders* 13: 87
32. Klussmann A, Gebhardt H, Liebers F, Rieger A 2008. Musculoskeletal symptoms of the upper extremities and the neck: A cross-sectional study on prevalence and symptom-predicting factors at visual display terminal (VDT) workstations. *Biomed Central* 9:96
33. Kuorinka I, Jonsson B, Kilbom A 1987. Standardized Nordic questionnaires for the analysis of musculoskeletal symptoms. *Applied ergonomics* 18: 233-237
34. Latko WA, Armstrong TJ, Frazblou A, Ulin SS, Werner RA, Albers JW 1999. Cross sectional study of the relationship between repetitive work and the prevalence of upper limb musculoskeletal disorders. *American Journal of Industrial medicine* 36: (2) 248-259
35. Maharaj SS 2013. Mandatory continuing professional development in South Africa: Rehabilitation therapist's perspective. *International Journal of Therapy and Rehabilitation* 20: (7) 343-349
36. Maharaj SS, Rangiah P (2010). The prevalence of co-morbidities in patient on HAART referred to physiotherapists in three public hospitals in Kwa Zulu-Natal, South Africa: a short report. *South African Journal of Physiotherapy* 66: (3) 21-4
37. Mann C 2003. Observational research methods. Research design II: cohort, cross sectional, and case control studies. *Emergency medicine Journal* 20: (1) 54-60
38. Mizejewski M, Kumar S 1997. Prevalence of low back pain among physical therapists in Edmonton, Canada. *Occupational medicine* 57: 300-301
39. Nordin NA, Leonard JH, Thye NC 2011. Work related injuries among physiotherapists in public hospitals – a South East Asian picture. *Journal of Clinics (Sao Paulo)* 66: (3) 373- 378
40. Nyagah JN, Frantz JM 2006. Health Education needs among individuals with low back pain. *South African Journal of Physiotherapy* 62: (4) 22-7

41. Occupational Health Services for Health Care workers in the National health service sector of South Africa 2003. A Guideline Booklet.
(www.kznhealth.gov.za/occhealth/ohmanual)
42. Oxford Advanced Learner's Dictionary. 5th Edition, 5th Impression 1999.
43. Passier L, McPhail S 2011. Work related disorders amongst therapists in physically demanding roles: qualitative analysis of risk factors and strategies for prevention. *Biomed Central Musculoskeletal Disorders* 12: 24
44. Payne CB (1993). Continuing professional postgraduate education: overview and issues. *New Zealand Journal of Adult Learning* 21: (2) 113-128
45. Ranney D, Wells R, Moore A 1995. Upper limb musculoskeletal disorders in highly repetitive industries: precise anatomical physical findings. *Ergonomics* 38: 1408-23
46. SA Statistics, 2012
(<http://www.avert.org/south-africa-statistics.htm>)
47. Sang D, Woletz TMS 2010. Do stretching programs prevent work related musculoskeletal disorders? *Journal of Safety, Health and Environment Research* 6: 660 -679
48. Salik Y, Ozcan A 2004. Work-related musculoskeletal disorders: A survey of physical therapists in Izmir- Turkey. *Biomed Central Musculoskeletal disorders* 5:27
49. Shaik AR, Rao SB, Husain A, D'sa J 2011. Work- related musculoskeletal disorders among dental surgeons: A pilot study. *Journal of Contemporary Clinical Dentistry* 2: (4) 308-312
50. South Africa HIV and Aids Statistics, 2010
(<http://www.avert.org/south-africa-hiv-aids-statistics.htm>)
51. Stats SA, 2011 Use of health facilities and levels of selected health conditions in South Africa: Findings from the General Household survey, 2011
52. Tony W, Luis C, Louis JS 2004. Biomechanics of tendon injury and repair. *Journal of Biomechanics* 37: 865 -877
53. Wajon A, Ada L 2003. Prevalence of thumb pain in physical therapists. *Journal of Hand therapy* 16: 237-244

54. West DJ, Gardner D 2001. Occupational injuries of physiotherapists in North and Central Queensland. *Australian Journal of Physiotherapy* 47: 179-186
55. World Health Organization website- Occupational Health
(www.who.int/occupational_health)
56. Whittaker S, Shaw C, Spieker N, Linegar A 2011. Quality Standards for Healthcare establishments in South Africa. *Council for Health Service Accreditation of Southern Africa*. (www.cohasa.co.za)

APPENDIX A



UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

RESEARCH OFFICE
Biomedical Research Ethics Administration
Westville Campus, Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609
Email: BREC@ukzn.ac.za

Website: <http://research.ukzn.ac.za/ResearchEthics/BiomedicalResearchEthics.aspx>

10 November 2011

Ms. H Pillay
Department of Physiotherapy
Westville Campus
University of KwaZulu-Natal

Dear Ms Pillay

PROTOCOL: A Study to Determine the Prevalence, Risk Factors and Coping Strategies of Physiotherapists, Experiencing Work- Related Musculoskeletal-Disorders in KwaZulu-Natal. REF: BE249/010

EXPEDITED APPLICATION

A sub-committee of the Biomedical Research Ethics Committee has considered and noted your application dated 12 March 2008.

I wish to advise that your letter dated 27 May 2012 has been noted by a sub-committee of the Biomedical Research Ethics Committee. The study was provisionally approved pending appropriate responses to queries raised. Your responses dated 27 May 2012 to queries raised on 10 November 2011 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 11 June 2012.

This approval is valid for one year from 11 June 2012. 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 (2004), 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/ResearchEthics11415.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).

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely



 Professor D.R Wassenaar
Chair: Biomedical Research Ethics Committee

cc: Dr S Maharaj (Supervisor)

APPENDIX B



SOUTH AFRICAN SOCIETY OF PHYSIOTHERAPY

PO BOX 752378
GARDENVIEW
JHB, 2047

TEL: (011) 815 3170
FAX: 086 559 8237
www.physiosa.org.za

26 April 2011

To: The Ethics Board
University of KZN

RE: Support for Research Project by SASP

This confirms that the South African Society of Physiotherapy supports the research project proposed by Ms H Pillay titled:

"A study to determine the prevalence, risk factors and coping strategies of physiotherapists experiencing work-related musculoskeletal disorders in KZN."

We further urge our members to assist Ms Pillay with her research through the completion of a questionnaire for the purposes of this study as the results will enable us in providing better focused support to the needs of Physiotherapists in South Africa.

Yours faithfully

(Not signed – sent electronically)
Mansur Cloete
President

APPENDIX C

SOUTH AFRICAN SOCIETY OF PHYSIOTHERAPY
KWAZULU-NATAL PROVINCE
PO BOX 70646
OVERPORT
4067
Tel/Fax: 031-5640238
Email: saspkzn@iafrica.com



3 May 2011

Dear Colleague

Re: Master's Research Questionnaire

"A study to determine the prevalence, risk factors and coping strategies of physiotherapists experiencing work-related musculoskeletal disorders in KwaZulu-Natal."

Research into the aforementioned topic would provide invaluable information to our noble profession due to the nature and scope of our often labour-intensive profession. Ensuring the health of the physiotherapist is vital if we as physiotherapists are to provide health care to others.

I therefore encourage you to take a few minutes to please fill in the attached questionnaire and return it to the researcher, Hayley Pillay in the postage-paid, self-addressed envelope provided.

Yours sincerely

Gerda Hayden
SASP KZN Chairman



APPENDIX D

Department:
Health
PROVINCE OF KWAZULU-NATAL

Inkosi Albert Luthuli Central Hospital
Ethekwini Health District
Office of the Medical Manager
Private Bag X 03, Mayville, 4058
800 Bellair Road, Mayville, 4058
Tel.: 031 240 1059,
Fax.: 031 240 1050
Email.: ursulanun@ialch.co.za
www.kznhealth.gov.za

17 September 2012

Ms H Pillay
Department of Physiotherapy
Westville Campus

Dear Ms Pillay

Re: Research Approval: BE 249/010: A Study to Determine the Prevalence, Risk Factors and Coping Strategies of Physiotherapists, Experiencing Work – Related Musculoskeletal – Disorders in KwaZulu-Natal.

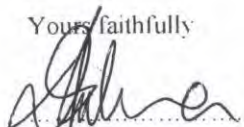
As per the policy of the Provincial Health Research Committee (PHRC), you are hereby granted permission to conduct the above mentioned research once all relevant documentation has been submitted to PHRC inclusive of Full Ethical Approval.

Kindly note the following.

1. The research should adhere to all policies, procedures, protocols and guidelines of the KwaZulu-Natal Department of Health.
2. Research will only commence once the PHRC has granted approval to the researcher.
3. The researcher must ensure that the Medical Manager is informed before the commencement of the research by means of the approval letter by the chairperson of the PHRC.
4. The Medical Manager expects to be provided feedback on the findings of the research.
5. Kindly submit your research to:

The Secretariat
Health Research & Knowledge Management
330 Langaliballe Street, Pietermaritzburg, 3200
Private Bag X9501, Pietermaritzburg, 3201
Tel: 033395-3123, Fax 033394-3782
Email: hrkm@kznhealth.gov.za

Yours faithfully


Dr M E L Joshua
Medical Manager

uMnyango Wezempilo . Department van Gesondheid

Fighting Disease, Fighting Poverty, Giving Hope



health APPENDIX E

Department:
Health
PROVINCE OF KWAZULU-NATAL

MAHATMA GANDHI MEMORIAL HOSPITAL
Postal Address: Private Bag X 13, Mount Edgecombe, 4300
Physical Address: 100 Phoenix Highway, Phoenix 4068
Tel. 031 502 1719 Fax. 031 502 1869
Email.: nancy.bridgemohun@kznhealth.gov.za
www.kznhealth.gov.za

Enquiries: Dr. C. Persad
Telephone: 031 502 1719 Ext 2012
Date: 14 September 2012

MS H. PILLAY
DEPARTMENT OF PHYSIOTHERAPY

**RE: PERMISSION TO CONDUCT STUDY: A STUDY TO DETERMINE THE PREVALENCE,
RISK FACTORS AND COPING STRATEGIES OF PHYSIOTHERAPIST, EXPERIENCE WORK
– RELATED MUSCULOSKELETAL-DISORDERS IN KWAZULU-NATAL. REF: BE249/010**

I wish to inform you that permission is hereby granted for you to conduct the above mentioned research at Mahatma Gandhi Memorial Hospital complex

Kindly liase with Mrs A. Naidoo to make the necessary arrangements before commencement of your study.

Yours faithfully,

DR. C. PERSAD
CLINICAL MANAGER
MAHATMA GANDHI MEMORIAL HOSPITAL



APPENDIX F

health

Department:
Health
PROVINCE OF KWAZULU-NATAL

Health Research & Knowledge Management sub-component
10 – 103 Natalia Building, 330 Langalibalele Street
Private Bag x9051
Pietermaritzburg
3200
Tel.: 033 – 3953189
Fax.: 033 – 394 3782
Email.: hrkm@kznhealth.gov.za
www.kznhealth.gov.za

Reference : HRKM 140/12
Enquiries : Mr X Xaba
Tel : 033 – 395 2805

Dear Ms H. Pillay

Subject: Approval of a Research Proposal

1. The research proposal titled 'A study to determine the prevalence, risk factors and coping strategies of physiotherapists, experiencing work-related musculoskeletal disorders in KwaZulu Natal' was reviewed by the KwaZulu-Natal Department of Health.

The proposal is hereby **approved** for research to be undertaken at Inkosi Albert Luthuli Central Hospital.

2. You are requested to take note of the following:
 - a. *Make the necessary arrangement with the identified heads of physiotherapy departments before commencing with your research project.*
 - b. *Provide an interim progress report and final report (electronic and hard copies) when your research is complete.*
3. Your final report must be posted to HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200 and e-mail an electronic copy to hrkm@kznhealth.gov.za

For any additional information please contact Mr X. Xaba on 033-395 2805.

Yours Sincerely

Dr E Lutge

Chairperson, Health Research Committee

Date: 10/11/2012

uMnyango Wezempilo . Departement van Gesondheid

Fighting Disease, Fighting Poverty, Giving Hope

APPENDIX G (Information sheet)

P.O Box 695
Umhlanga Rocks
4320

25 August 2012

The participant

Dear Colleague

Re: Request assistance to conduct study

I, Hayley Pillay, am enrolled as a student in the Masters programme in Physiotherapy at UKZN.

The purpose of the study is to determine the prevalence and risk factors regarding the range of work-related musculoskeletal disorders incurred by physiotherapists, so that measures could be taken to reduce work-related musculoskeletal disorders amongst physiotherapists.

The knowledge of the study would surely benefit the physiotherapy profession, as ensuring the health of the physiotherapist is vital if we as physiotherapists are to provide health care to others.

I humbly request that you as a physiotherapist participate in the study by signing the attached consent form, answering the attached questionnaire and returning it to the above mentioned address in the pre- paid postage envelope enclosed.
All information received will be kept strictly confidential.

Yours faithfully

Hayley Pillay
Masters Student- Physiotherapy
Cell:0832252893
Work: 031 561 7428

Dr SS Maharaj
Research Supervisor
Tel: (031) 260 7817

APPENDIX H (Consent Form)

Research Title

A study to determine the prevalence, risk factors and coping strategies of physiotherapists, experiencing work-related musculoskeletal disorders, in Kwa Zulu-Natal.

Purpose

The purpose of the study is identify the range of work-related musculoskeletal disorders incurred by physiotherapists due to the nature and scope of the profession so that corrective measure could be taken to reduce work-related musculoskeletal disorders amongst physiotherapists.

What does the study involve?

If you consent to participate in the study, you will be asked to complete a questionnaire regarding your medical history in terms of work-related musculoskeletal disorders.

Is there any discomfort or risk?

No.

When and where will study be conducted?

At your convenience.

Who will receive the results of the study?

All information relevant to the study will be kept confidential, and will not be available to anyone besides the researcher. Any information presented or published will be grouped with other participants, so that you cannot be identified.

Your signature indicates that you have read the above information and that you accept and freely volunteer to participate in this study.

Subject's signature

Date

Witness

APPENDIX I

Isihloko Socwango

Lolu ucwango olumayelana nezinkinga ngenhloso yokuthola izixazululo zezinkinga eziphathelene nomsenzi wosompilo abasiza ngokubuyisela amathambo nezikhwepha esimeni emva kokulimala noma kuphazanyiswe yizifo lapha Kwa Zulu-Natal.

Inhloso

Inhloso yalolucwango ukuthola izinkinga zamathambo nezikhwepha kanye nezisombululo labosompilo abahlangabezana nazo uma benza lomsebenzi.

Yini kahle eyenziwa kulolucwango?

Uma uvuma ukusizana nalabosompilo, uzocelwa ukuba ugcwalise ifomu elichaza nge imininingwane yomlando wakho wempilo ophathelene nokusebenza lomsebenzi wokulungisa amathambo nezikhwepha.

Ikhona yini ingozi noma ubuhlungu kulolucwango?

Cha akukho ngozi nabuhlungu.

Luzokwenzelwa kuphi, nini lolucwango?

Uzozikhethela wena ukuthi ufisa akwenzele kuphi.

Imiphumela yalolucwango iya kubani?

Yonke imininingwane nolwazi yalolucwango kuyotholwa abacwangingi kube yimfihlo yabo. Izogcinwa kanye neyabanye abafana nawe abavume ukusizana nabacwangingi, ingasenamagama enu abhalwe kuyo. Ukusayina kwakho kukhombisa nje ukuthi ivumile ukulekelela kulolucwango.

Sayina lapha ubhale ne negama nesibongo

Usuku

Ufakazi

APPENDIX J

SURVEY

QUESTIONNAIRE (adapted from Igumbor et al 2003, Cromie et al 2000, and the Nordic questionnaire, 2007)

SECTION A

1. Age: _____ 2. Height: _____ 3. Weight: _____
4. Gender: Female: _____ Male: _____
5. Year of Graduation (Physiotherapy): _____
6. School of Physiotherapy where Qualification Obtained: _____
7. Post Graduate Qualifications: _____
8. Work Status in the last 12 Months: Full-Time: _____ Part-Time: _____
Sessional/Casual/Part-Time/Locum: _____
9. In What Town/City Do You Currently Practice? Town: _____ City: _____
10. Do You Work in the Private Sector: _____ Public Sector: _____ Or Both: _____
11. Please indicate the approximate time in *years*, you have *worked* in each of the following areas:
Tick the area in which you are currently working

General Hospital **		Neurology *	
Cardio Thoracic Unit *		Rehabilitation Unit *	
Paediatric Unit *		Nursing Home Old-Age Facility	
Community Health/Outreach Project		Orthopaedic Unit *	
Private Practice		Sports Physiotherapy	
Spinal Unit *		Other	

** General Hospital refers to a job where you rotate through the different areas eg. Medical, Surgical, Outpatients, ICU/CCU etc. --- * Unit refers to Specialised areas of practice.

12. Please indicate **approximate hours** per week you have performed these modalities in your area of work, in the last 12 months as routine part of your practice of Physiotherapy:

	Manipulation, Mobilisation, Massage	Hydrotherapy	Administration	Chest/ Respiratory Physio
General Hospital				
Cardio Thoracic Unit				
Community Health				
Paediatric Unit				
Private Practice				
Spinal Unit				
Neurology				
Rehabilitation Unit				
Nursing Home Old Age Facility				
Orthopaedic Unit				
Sports Physio				
Other				
	Neurological Rehabilitation	Electro-Therapy	Orthopaedic Rehabilitation	Sports Physio
General Hospital				
Cardio Thoracic Unit				
Paediatric Unit				
Community Health				
Private Practice				
Spinal Unit				
Neurology				
Rehabilitation Unit				
Nursing Home Old Age Facility				
Orthopaedic Unit				
Sports Physio				
Other				

SECTION B

1. Have you ever experienced work-related pain, discomfort or injury in any part of your body?

Yes: _____ No: _____

2. a) Please tick the boxes that describe your work-related pain, discomfort or injury, and indicate (using numbers) what treatment (if any) you sought.

Anatomical Area	Have you had any symptoms in the last 12 months:					
	Ever?	Currently?	Have you had any symptoms of work-related musculoskeletal disorders?	Have these symptoms prevented you from working?	Have these symptoms prevented you from doing normal ADL or leisure activities?	Have you had any treatment by the ffg: Doctor.....(1) Physio.....(2) Other.....(3)
Neck						
Shoulders						
Upperback						
Elbow/Arm						
Lowerback						
Wrist/Hand						
Thumbs						
Hips/Thigh						

b) What type of injury was it? Please describe eg. Muscle strain _____

c) Can you estimate the approximate time of your first injury?

Before training as a physio _____ As a physio student _____
 In the first 5 years after graduating _____ 5 – 10 years after graduating _____
 10 – 15 years after graduating _____ > 15 years after graduating _____
 Don't know _____

d) Was the Onset: Gradual: _____ Sudden: _____ Accident related: _____

3. In what type of setting did the injury occur? Please tick appropriate

Private hospital -- in-patient	
Private – out-patient	
Public hospital – in-patient	
Public – out-patient	
Old Age Home	

4. As a result of this work-related discomfort, which of the following have you done?

Officially reported disorder _____ Lodged a worker's compensation claim _____
 Taken sick leave _____ Continued working with discomfort _____
 See a doctor _____ Other (please specify) _____

5. a) Have you changed the area/speciality in which you practice as a result of work-related pain/discomfort/injury? Yes _____ No _____

b) If the answer is YES to the above question 5. (a) How?

From _____ To _____

c) Did you lose time from work as a result of the injury?

Yes _____ No _____

d) How much time/ approximate number of hours/ days? _____

e) Since your injury, have symptoms been exacerbated by clinical practice?

Yes _____ No _____

f) Have you limited your patient contact time as a result of the injury, pain or discomfort?

Yes _____ No _____

g) Are you considering changing jobs because of this injury or risk of another injury?

Yes _____ No _____

6. Have you ever had training in ways to alter your environment or reduce strain on your body?

Yes _____ No _____

7. a) Which of the following do you use to reduce the strain on your body when working?

Adjustable bed/plinth _____ Sliding Board _____
 Wheelie Stool _____ Patient Lifting Belt _____
 Splint _____ Other (Please Specify) _____
 None of these _____

b) Are physiotherapy assistive devices available to help you?

Yes _____ No _____

c) Is there a physiotherapy assistant or an individual available to help?

Yes _____ No _____

8. The list describes factors that could contribute to work related pain, discomfort or injury. In your opinion, how have the following factors contributed to your work-related pain, discomfort or injury? Please tick the appropriate.

	Major	Moderate	Minor
1. Performing the same task over and over	1	2	3
2. Treating a large number of patients in one day	1	2	3
3. Not enough rest breaks in one day	1	2	3
4. Performing manual orthopaedic techniques	1	2	3
5. Working in awkward or cramped positions	1	2	3
6. Working in the same positions for long periods	1	2	3
7. Bending or twisting your back in an awkward way	1	2	3
8. Reaching or working away from your body	1	2	3
9. Un-anticipated sudden movement or falls of patient	1	2	3
10. Assisting patient during gait activities	1	2	3
11. Lifting or transferring dependent patients	1	2	3
12. Working with confused or agitated patients	1	2	3
13. Carrying, lifting or moving heavy materials	1	2	3
14. Working at or near your physical limits	1	2	3
15. Continuing to work when injured or hurt	1	2	3
16. Work scheduling: (overtime, irregular shifts, length)	1	2	3
17. Inadequate training in injury prevention	1	2	3

9. The responses to the following statements should reflect what you *actually do in practice* rather than what you would like to do or think you should do. Please tick the appropriate.

In order to reduce the strain on my body when working:-	Always	Sometimes	Never
I get someone else to help me handle a heavy patient	1	2	3
I modify patient position/ my position	1	2	3
I use a different part of my body to administer techniques	1	2	3
I warm up and stretch before performing manual techniques	1	2	3
I use electrotherapy instead of manual therapy	1	2	3
I pause regularly so I can stretch and change posture	1	2	3
I adjust plinth or bed height	1	2	3
I select techniques that will not aggravate my discomfort	1	2	3
I use rehabilitation technicians to perform physically stressed tasks	1	2	3
I stop a treatment if it causes or aggravates my discomfort	1	2	3

10. Do you contemplate leaving the physiotherapy profession as a result of work-related musculoskeletal disorders? Yes _____ No _____

11. Do you have any suggestions to help reduce work-related musculoskeletal disorders among physiotherapists

12. Have you any other comments? _____

Thank you for your assistance.