Prevalence and selected risk factors for neck, shoulder and low back pain among primary school teachers in the Central Durban area – a cross-sectional study.

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Title of research as approved by Faculty

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I, Lindy Eggers, do declare that this dissertation is representative of my own work in both conception and execution and that the use of work by others has been duly acknowledged in the text.

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Dedication

I dedicate this thesis to my parents and my husband.

Rupert and Stella Uhlmann and Ralph Eggers, this one is for you!

Thank you for making me the person I am today. Words cannot express how grateful I am to and for you.

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"Along my journey I have learnt that the more thankful I am, the more I have to be thankful for."

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Abstract

Background: Musculoskeletal disorders (MSDs) are a significant and common occupational health concern, consequently impacting work attendance and performance. High prevalence rates of MSDs have been reported amongst school teachers. Studies have linked these higher prevalence rates to typical daily teaching activities including prolonged standing, awkward postures, heavy lifting, bending and repetitive movements.

Objectives: To determine the prevalence of neck, shoulder and low back pain among primary school teachers in the Central Durban area; to identify any risk factors associated with neck, shoulder and low back pain; and to establish the relationship, if any, between the prevalence and risk factors of neck, shoulder and low back pain among primary school teachers.

Methods: This was a quantitative, descriptive and cross-sectional study, conducted in 12 selected public primary schools within the Central Durban area. Volunteers who met the inclusion criteria (n = 97) were invited to complete self-administered questionnaires.

Results: Of the 97 completed questionnaires 83.1 percent (%) reported neck and shoulder pain and 71.0% low back pain. Neck and shoulder pain were significantly associated with a forward-bent head posture (p = 0.001), ethnicity (p = 0.001), and history of a severe trauma/injury (p = 0.006). Similarly, significant associations were noted with regards to medical conditions (p = 0.006), a backward-bent head posture (p = 0.016), lifting of heavy loads (p = 0.045) and treatment for severe injury (p = 0.047). Associations were also noted between low back pain and prolonged standing (p = 0.000), ethnicity (p = 0.008), transportation methods (p = 0.023), medical conditions (p = 0.031) and a history of a severe trauma/injury (p = 0.049).

Conclusion: This is a first South African study, to our knowledge that highlights increased prevalence rates for both neck and shoulder pain and low back pain amongst teachers, with a variety of associated risk factors. This draws attention to the urgent need for intervention programs to be implemented to prevent/reduce the development of musculoskeletal pain amongst teachers.

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Definitions

Focus group – a meeting to allow for discussions to generate data which the researcher might not obtain otherwise, develop and identify possible problems with the data collection tool (Connelly, 2015).

Low back pain – pain localized between the inferior gluteal folds and the 12th rib, experienced with or without leg pain (Krismer and van Tulder, 2007).

Musculoskeletal Disorder(s) - an ache, pain or discomfort in the neck, shoulder, elbows or hands/wrists (Devereux *et al.,* 2002); or impairments of bodily structures of the limbs and back, including muscles, tendons, vessels and cartilage (Ha *et al.,* 2009).

Neck pain – stiffness and/or pain felt dorsally in the cervical region between the occiput, presenting as a headache, upper thoracic region and jaws, and may be associated with pain referred along myotomal patterns (Ferrari and Russell, 2003).

Pain as defined by Nachemson and Jonsson in 2000 (cited by Jensen and Harms-Ringdahl, 2007):

- **Acute**: 0-3 weeks of pain and/or disability
- **Subacute**: 4-12 weeks of disability
- **Chronic**: more than 12 weeks of disability
- **Recurrent**: patients seek help after one month of not seeking care, or being on sick leave after at least 1 month of working

Pilot study – a study conducted to validate the data collection tool, verify that it is well read and understood by the sample group.

Risk factor – "a condition present in the workplace" which may act as a trigger, may be solely responsible for creating a health problem or which may create conditions contributing to the problem (Simoneau *et al.,* 1996).

Work-related musculoskeletal disorder(s) – “symptoms caused by work and characterized by discomfort, impairment, disability or persistent pain in joints, muscles, tendons and other soft tissue, with or without physical manifestations” (Mohammadi, 2013).

Abbreviations

BMI	Body mass index
IREC	Institutional Research and Ethics Committee
(KZN) DoE	(Kwa-Zulu Natal) Department of Education
kg	Kilograms
LBP	Low back pain
m	Metres
min	Minutes
MSD(s)	Musculoskeletal Disorder(s)
n	Sample number (of participants/respondents)
***p*-value**	Measurement of probability, showing statistical significance
WRMSD(s)	Work-related musculoskeletal disorder(s)
%	Percentage

CHAPTER 1

INTRODUCTION

1.1 Background

Musculoskeletal disorders (MSDs) are common occupational health issues linked to inadequate work place support and subsequently affect the quality of life of those affected (Erick and Smith, 2011; Abdulmonem *et al.*, 2014). MSDs become work-related when work conditions and activities significantly contribute to their development (Buckle and Devereux, 2003). The negative impact of MSDs on the quality of life poses a huge economic burden with regards to compensatory costs and wages (Erick and Smith, 2011). Recent epidemiological studies reported significantly greater prevalence rates of MSDs amongst school teachers (Erick and Smith, 2011; Yue *et al.*, 2012). These studies have linked the high prevalence rates to activities such as heavy lifting, awkward postures, bending, twisting or stooping, prolonged sitting or standing and repetitive motions that teachers often engage in while doing their jobs (Yue *et al.*, 2012).

Teachers stand out amongst a group of workers exposed to occupational MSDs due to the inappropriate occupational characteristics they carry out (Cardosa, *et al*., 2009). Studies conducted amongst school teachers in Turkey reported a prevalence rate of 44% - 75% for low back pain, 43% - 48% for neck pain and 29% - 56% for shoulder pain (Yue *et al.*, 2012). These investigators further reported similar prevalence rates for Brazilian and Malaysian studies (41% and 40% for low back pain, respectively).

Previous investigations have suggested a paucity of South African data on the prevalence and functional impact of MSDs (Parker and Jelsma, 2010). To date, there are some occupational MSDs studies conducted in South Africa (Schierhout *et al.*, 1995; van Vuuren *et al.*, 2006; Albert, 2009; Zungu and Ndaba, 2009; Hohls, 2010; Parker and Jelsma, 2010; Desai *et al.*, 2012; Botha *et al.*, 2014) however, limited studies are available on the prevalence and risk factors of MSDs among South African teachers.

1.2 Rationale for and significance of the study

The current combination of infectious and life-style diseases may contribute towards an increase in the incidence of MSD. The spectrum of MSDs in developing countries is similar to that in industrialized countries, but the burden of disease is higher in the developing

countries due to a delay in diagnosis or lack of access to adequate health-care centers for effective treatment (Mody and Brooks, 2012). When compared, it is evident that MSDs in industrialized countries are given a higher priority than in developing countries because of the increased burden of disease in the poorer countries (Sieberhagen *et al.*, 2009).

Many countries such as France (Ha *et al.*, 2009), Sweden (Hultberg *et al.*, 2007) and Korea (Kee *et al.*, 2011) have legislation in place to protect and provide assistance to those with MSDs. The South African Compensation for Occupational Diseases and Injuries Act ensures that persons suffering an occupational accident receive compensation for any injury or disability caused, but that no compensation will be given for any temporary disabilities of three days or less, or those resulting from employee misconduct or non-physical damage such as pain or suffering (Sieberhagen *et al.*, 2009)

There is an increased global urgency to address this burden of MSDs as highlighted by Erick and Smith (2015: 386), who stated that "If preventative control measures are not put into place to curb the burden of MSDs and the progression of symptoms, governments of all countries will likely find themselves battling with more widespread disabilities and increased health costs in the future". Various international systematic studies have highlighted the need to further investigate MSD among teachers (Chong and Chan, 2010; Samad *et al*., 2010; Erick and Smith, 2011; Korkmaz *et al.*, 2011). Louw *et al.* (2007) recommend that further research is necessary to identify low back pain in African countries. Many studies have explored the prevalence and risk factors for MSDs, especially in the workplace, but there are currently no studies on the prevalence and risk factors of MSDs among teachers in South Africa (Parker and Jelsma, 2010). This urgency combined with the paucity of South African data with regards to prevalence of MSD among school teachers has thus prompted the undertaking of this study.

1.3 Aim and objectives

1.3.1 Aim

The aim of this study was to determine the prevalence and risk factors of neck, shoulder and low back pain among primary school teachers in the Central Durban area.

1.3.2 Objectives

The objectives of this study were to:

1) Determine the prevalence of neck, shoulder and low back pain among primary school teachers in the Central Durban area;

2) Identify any risk factors associated with the development of neck, shoulder and low back pain among primary school teachers;

3) Establish the relationship, if any, between the prevalence and risk factors for neck, shoulder and low back pain among primary school teachers.

1.4 Hypothesis

Whilst we hypothesize that musculoskeletal pain is associated with selected risk factors, we assume no association at the start of our research as follows:

- **Null hypothesis 1**: There is no association between the prevalence of low back pain and selected risk factors.
- **Null hypothesis 2**: There is no association between the prevalence of neck and shoulder pain and selected risk factor.

1.5 Potential limitations of the study

Cross-sectional studies measure prevalence and allow the exposure and the outcome to be determined at the same time point for each of the participants (Pandis, 2014). However, this method of obtaining data can lead to selection and information bias, over- and underestimation, as well as the difficulty of separating cause and effect, known as confounding (Pandis, 2014). Furthermore, this study method allows associations to be made, but no inferences of causality can be established (Yue *et al.*, 2012). A cross-sectional study is not able to address latency periods of MSDs, and can lead to long-term disorders being over-sampled and short-term disorders being overlooked (Punnett and Wegman, 2004).

1.6 Outline of chapters

- Chapter One: The topic of the study is introduced, as well as the aims, objectives, rationale and study limitations.
- Chapter Two provides a review of the literature pertinent to this topic in order to facilitate further understanding of the research and the need for the study.
- Chapter Three details the methods and materials that were employed in this study, as well as how the data was statistically analyzed.
- Chapter Four provides the results and interpretation of the data collected.
- Chapter Five provides an interpretation and discussion of the results and how the results compare with those of other studies on wheelchair basketball players and/or the disabled population.
- Chapter Six draws conclusions from the study and provides recommendations for future studies in this field.
- The References provide a list of all the academic sources used for this dissertation.
- The Appendences include all appropriate, additional material used in this study will be provided in this chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition and types of musculoskeletal disorders

Musculoskeletal disorders (MSDs) are common occupational health issues that affect the quality of life (Erick and Smith, 2011). Various inflammatory and degenerative conditions which affect the tendons, muscles, ligaments, peripheral nerves, joints and supporting blood vessels characterize MSDs today (Punnett and Wegman, 2004). Such conditions often result in pain and functional impairment (Buckle and Devereux, 2003). Musculoskeletal symptoms have previously been defined as an ache, pain or discomfort in the neck, shoulder, elbows or hands/wrists (Devereux *et al.*, 2002); and as impairment of bodily structures of the limbs and back, including muscles, tendons, vessels and cartilage (Ha *et al.*, 2009). More recent studies suggest that musculoskeletal symptoms arise from overexerted usage of bones, ligaments and muscles (Abdulmonem *et al.*, 2014).

Pain is often the most reported symptom caused by MSDs (Darwish and Al-Zuhair, 2013). Based on the location of the pain felt, MSDs are classified as tendonitis, tenosynovitis, peripheral nerve entrapment, bursitis, low back pain and sciatica, and neuro-vascular syndromes (Ha *et al.*, 2009). Musculoskeletal pain is described as either acute or chronic and is often work-related (Abdulmonem *et al.*, 2014). Chronic MSDs are known to result in work absenteeism and early retirement thereby posing an economic burden on employers (Abdulmonem *et al.*, 2014). However, chronic MSD develops slowly, taking months or even years before its diagnosis is concluded (Abdulmonem *et al.*, 2014).

In a Finnish mini Health Survey, it was found that 20% of people older than 30 years of age reported MSD as their main source of disability (Cole *et al.*, 2001). Cole *et al.* (2001) further stated that 1 in every 20 Canadian adults with physical disability attributed it to MSD. In South Africa, it is reported that approximately 30 000 people suffer from neck and back pain daily, of which 3 000 cases become chronic (van Vuuren *et al.*, 2006).

2.1.1 Causes of musculoskeletal disorders

Severe regional musculoskeletal pain is multifactorial (Andersen *et al.*, 2007). Musculoskeletal disorders are caused or aggravated by prolonged, repetitive and awkward movements, poor posture and ergonomics, or a fast-paced workload (Farlex, 2012).

Simoneau *et al*. (1996) found that MSDs were as a result of overuse of the body, and appear gradually because of repeated overuse and insufficient recovery time. Earlier reports suggested that an increased exposure to risk factors correspond to an increased incidence of MSDs (Häkkänen *et al.*, 2001). Simoneau *et al*. (1996) defined a risk factor as "a condition present in the workplace" which may act as a trigger, may be solely responsible for creating a health problem or may create conditions contributing to the problem. Therefore, MSDs are usually a result of a combination of risk factors, rather than one factor (Simoneau *et al.*, 1996). The exposure to a risk factor does not necessarily result in a problem; it increases the chances of a problem developing, depending on the intensity, the frequency and the duration of exposure (Simoneau *et al.*, 1996).

Advancing age is accompanied by MSD due to proprioceptive degeneration linked to increased tissue susceptibility to physical workload, which is often intensified when faced with daily occupational risk factors (Cassou *et al.*, 2002). More recent studies have shown that arm pain was predicted by highly repetitive work, lower back pain by heavy lifting and lower limb pain by pulling/pushing heavy weights (Andersen *et al.*, 2007). Significant associations were found between low job satisfaction and neck, shoulder and lower limb pain; low job control and low back pain; and, low social support from colleagues and lower limb pain (Andersen *et al.*, 2007).

2.1.2 Musculoskeletal disorders in the workplace

Musculoskeletal disorders are very common in the working population, often due to low job satisfaction and low work place support (Abdulmonem *et al.*, 2014). According to the World Health Organization (1985), they become work-related when work conditions and activities significantly contribute to the development and exacerbation of MSDs, but are not the only cause (Buckle and Devereux, 2003). Pope *et al*. (1997) found that the prevalence of MSDs was increased in people with occupations that are monotonous, have a high workload with little personal autonomy and are involved with time pressure (Pope *et al.*, 1997). In a study by Durmus *et al*. (2012) it was reported that 85% of adults will be influenced by work-related musculoskeletal pain during their work career. Work-related musculoskeletal disorders (WRMSDs) is defined as "symptoms caused by work and characterized by

discomfort, impairment, disability or persistent pain in joints, muscles, tendons and other soft tissues, with or without physical manifestations" (Mohammadi, 2013: 1350010-1). It can be classified as a heterogeneous group of disorders which include peripheral nerve entrapments, tendonitis, tenosynovitis, muscle and vascular disorders, caused by the work environment and work performance (Roquelaure *et al.*, 2002). Moreover, WRMSDs can lead to morbidity and work disability with the subsequent development of social and occupational burdens due to pain and psychosocial effects (Ha *et al.*, 2009). This consequently affects employees' careers due to irreversible functional after-effects and decreased work capacity (Ha *et al.*, 2009; Abdulmonem *et al.*, 2014). The incidence of WRMSDs have increased in the last 15 years and have become the main cause of disability before the age of 45 years, and the number one cause of health-related work limitation (Ha *et al.*, 2009). Work absenteeism is an inaccurate indication of the effect of WRMSDs as absenteeism can occur for various reasons (Häkkänen *et al.*, 2001).

Musculoskeletal disorders are multifactorial; not everyone who is exposed to risk factors at work develops WRMSDs, and not everyone with MSDs are exposed to work-related risk factors (Punnett and Wegman, 2004). Psychological risk factors for WRMSDs have a greater impact than physical risk factors, although there is not a lot of evidence to support this (Devereux *et al.*, 2002). Physical work risk factors include: application of force, high repetition, vibration and awkward positions due to inadequate work surface, environmental conditions such as insufficient lighting or poorly located material. Psychological risk factors consist of increased work load, low job control, monotonous work, and low coworker and management support (Devereux *et al.*, 2002). The psychological and physical risk factors coexist, and together they increase the risk of WRMSDs (Devereux *et al.*, 2002). Several studies suggest that the length of employment may be directly related to the prevalence of musculoskeletal pain and could be a major risk factor for MSD (Ono *et al.*, 2002; Tsuboi *et al.*, 2002). Low back pain is the most common musculoskeletal problem affecting the working population (Durmus and Ilhanli, 2012).

2.1.3 Work-related musculoskeletal disorders among teachers

Prevalence rates of MSDs are significantly greater amongst school teachers (Erick and Smith, 2011; Durmus and Ilhanli, 2012; Darwish and Al-Zuhair, 2013). These high prevalence rates may be attributed to various factors such as heavy lifting, awkward postures, bending, twisting or stooping, prolonged sitting or standing and repetitive motions (Ariëns *et al.*, 2000; Ono *et al.*, 2002; Chong and Chan, 2010; Durmus and Ilhanli, 2012; Yue *et al.*, 2012). School teachers most frequently complain of neck, shoulder, upper limb and low back pain due to their high work load and improper posture (Abdulmonem *et al.*, 2014). Musculoskeletal pain ranks 6th (shoulder pain), 7th (neck pain) and 10th (low back pain) amongst school teachers' health complaints (Abdulmonem *et al.*, 2014).

The following risk factors were found to be associated with MSDs among school teachers: Vitamin D deficiency, concomitant chronic illness, anxiety and bad moods, level of teaching, marital status and body mass index (Abdulmonem *et al.*, 2014). No significant relationship was found between MSDs and number of teaching hours, teaching sessions, age and the duration of teaching, which contrasts with findings from other studies (Abdulmonem *et al.*, 2014). In a study conducted on secondary school teachers, correlations were found between MSDs and age, MSDs and teaching years and MSDs and obesity (Darwish and Al-Zuhair, 2013).

Teachers are a part of an occupational group at risk of long-term sickness absence due to their specific work demands (requirements set by the work environment) and characteristics (Aas *et al.*, 2009). These include teaching, parent-teacher meetings, lesson planning, computer and office work, student evaluations, facilitating play and counselling (Aas *et al.*, 2009), all of which can lead to adverse mental and physical health effects (Darwish and Al-Zuhair, 2013). A study conducted in Scotland found that MSDs were the second most common cause of ill-health retirement in teachers (Hobson, 2001 as cited by Maguire and O'Connell, 2007). Erick and Smith (2015: 386) stated that "If little or nothing is done to reduce the prevalence of this crucial workplace problem, MSDs may potentially lead to reduced teachers performance, increased sick leave, ill-health, early retirement and increased health care costs."

To our knowledge, there is a paucity of South African data with regards to prevalence of MSD among school teachers (Korkmaz *et al.*, 2011). The current combination of infectious and life-style diseases may contribute towards increasing the incidence of MSD. Although the teaching population has access to medical schemes, some may be faced with limited access to comprehensive plans based on individual budgetary constraints. These constraints may limit the extent and level of medical treatment obtained for MSD. There is a lack of legislation in South Africa to support workers suffering from low back pain to make sure that they receive appropriate treatment, rehabilitation and support (Louw *et al.*, 2007). In more developed countries, legislation is often in place to protect and help workers suffering from low back pain (Edlich *et al.*, 2005; Hudson, 2005).

2.1.4 The impact of musculoskeletal disorders

Musculoskeletal disorders negatively affect the economy due to the associated costs, arising from the subsequent disability and long-term pain (Ariëns *et al.*, 2000; Erick and Smith, 2011). MSDs have a significant socio-economic impact, especially with the direct (medical care, compensation) and indirect costs (sick leave, loss of production, replacement costs) that they cause (Simoneau *et al.*, 1996). The compensation costs of low back pain in South Africa were the equivalent of 20 million US dollars in 2000 (van Vuuren *et al.*, 2006).

Regional musculoskeletal pain is a common element of working life, and will not be resolved anytime soon (Andersen *et al.*, 2007). Ha *et al.* (2009: 471) stated: “Upper extremity MSD and low back pain (LBP) will be an increasing problem in the years to come due to the predictable combined effect of ageing of the working population and the intensification of work.”

In developing countries, non-communicable (e.g. cardiovascular diseases, respiratory diseases, malignancies) and communicable (HIV, tuberculosis, malaria) diseases are a bigger and more important focus for public health initiatives than more common diseases (e.g. MSDs), as they are the leading contributors to morbidity (Mody and Brooks, 2012). Therefore, less attention is given to the common diseases, even though they make a big contribution to the burden of disability and disease (Mody and Brooks, 2012). The spectrum

of MSDs in developing countries are similar to that in industrialized countries, but the burden of disease is higher in those countries due to a delay in diagnosis or lack of access to adequate health-care centers for effective treatment (Mody and Brooks, 2012).

There is a global shortage of health care workers which poses a major health challenge, as over a billion people lack access to quality health care services (Mody and Brooks, 2012). The World Health Organization estimated that there was a shortage of approximately 4.3 million health care workers in the decade 2007-2017 (Mody and Brooks, 2012). This situation is unlikely to change in the near future based on the current training of health care workers and the traditional models of care for service delivery which are in place (Mody and Brooks, 2012). There is a need to raise awareness for MSDs among the entire population, so that the urgently required prevention strategies can be utilized (Mody and Brooks, 2012). In many countries, it has been considered a priority to come up with prevention strategies for MSDs (Mohammadi, 2013). In addition, further research is necessary to identify low back pain in African countries (Louw *et al.*, 2007). Other studies emphasize the need to study workload stress factors in order to develop preventive and interventional actions (Ono *et al.*, 2002; Yue *et al.*, 2012). Erick and Smith (2015: 386) stated: "If preventative control measures are not put into place to curb the burden of MSDs and the progression of symptoms, governments of all countries will likely find themselves battling with more widespread disabilities and increased health costs in the future."

2.2 Low back pain

In developed countries, low back pain (LBP) is identified as the most common MSD with consequent disability (Woolf and Pfleger, 2003). It counts for half of the total MSDs (Kim and Nakata, 2014). Low back pain is defined as chronic or recurrent and is a leading cause of absenteeism (Meade *et al.*, 1990). Low back pain is one of the most common health concerns in industrialized countries, and is often associated with incapacity, loss of productivity due to sick leave and high costs to society, despite its benign nature and favorable course (Waddell and Burton, 2000; Staal *et al.*, 2003). It is a very common, costly cause of illness (Manga *et al.*, 1993) and is the leading cause of disability and morbidity in the middle-aged generation and the most expensive source of workers' compensation costs

(Guzmán *et al.*, 2001). Croft *et al*. (1998: 1359) stated that LBP "should be seen as a chronic problem with an untidy pattern of grumbling symptoms and periods of relative freedom from pain and disability interspersed with acute episodes, exacerbations and recurrences." Low back pain has often been described as being chronic, which in itself has various definitions: pain lasting longer than 7-12 weeks; pain lasting longer than the expected time of healing; back pain that reoccurs frequently (Andersson, 1999).

Previous American studies have shown that back pain is the most common cause of limited activity in younger people (less than 45 years of age), the second most common reason for visits to the physician, third most common cause of back surgery and the fifth-ranked cause of hospital admissions (Andersson, 1999).

Although LBP affects all age groups, it has little impact on the adolescent age group in comparison to the adult age group (Balagué *et al.*, 2012). There is strong evidence to suggest that older people (> 50 years) with LBP will have more severe and persisting symptoms, radiating leg pain, symptoms which have a greater impact on work and activity, respond slower/are more resistant to treatment and are at a greater risk of long-term disability (Waddell and Burton, 2000).

2.2.1 Causes of low back pain

LBP can be due to specific or non-specific causes, with 85% of patients presenting to primary health care practitioners with non-specific LBP (Chou *et al.*, 2007; Balagué *et al.*, 2012). The most common reasons are musculo-ligamentous injuries; degenerative changes in the intervertebral discs and facet joints; nucleus pulposis herniation leading to irritation of the nerve roots; spinal stenosis; anatomical anomalies such as scoliosis; spondylolisthesis; systemic diseases such as cancer, infection, ankylosing spondylitis; visceral diseases unrelated to the spine, including pelvic organs, kidneys, gastrointestinal tract and the aorta (Deyo *et al.*, 1992). Evidence suggests that screening for red flags is important to rule out serious causes of LBP (Waddell and Burton, 2000). Chou *et al*. (2007) list the following specific causes of LBP and their proportion in the MSD diagnostic category as being cancer

(0.7%), compression fractures (4%), spinal infection (0.01%), ankylosing spondylitis (0.3% - 5%), spinal stenosis (3%), herniated disc (4%), cauda equine syndrome (0.04%).

The cause of first time onset of LBP is considered to be obscure as most studies have not found many strong risk factors (Balagué *et al.*, 2012). The most common risk factor for reoccurrence of LBP and developing chronicity is a history of LBP (Croft *et al.*, 1998; Waddell and Burton, 2000; Pengel *et al.*, 2003; Balagué *et al.*, 2012), the frequency and duration of LBP attacks, time since last LBP attack, radiating leg pain, previous surgery and sickness due to LBP (Waddell and Burton, 2000).

There is strong evidence that psychosocial risk factors (individual or work-related) influence the onset of LBP, the severity and persistence of symptoms and the response to treatment and rehabilitation (Waddell and Burton, 2000). Psychosocial risk factors for LBP include low job satisfaction and distress (Waddell and Burton, 2000; Pengel *et al.*, 2003), anxiety, depression, stressful responsibility, job dissatisfaction, somatization symptoms, mental stress at work, negative body image, ego functioning weakness, low level of education, poor drive satisfaction, lack of social confidence, inadequate income and the person's psychological frame of mind (Andersson, 1999; Abdulmonem *et al.*, 2014).

Physical risk factors also play a role in the onset of LBP: manual handling of materials, bending, twisting, body vibration (Waddell and Burton, 2000), lifting (Waddell and Burton, 2000; Andersen *et al.*, 2007; Abdulmonem *et al.*, 2014), prolonged sitting and improper posture (Abdulmonem *et al.*, 2014).

Advancing age is known to possibly cause LBP due to its effect on degeneration within the body structures (Croft *et al.*, 1998; Andersson, 1999; Abdulmonem *et al.*, 2014). Other risk factors found to be associated with LBP include obesity (Balagué *et al.*, 2012; Abdulmonem *et al.*, 2014), location of symptoms (Andersson, 1999; Abdulmonem *et al.*, 2014), gender, smoking and lack of physical activity (Abdulmonem *et al.*, 2014).

The Bradford-Hill criterion assesses the strength, consistency, specificity, temporality, biological gradient, plausibility and coherence considering an association before deciding if it is a causation (Hill, 1965). Several systematic reviews conducted using the Bradfield-Hill

causation criteria have concluded that it was unlikely that the following factors independently caused LBP in the working population studied: occupational sitting (Roffey *et al.,* 2010b), awkward postures (Roffey *et al.,* 2010a), standing or walking (Roffey *et al.,* 2010c), manual handling or assisting of patients (Roffey *et al*., 2010e), pushing or pulling (Roffey *et al.,* 2010d), bending or twisting (Wai *et al*., 2010), lifting (Wai *et al*., 2010) or carrying (Wai *et al*., 2010; Balagué *et al.*, 2012).

2.2.2 Incidence and prevalence of low back pain

Acute LBP is the most common reason for consulting a primary care physician and the direct (medical care) and indirect costs (absenteeism) of LBP are immense (Malmivaara *et al.*, 1995; Chou *et al.*, 2007). There is a higher report of LBP from patients with heavy manual jobs, although patients with lighter manual jobs report similar symptoms (Waddell and Burton, 2000). Most reported work-related low back injuries are actually due to everyday activities such as lifting and bending, usually with minimal/no evidence of tissue damage, leading to inconsistent results between work-related risk factors and the incidence of LBP (Waddell and Burton, 2000).

Low back pain is more common in females than in males, and in white people than black people (Andersson, 1999). Males have the highest risk of reoccurrence, followed by age (25-45 years) and then by occupation (Andersson, 1999). There are numerous definitions of LBP, which may contribute to the fluctuating prevalence rates. In their study Balagué *et al.* (2012) found that LBP requiring sick leave had a prevalence of 8% and LBP lasting at least a day had a prevalence rate of 45%. Deyo *et al*. (1992) reported that 70% of people have LBP at some time; while 14% have it for more than 2 weeks. Balague *et al*. (2012) reported the lifetime prevalence of LBP to be 84%, with chronic LBP having a prevalence of 23%, disabling 11% - 12% of the population.

Low back pain had the highest incidence in musculoskeletal pain amongst teachers, due to the fact that school teachers spend so much time standing while teaching (Abdulmonem *et al.*, 2014). Low back pain occurs in 40% - 70% of school teachers (Abdulmonem *et al.*, 2014). In a recent study, Turkish school teachers showed a prevalence rate of 44% - 75% for LBP,

while teachers in Brazil and Malaysia showed rates of 41% and 40% respectively (Yue *et al.*, 2012).

2.2.3 Treatment

Low back pain can occur due to a variety of different causes and factors, making it challenging and resistant to treatment (Guzmán *et al.*, 2001). A multidisciplinary approach therefore needs to be taken to treat LBP. This multidisciplinary treatment is known as the biopsychosocial model, which addresses the physical, the psychological and the occupational/social factors involved with LBP (Guzmán *et al.*, 2001). Guzman *et al*. (2001) stated that "intensified (more than 100 hours of therapy), multidisciplinary biopsychosocial rehabilitation with functional restoration will lead to greater improvements in pain and function for disabling LBP than less intensive multidisciplinary or non-disciplinary rehabilitation or usual care."

The treatment options for patients differ depending on their occupation, age, health status etc. (Malmivaara *et al.*, 1995). There is no evidence to suggest that one treatment option is more favourable than the other, but that the treatment plan should be dependent on the patient and the pain (Meade *et al.*, 1990).

Patients with acute LBP who continue with ordinary activities within limits permitted by the pain tend to recover more rapidly than those who are treated with back rest or back-mobilizing exercises, which are considered standard treatment options for patients with acute LBP (Malmivaara *et al.*, 1995). There is general agreement that LBP is a self-limiting condition and patients with LBP are advised and encouraged to remain at work or return to work early (gradually), with modified activities (Staal *et al.*, 2003). Most people with acute LBP recover quickly if the LBP is self-limiting and not related to serious disease, while only 10% - 15% develop chronic symptoms (Balagué *et al.*, 2012).

Treatment in the subacute stage (approximately 4-12 weeks) of LBP has a greater chance of preventing the condition from becoming disabling and severe, than treatment of chronic LBP, which at that stage is already disabling and severe (Waddell and Burton, 2000). Treatment in the subacute stage also has positive effects on occupational factors, making it

more cost-effective (Waddell and Burton, 2000). It is therefore suggested that patients get back to work before their condition becomes disabling and sickness absence greater (Waddell and Burton, 2000). Evidence from a systematic review found that patients with LBP do not need to wait to be completely pain free before returning to or continuing with work; the longer the patient with LBP is away from work, the greater the probability of long-term sickness, the less successful any treatment and the more disabling the condition becomes (Waddell and Burton, 2000).

In Ontario, management of LBP includes physicians and chiropractors (which are only partially covered under medical aid insurance in Canada), with physiotherapy playing a significant role (Manga *et al.*, 1993). A systematic review conducted by Waddell and Burton (2000) found strong evidence indicating that lumbar belts or supports do not reduce work-related LBP and work loss.

Family doctors commonly seem to prescribe bed rest and sick leave as treatment interventions for patients with LBP, rather than physical activity (Balagué *et al.*, 2012). Systematic review findings show that only physical activity interventions proved to be effective for the prevention of LBP, while ineffective interventions included: shoe insoles, stress management, ergonomics, back supports, back education and reduced lifting programs (Balagué *et al.*, 2012).

There is strong evidence suggesting that advice to LBP patients to continue with work despite their pain can have a better effect on the LBP symptoms than 'traditional' medicinal treatment, thereby leading to faster relief of symptoms, shorter periods of work loss and fewer recurrences (Waddell and Burton, 2000). This can be achieved through education interventions to decrease and overcome fear avoidance behavior and to encourage patients to take responsibility for their own health (Waddell and Burton, 2000). Occupational health management's goals should be supporting the LBP patient, helping him/her remain at work or helping him/her to return to work as soon as possible and deal with any occupational obstacles which may prevent these goals from being achieved (Waddell and Burton, 2000). In some countries there are guidelines for the occupational environment to improve the management of LBP (Staal *et al.*, 2003).

2.3 Neck and shoulder pain

Neck pain is the second most common MSD after low back pain (Ferrari and Russell, 2003). It counts for a fifth of the total of MSDs (Kim and Nakata, 2014). Neck pain has been defined as stiffness and/or pain felt dorsally in the cervical region between the occipital condyles and the C7 vertebra, accompanied by pain in the occiput (presenting as a headache), upper thoracic region and jaws, and may be associated with pain referred along myotomal patterns (Ferrari and Russell, 2003). Nachemson and Jonsson (2000) defined neck pain by the duration of the pain: acute (0-3 weeks of pain and/or disability), subacute (4-12 weeks of disability), chronic (more than 12 weeks of disability) or recurrent (patients seeks help after one month of not seeking care or being on sick leave after at least one month of working) (as cited by Jensen and Harms-Ringdahl, 2007). The cervical region is known to be a site of referred pain from cardiac, gastric and diaphragmatic disease processes (Ferrari and Russell, 2003). A study by Ferrari and Russell (2003) revealed that 95% of all neck pain diagnoses are benign in nature, for example, neck sprain, mechanical neck pain, muscular neck pain, myofascial pain syndromes or postural neck pain. They further found that 80% of all acute neck pain resolved within days to weeks (Ferrari and Russell, 2003).

Musculoskeletal problems of the shoulder are common among the general population (Pope *et al.*, 1997). Shoulder problems are usually short-term and not debilitating (Pope *et al.*, 1997). The pathogenesis and etiology of shoulder pain remains unknown, due to the complexity of the anatomy and functional structures of the shoulder, making it difficult to find the cause of pain, and nearly impossible to classify it (van der Windt *et al.*, 1995).

'Neck and shoulder pain' is a very broad term used to describe a variety of diagnoses associated with muscles, nerves, ligaments, tendons and joints, making it very difficult to distinguish between the two (Cassou *et al.*, 2002). Neck and shoulder pain often have linked risk factors, making them closely related (Andersen *et al.*, 2003).

Neck pain is an economic and health burden, a frequent source of disability and work absenteeism, and has high costs in terms of insurance and litigation (Ferrari and Russell, 2003; Fejer *et al.*, 2006). Buckle and Devereux (2003) estimate that approximately 5.4

million working days have been lost due to work absenteeism because of work-related neck and upper limb disorders.

2.3.1 Causes of neck and shoulder pain

Neck pain is considered to be multifactorial and multidimensional (Ariëns *et al.*, 2001; Cassou *et al.*, 2002; Andersen *et al.*, 2003). A study by Jenson and Harms-Ringdahl (2007) found neck pain to be multifactorial due to the relationships they discovered between neck pain and high repetitiveness, neck pain and high force, neck pain and high repetitiveness and high force, neck pain and high job demands, neck pain and injury of neck/shoulder, neck pain and the female gender, and neck pain and low pressure pain threshold. They further found the following physical risk factors for neck pain: a) heavy physical workload, bent/twisted body posture, low work satisfaction and increased risk for short- and long-term sick leave; b) specific back diagnosis and previous work absenteeism due to back disorders, increasing the risk of sick leave; c) self-reported pain and activity limitations associated with high risk for long-term absenteeism; and d) female gender and increased age resulting in an increased risk for disability pension (Jensen and Harms-Ringdahl, 2007).

Smedley *et al.* (2003) stated that a history of neck and shoulder pain was a greater risk for onset of neck/shoulder pain than any physical activity, and that activities such as pulling and pushing with outstretched arms/shoulders was the greatest physical risk factor. Repetitive manual tasks, such as neck flexion of more than 20 degrees, sitting, quantitative job demands and low coworker support are risk factors for neck pain (Andersen *et al.*, 2003). Increased repetition leads to a decreased percentage of recovery time and an increased percentage of flexed-neck posture (Andersen *et al.*, 2003).

An earlier study found associations between neck pain and duration of sitting, and twisting and bending the trunk (Ferrari and Russell, 2003).

The prevalence of musculoskeletal disorders increases with advancing age (Cassou *et al.*, 2002). There is some controversy though: advancing age causes degeneration which can lead to musculoskeletal disorders (Cassou *et al.*, 2002). Therefore, is the neck pain due to

the risk factors or due to age? An earlier study by Chiu *et al.* (2006) found that neck pain had highest prevalence in the age group of 46-50 years of age.

Several literature reviews have been conducted to establish the risk factors for neck pain, concluding that the main physical risk factors for neck pain are static postures and repetitive movements of the neck (neck flexion), static and repetitive or forceful movements of the arm, and a sitting posture at work (Ariëns *et al.*, 2000; Ariëns *et al.*, 2001). A study by Chui and Lam (2007) revealed that 84% - 85% of neck pain experienced was from a head down posture and computer work. No relationship was found between neck rotation and neck pain in the work place (Ariëns *et al.*, 2001). Prevention of neck pain can be addressed by reducing the time spent in a sitting position (Ariëns *et al.*, 2001).

A painful or stiff shoulder may be due to a number of reasons: neurological or vascular conditions, neoplasms, extrinsic causes such as referred pain from internal organs and disorders of the cervical spine and more commonly, intrinsic causes such as articular or peri-articular rheumatic conditions (van der Windt *et al.*, 1995). Shoulder pain can also be due physical work with heavy loads, awkward postures, mental stress and obesity (Miranda *et al.*, 2001).

Relationships have been found between shoulder pain and shoulder injuries, twisting of the trunk, hand-above-shoulder work, mental stress and sport such as volleyball and swimming, due to the excessive use of the arm and shoulder (Miranda *et al.*, 2001). Age is a big risk factor for shoulder pain, due to the increase in degeneration of the tendons and due to osteoarthritis in the joints (Miranda *et al.*, 2001). Obesity/increased BMI is another big risk factor as it leads to osteoarthritis, resulting in shoulder pain (Miranda *et al.*, 2001).

A causal relationship was found between mechanical factors, such as work load, posture and repetitive movements, and shoulder pain of new onset (Harkness *et al.*, 2003). The onset of pain in the neck/shoulder region can be caused by increased stress levels and physical work with heavy loads, awkward postures, mental stress and psychosocial workplace factors (Cassou *et al.*, 2002; Andersen *et al.*, 2003). Shoulder/arm pain is most often related to repetitive movements (Andersen *et al.*, 2007). A flexed trunk leads to increased risk of shoulder pain (Miranda *et al.*, 2001). Pope *et al*. (1997) found that physical

risk factors such as working with arms at or above shoulder level, heavy work, insufficient rest breaks and repetitive movements of the arm were strongly related to the development of shoulder pain.

An earlier study by Harkness, *et al*. (2003) found that cohort studies produced inconsistent results of risk factors for shoulder pain, due to biases, changing of work force, over- or underestimation and the different types of studies; concluding that ergonomic interventions and rehabilitation programs are needed for the prevention of MSD.

2.3.2 Incidence and Prevalence of neck and shoulder pain

Neck pain occurs in at least 80% of the population at some time, with approximately 10% of the population complaining of neck pain for at least 7 days per month at any given time (Ferrari and Russell, 2003). The one year prevalence of neck pain in the general population was found to be as high as 40% (Ariëns *et al.*, 2001). A study conducted amongst European and North American adult populations reports a neck pain prevalence rate of approximately 30% (Chiu and Lam, 2007). In a study conducted by Fejer *et al*. (2006) neck pain point prevalence for the adult population ranged from 5.9% to 22.2%, with a mean prevalence of 7.8%; a one-year prevalence ranging from 16.7% to 75.1%, with a mean prevalence of 37.2%; and a lifetime prevalence between 14.2% and 71%, with an average of 48.5%. Average neck pain prevalence estimates increase with longer prevalence periods (Fejer *et al.*, 2006). Neck pain is most common among females (Kjellman *et al.*, 1999; Ariëns *et al.*, 2001; Fejer *et al.*, 2006), which may be due to the specific work tasks of females: static loads on neck musculature, high repetitiveness, low control and increased mental demands (Larsson *et al.*, 2007).

The prevalence of neck pain in an occupational setting was found to be between 6% and 76% (Ariëns *et al.*, 2001), dependent on the occupation (Larsson *et al.*, 2007). A higher prevalence was found among computer users (Larsson *et al.*, 2007). The teaching profession is one in which a high prevalence of neck pain has been found (Iqbal *et al.*, 2013). Neck pain was reported to occur in 48.7% of school teachers (Abdulmonem *et al.*, 2014). The prevalence of neck pain upon becoming a teacher was estimated to be 32%, being more prevalent in teachers with 0-5 years of teaching experience (Chiu and Lam, 2007). In a study

by Chiu *et al.* (2006) the prevalence of neck pain among secondary school teachers was found to be 68.2%, with a one-year prevalence of 64.4% and the prevalence of 56.8% since becoming a teacher. These investigators further found that neck pain had a higher prevalence among females, and in the age group of 46-50 years of age (Chiu *et al.*, 2006).

Shoulder pain is a frequent problem in primary health care (van der Windt *et al.*, 1995), with a prevalence of between 6% and 25% in the general population (Miranda *et al.*, 2001), 6% - 11% in people less than 50 years of age and 16% - 25% in people above the age of 50 years (van der Windt *et al.*, 2000). Upper limb pain in France was six times higher in 1994 than in 1985, resulting in an increase in disability and time off work (Cassou *et al.*, 2002). It is most common in females and in the 5^{th} to 7^{th} decades of life (van der Windt *et al.*, 1995). Shoulder pain has been found to have a higher prevalence rate among occupational groups when compared to the general population (Pope *et al.*, 1997).

2.3.3 Treatment

In a study conducted among the general population regarding the outcome of acute neck pain, an estimation was made that at least 80% of all acute neck pain resolves within days to weeks (Ferrari and Russell, 2003). Only 25% of patients with neck pain seek health care (Ferrari and Russell, 2003). The pathology and etiology of neck pain is unclear; therefore the treatment plan is based on the symptomatic signs (Kjellman *et al.*, 1999). There is usually a multidisciplinary approach to the treatment of neck pain (Ferrari and Russell, 2003). An earlier study by Ferrari and Russell (2003) found that rest, as a treatment for neck pain was ineffective. In America, neck pain is the second most common reason for visits to the chiropractor (Hurwitz *et al.*, 2009).

Exercise as part of a treatment plan for neck pain has been shown to have positive results, although it is unknown whether this is because passive therapy is harmful or exercise is effective (Ferrari and Russell, 2003). Sport is seen as a protective factor for neck and shoulder pain (Cassou *et al.*, 2002).

Shoulder pain is usually self-limiting (less than 3 months), and treated in primary health care if necessary (van der Windt *et al.*, 1995). In a case where the condition is not self-limiting or

resolved, it can lead to persistent pain or a limited range of motion, which may last for several years (van der Windt *et al.*, 1995).

In a study by Miranda *et al.* (2001) physical exercise had more protective than impairing effects on shoulders, especially jogging and cross-country, due to the upper arms swinging back and forth repeatedly below the horizontal level, causing a pendulum movement, leading to increased blood circulation without exposing the joint/tendon to heavy external loads (Miranda *et al.*, 2001).

2.4 Summary

Various systematic studies have highlighted the need to further investigate MSD among teachers (Chong and Chan, 2010; Samad *et al.*, 2010; Erick and Smith, 2011; Korkmaz *et al.*, 2011). To date, several studies have been conducted on MSD in different occupations (Bork *et al.*, 1996; Skov *et al.*, 1996; Kaergaard and Andersen, 2000; Walker-Bone and Palmer, 2002; Alexopoulous, Stathi and Charizani, 2004), but to our knowledge, no studies have been conducted on primary school teachers. This study therefore aims to determine the prevalence and risk factors of neck, shoulder and low back pain among primary school teachers in the Central Durban area to broaden knowledge in this field.

CHAPTER 3

METHODOLOGY

3.1 Study design

This was a quantitative, descriptive, cross-sectional study that was conducted in selected public schools within the Central Durban area. Descriptive, cross-sectional studies are identified as the preferred study design in prevalence studies.

3.2 Sampling

3.2.1 Study population

The study population consisted of primary school teachers from selected public schools within the Central Durban area, as determined by the Kwa-Zulu Natal Department of Education. The Central Durban area is one circuit, part of the Umlazi educational district and consists of the following wards within the circuit: City, Mayville, Port Natal and Umngeni North (KwaZulu Natal Department of Education 2012).

3.2.2 Sample size and recruitment

A list of all primary schools was obtained from the KwaZulu-Natal Department of Education (DoE). This list was then revised to include only schools from the public domain. The sample number of 95 completed questionnaires, as determined by the biostatistician, was required to make this study viable. Schools were chosen by a process of random selection using Microsoft Excel.

Each teacher in the selected schools was given the opportunity to participate in this study, dependent on whether they fit the stringent inclusion and exclusion criteria as outlined below. A letter of information and informed consent was given to the teachers of the selected schools (Appendix H).

3.2.3 Inclusion criteria

- Participants must have been teaching full-time for 2 or more years.
- Participants between the ages of 25-65 years of age.
- Completion of informed consent.

3.2.4 Exclusion criteria

- Focus group and pilot study participants.
- Participants below 25 years and over the age of 65 years.
- Substitute teachers.
- Part-time teachers.
- Student teachers.

3.3 Methods

3.3.1 Focus group discussion

A focus group was conducted to test the validity and the reliability of the research procedure and data measurement tool. Connelly (2015) stated that focus group discussions allowed for dialogues to generate data which the researcher would be unable to otherwise obtain; it develops and identifies possible problems with the data collection tool.

The focus group consisted of 10 members:

- The researcher.
- The research co-supervisor.
- One qualified chiropractor practicing in the Central Durban area.
- One qualified chiropractor practicing in the Central Durban area, who used to be a teacher.
- One chiropractic lecturer/clinician.
- One current chiropractic student in the process of doing a questionnaire-based study.
- One current student who operated the voice recording.
- Two current primary school teachers.
- One biokineticist (Central Durban area).

Each focus group participant had to sign a code of conduct and confidentiality agreement (Appendix D), was given a letter of information (Appendix E) and a copy of the draft questionnaire (Appendix F). The researcher gave a brief introduction to the study and to the

purpose of the focus group. The participants then completed the questionnaires after which each question was discussed sequentially and individually and suggestions were given by the participants. The researcher and co-supervisor were present to answer any questions. The whole procedure was voice-recorded and saved for future reference. The data from the focus group will be stored in a locked unit at DUT for 5 years as per DUT requirements and thereafter destroyed as per arrangements made by the researcher and the university.

3.3.2 Ethical approval

Following the focus group, partial ethical approval was granted, subject to the completion of a pilot study to validate the data collection tool.

3.3.3 Permission to conduct research from KwaZulu-Natal Department of Education

Following partial ethical approval, permission to conduct research within schools was obtained from the KwaZulu-Natal Department of Education (KZN DOE) (Appendix C).

3.3.4 Pilot study

A pilot study was conducted to validate the questionnaire so that it would read well and be understood by the primary school teachers (Appendix E).

Two schools were approached to participate in the pilot study. After permission from the relevant principals, 12-16 primary school teachers were handed a letter of information, informed consent and a questionnaire and asked to complete it. The researcher then worked through each of the questionnaires, addressed any problems and formed the final questionnaire (Appendix I).

3.3.5 Main research study

Following completion of the pilot study, full ethical approval was granted by the Institutional Research Ethics Committee (Appendix A) and data collection could begin. Schools were chosen by a process of random selection using Microsoft Excel from all the schools in the Central Durban area on the list from the KZN DOE.

The researcher obtained permission from the relevant principals of the selected schools, by means of a letter of information and consent (Appendix G*)*. The research procedure was briefly explained to the teachers, and those who fulfilled the inclusion and exclusion criteria and were willing to participate, were then handed a letter of information and informed consent (Appendix H) and a copy of the questionnaire (Appendix I). The researcher allowed the teachers 1-2 weeks to complete the questionnaires, thereby ensuring that participation in the study had no interference with teaching, and then collected the informed consent forms and questionnaires at a suitable time, as discussed with the relevant principals. The informed consent forms and questionnaires were collected separately to ensure confidentiality of the participants.

The completed questionnaires were then electronically captured, statistically analyzed and subsequently reported on.

3.4 Ethical considerations

- Institutional ethical clearance was obtained prior to onset of the research procedure.
- Each teacher received a letter of information outlining to them a summary of the intended study, and assuring them of the voluntary nature of their participation, and of confidentiality.
- A letter of consent was signed.
- Letters of permission were obtained from the KZN DoE and from the principals of the selected schools.
- This research procedure did not cause interference to the scholars, as the questionnaires were completed outside of teaching time, and the initial information given during the school's staff meeting or during a break.
- Confidentiality was ensured through separate collection of both letters of informed consent and questionnaires in specified boxes.
- The data was stored in a locked unit at the Department of Chiropractic, Durban University of Technology, for five years. The information obtained will be available in the form of a dissertation at the Durban University of Technology.

3.5 Data collection measurement tool

A self-administered questionnaire (Appendix I*)* was used to conduct this study. The questionnaire was constructed and adapted from the Dutch Musculoskeletal Questionnaire (Hildebrandt *et al*., 2001), critiqued by both an expert and a pilot group. The Dutch Musculoskeletal Questionnaire was validated using available reviews of the epidemiological literature, which identified various potentially harmful postures, force-exertions, movements and hazardous working conditions (Hildebrandt *et al*., 2001). Further, to this, the focus group discussion as well as the pilot study further informed the development/modifications of the study questionnaire. Risk factors used in the study were selected from the Dutch Musculoskeletal Questionnaire (Hildebrandt *et al*., 2001), based on those which specifically related to school teachers.

The questionnaire consisted of four pages and took approximately 15-20 minutes to complete. Completion of the questionnaire resulted in gathering of the following data:

- Demographic profiles.
- Teaching history.
- Neck and shoulder pain (with possible associated risk factors).
- Low back pain (with possible associated risk factors).

3.6 Statistical analysis

Data was analyzed using IBM SPSS version 21. A p value < 0.05 was considered as statistically significant. Descriptive analysis was performed to present all categorical variables using frequency tables and bar charts. Associations between risk factors and MSD were assessed using bivariate analyses (chi square and t–tests), where appropriate. In order to control for confounding, multivariate logistic regression models were constructed to assess the independent associations. Odds ratios and 95% confidence intervals were reported, where appropriate.

3.7 Summary

A quantitative, descriptive, cross-sectional study involving the sampling of primary school teachers in public schools in the Central Durban area was conducted, using a self-administered questionnaire to gather information that provided the prevalence and selected risk factors for neck, shoulder and low back pain. The study design, sampling, focus group, pilot study and main research study procedures, as well as the ethical considerations; data collection measurement tool and statistical analysis have been presented and discussed.

CHAPTER 4

RESULTS

A total of 177 questionnaires were distributed among 12 public primary schools in the Central Durban area. Of the 177 questionnaires distributed, 106 were completed and returned. Nine questionnaires were excluded since two did not meet the inclusion criteria and seven failed to complete the informed consent form. The final sample number for this study was thus 97 (n = 97). This was above the minimum requirement of 95 questionnaires, as determined by the biostatistician Mrs Tonya Esterhuizen via email communication on the 1 May 2014. A final response rate of 54.8% was achieved.

4.1 Demographic data

The gender distribution of the final sample was 13.3% males and 86.7% females, whilst the ethnic distribution was 60.0%, Indians, 8.4% Whites, 12.6% Blacks and 18.9% Coloureds (**Table 4.1**). With regards to age, 47.8% of the total sample was in the 45-54 year age group and 13.3% were in the 55-65 year age group.

Table 4.1: General characteristics of participants

Demographic variable	Subcategory	Number (n)	Percentage (%)
Gender	Male	12	13.3
	Female	78	86.7
Ethnicity	White	8	8.4
	Black	12	12.6
	Indian	57	60.0
	Coloured	18	18.9
Age	25-34 years	16	17.8
	35-44 years	19	21.1
	45-54 years	43	47.8
	55-65 years	12	13.3

Data categorized by weight and height revealed 50.7% of the total sample to be within a range of 1.6 and 1.79 meters and 47.7% within the 50-69 kilograms (kg) category. The Body Mass Index (BMI), a predictor of weight status, was calculated by dividing weight (in kilograms) by height (in meters) squared. Data categorized by BMI showed 34.3% of the total sample within the normal range, 34.3% were overweight and 18.6% were obese

(**Table 4.2**). Categorization of BMI by gender revealed 45.4% of males being within the normal range and 36.4% of females in the "overweight" group (**Table 4.2**).

Table 4.2: Body mass index classification

BMI Classification	General Population Percentage (number)	Male Percentage (number)	Female Percentage (number)	Unknown Gender Percentage (number)
Underweight: < 18.5kg/m²	1.4 (n = 1)	0.0 (n = 0)	0.0 (n = 0)	14.3 (n = 1)
Normal range: 18.5-24.9 kg/m²	34.3 (n = 24)	45.4 (n = 5)	34.5 (n = 19)	0.0 (n = 0)
Overweight: 25.0-29.9 kg/m²	34.3 (n = 24)	18.2 (n = 2)	36.4 (n = 20)	28.6 (n = 2)
Obese Class I: 30.0-34.9 kg/m²	18.6 (n = 13)	18.2 (n = 2)	18.2 (n = 10)	14.3 (n = 1)
Obese Class II: 35.0-39.9 kg/m²	5.7 (n = 4)	0.0 (n = 0)	7.3 (n = 4)	0.0 (n = 0)
Obese Class III: > 40.0 kg/m²	5.7 (n = 4)	18.2 (n = 2)	3.6 (n = 2)	0.0 (n = 0)
Unknown BMI	27.8 (n = 27)	8.3 (n = 1)	29.5 (n = 23)	42.8 (n = 3)

[a] BMI as classified by the World Health Organization (World Health Organization)

4.2 Prevalence and occurrence of neck, shoulder and low back pain

Of those who completed this question (n = 96 for neck and shoulder pain; n = 93 for low back pain), 81.3% (n = 78) experienced neck and shoulder pain in the last 12 months, and 71.0% (n = 66) of respondents experienced low back pain in the last 12 months.

The frequency with which respondents experienced neck, shoulder and low back pain is shown in **Table 4.3**. The monthly incidence of neck and shoulder pain and low back pain was reported by 47.9% and 46.7% of the sample respectively. Furthermore, the neck, shoulder and low back pain was most commonly experienced during the afternoons and evenings (**Table 4.3**).

Table 4.3: **Frequency/occurrence of neck, shoulder and low back pain**

Category	Subcategory	Neck and shoulder pain		Low back pain	
		Number (n)	Percentage (%)	Number (n)	Percentage (%)
Frequency/ Occurrence[a]	Morning	6	8.3	5	9.1
	Afternoon	16	22.2	9	16.4
	Evening	15	20.8	14	25.5
	Beginning of week	1	1.4	4	7.3
	End of week	4	5.6	6	10.9
	Weekend	3	4.2	4	7.3
	Month beginning	1	1.4	1	1.8
	Month End	3	4.2	4	7.3
	Other	3	4.2	3	5.5

[a] percentage totals per category do not add up to 100% as participants were allowed to choose more than one sub-category option

Data regarding the respondent's dominant hand, their location of neck and shoulder pain and the presence and location of numbness or tingling in their hands is shown in **Table 4.4**. Nearly half of the respondents stated that they experienced numbness or tingling in their hand/s. The majority of the sample group experienced both neck and shoulder pain, as well as bilateral numbness and tingling, despite 95.9% of them being right-handed (**Table 4.4**).

Table 4.4: Associations between neck and shoulder pain and upper limb characteristics/clinical effects

Category	Subcategory	Number (n)	Percentage (%)
Dominant hand	Right	93	95.9
	Left	1	1.0
	Unanswered	3	3.1
Pain Location	Right	16	22.9
	Left	4	5.7
	Bilateral	50	71.4
Numbness/tingling	Yes	35	49.3
	No	36	50.7
Location of numbness/ tingling	Right	11	31.4
	Left	8	22.9
	Bilateral	16	45.7

On the subject of working conditions, 43.7% respondents of the sample reported being exposed to a draught or air conditioner in their working environment, with 51.6% stating that this contributed to their neck and shoulder pain (**Table 4.5**).

Table 4.5: **Effect of draught/air-conditioning on neck and shoulder pain**

Category	Subcategory	Number (n)	Percentage (%)
Draught/ Air-conditioner	Yes	31	43.7
	No	40	56.3
Effect on pain	Yes	16	51.6
	No	15	48.4

With regards to injuries, 19.2% of those who responded reported experiencing neck and shoulder injuries at some point and 18.0% low back injuries (**Table 4.6**). Accidents were reported to be the cause of most neck, shoulder and low back injuries. Although this is notable, it is recognized as a limitation as most people with neck, shoulder and low back pain have not suffered previous injuries.

Table 4.6: **Neck, shoulder and low back pain in relation to injury history**

Category	Subcategory	Neck and shoulder pain		Low back pain	
		Number (n)	Percentage (%)	Number (n)	Percentage (%)
Sustained an injury	Yes	14	19.2	11	18.0
	No	59	80.8	50	82.0
Cause of injury	Fall	0	0.0	2	18.2
	Motor Vehicle Accident	7	50.0	3	27.2
	Sport	2	14.3	1	9.1
	Lifting	1	7.1	2	18.2
	Other	2	14.3	2	18.2
	Missing data	2	14.3	1	9.1
Occurrence of injury	0-6 months ago	2	14.3	1	9.1
	7-12 months ago	0	0.0	0	0.0
	1-5 years ago	0	0.0	1	9.1
	6-10 years ago	2	14.3	4	36.4
	>10 years ago	8	57.1	5	45.4
	Missing data	2	14.3	0	0.0
Severity of injury	Major (hospitalization)	5	35.7	2	18.2
	Minor	9	64.3	8	72.7
	Missing data	0	0.0	1	9.1

Less than 11% reported a need to modify their jobs as a result of their neck, shoulder and low back pain (**Table 4.7**).

Table 4.7: **Extent of progression of pain and job modification due to neck, shoulder and low back pain**

Category	Subcategory		Neck and shoulder pain		Low back pain	
			Number (n)	Percentage (%)	Number (n)	Percentage (%)
Modification	Yes		7	10.6	4	7.7
	No		59	89.4	48	92.3
Extent of progression	Progressed	Yes	8	10.3	11	15.9
		No	70	89.7	58	84.1
	Constant	Yes	39	50	28	40.6
		No	39	50	41	59.4
	Relieved	Yes	23	29.5	25	36.2
		No	55	70.5	44	63.8

Self-treatment was reported as the most common option (neck, shoulder: 35.9%; low back pain: 32.9%) in the context of treatment type accessed/sought. Homeopathy was reported as the least common choice for both, neck and shoulder (5.1%) and low back pain (4.3%). A further notable observation is that conventional treatment options (such as self-treatment, general practitioners and physiotherapists) appears markedly higher than alternative treatment options such as biokineticists, chiropractors and homoeopaths. **Table 4.8** provides a synopsis of results in this regard.

Table 4.8: **Treatment types for neck, shoulder and low back pain**

Treatment[a]	Neck and shoulder pain		Low back pain	
	Yes	No	Yes	No
	Percentage (number)	Percentage (number)	Percentage (number)	Percentage (number)
General Practitioner	28.2 (n = 22)	71.8 (n = 56)	31.4 (n = 22)	68.6 (n = 48)
Chiropractor	20.5 (n = 16)	79.5 (n = 62)	20.0 (n = 14)	80.0 (n = 56)
Physiotherapist	34.6 (n = 27)	65.4 (n = 51)	30.0 (n = 21)	70.0 (n = 49)
Biokineticist	7.7 (n = 6)	92.3 (n = 72)	5.7 (n = 4)	94.3 (n = 66)
Homeopath	5.1 (n = 4)	94.9 (n = 74)	4.3 (n = 3)	95.7 (n = 67)
Self-treated	35.9 (n = 28)	64.1 (n = 50)	32.9 (n = 23)	67.1 (n = 47)
Other	12.8 (n = 10)	87.2 (n = 68)	8.6 (n = 6)	91.4 (n = 64)

[a] Participants had the opportunity to select more than one treatment option

With regards to aggravating factors for pain, marking was reported as a major contributing factor for both neck and shoulder, and low back pain (**Table 4.9**). Writing on a blackboard was the biggest contributing factor for neck and shoulder pain (48.7%), and prolonged standing for low back pain (42.9%) (**Table 4.9**).

Table 4.9: **Aggravating factors for neck, shoulder and low back pain**

Aggravating Factors[a]	Neck and shoulder pain		Low back pain	
	Yes	No	Yes	No
	Percentage (number)	Percentage (number)	Percentage (number)	Percentage (number)
Blackboard	48.7 (n = 38)	51.3 (n = 40)	35.7 (n = 25)	64.3 (n = 45)
Standing	28.2 (n = 22)	71.8 (n = 56)	42.9 (n = 30)	57.1 (n = 40)
Marking	70.5 (n = 55)	29.5 (n = 23)	55.7 (n = 39)	44.3 (n = 31)
Sitting	24.4 (n = 19)	75.6 (n = 59)	24.3 (n = 17)	75.7 (n = 53)
Computer	42.3 (n = 33)	57.7 (n = 45)	30.0 (n = 21)	70.0 (n = 49)
Carrying	32.1 (n = 25)	67.9 (n = 53)	32.9 (n = 23)	67.1 (n = 47)
Reaching	24.4 (n = 19)	75.6 (n = 59)	17.1 (n = 12)	82.9 (n = 58)
Other	10.3 (n = 8)	89.7 (n = 70)	11.4 (n = 8)	88.6 (n = 62)

[a] Participants were allowed to indicate more than one aggravating factor

With regards to exposure to different types of physical activity/body position, holding the head in a forward-bent posture (82.2%) and reaching with arms above chest height (53.3%) were reported as the most common factors linked to neck and shoulder pain, and standing for a prolonged time (89.0%) was the most common job requirement associated with low back pain (**Table 4.10**). These results support and relate to those in **Table 4.9,** which shows that marking (head in forward-bent posture) and writing on a blackboard (head in backward-bent posture and reaching with arms above chest height) aggravate neck and shoulder pain, and standing aggravates low back pain. These aggravating factors are also the most common job requirements of teachers.

Table 4.10: Job requirements in daily work activities

Pain	Subcategory	Yes	No
Neck and shoulder	Head in forward-bent posture for a prolonged time	82.2 (n = 60)	17.8 (n = 13)
	Head in a backward-bent posture for a prolonged time	27.8 (n = 20)	72.2 (n = 52)
	Lifting heavy loads (>5kg)	19.7 (n = 15)	80.3 (n = 61)
	Push/pull heavy loads	4.9 (n = 11)	85.1 (n = 63)
	Carry heavy loads	22.4 (n = 17)	77.6 (n = 59)
	Carry heavy loads in awkward posture	10.5 (n = 8)	89.5 (n = 68)
	Carry heavy loads with load far from body	9.3 (n = 7)	90.7 (n = 68)
	Carry heavy load with twisted trunk	5.4 (n = 4)	94.6 (n = 70)
	Carry heavy loads with load above chest height	8.0 (n = 6)	92.0 (n = 69)
	Carry heavy load that is difficult to hold	10.7 (n = 8)	89.3 (n = 67)
	Carry a very heavy load (>20 kg)	4.0 (n = 3)	96.0 (n = 72)
	Reach with your arms above shoulder height	53.3 (n = 40)	46.7 (n = 35)
Low back	Stand for a prolonged time	89.0 (n = 81)	11.0 (n = 10)
	Sit for a prolonged time	29.3 (n = 24)	70.7 (n = 58)
	Walk for a prolonged time	34.2 (n = 27)	65.8 (n = 52)
	Stoop for a prolonged time	23.1 (n = 9)	76.9 (n = 30)
	Work in a bent posture for a prolonged time	39.8 (n = 33)	60.2 (n = 50)
	Work in a twisted posture for a prolonged time	12.8 (n = 10)	87.2 (n = 68)
	Work in a bent and twisted posture for a prolonged time	13.3 (n = 10)	86.7 (n = 65)
	Work in uncomfortable postures	29.5 (n = 23)	70.5 (n = 55)

4.3 Associations between the prevalence and risk factors of neck, shoulder and low back pain

Despite the high prevalence of both neck and shoulder and low back pain, there was no statistical difference between gender and neck, shoulder and low back pain (**Table 4.11**).

A statistically significant difference was, however, observed between ethnicity and neck and shoulder pain (p = < 0.001) and low back pain (p = < 0.008), respectively (**Table 4.11**). Our data indicated that Coloureds were most likely to have neck and shoulder pain compared to Blacks and low back pain was most common amongst Indians (**Table 4.11**).

In contrast, there was a lack of statistical significance between age and neck, shoulder and low back pain (**Table 4.11**).

Table 4.11: Association between participant characteristics and neck, shoulder and low back pain

Category	Subcategory	Neck and shoulder pain			Low back pain		
		Number (n)	Percentage (%)	*p*-value	Number (n)	Percentage (%)	*p*-value
Gender	Male	9	75.0	$p = 0.576$	7	58.3	$p = 0.300$
	Female	63	81.8		54	73.0	
Ethnicity	White	5	62.5	$p = < 0.001$*	3	42.9	$p = 0.008$
	Black	5	41.7		4	36.4	
	Indian	51	89.5		44	80.0	
	Coloured	16	94.1		14	77.8	
Age	25-34 years	11	68.8	$p = 0.247$	10	62.5	$p = 0.594$
	35-44 years	16	84.2		13	72.2	
	45-54 years	38	90.5		32	80.0	
	55-65 years	10	83.3		9	75.0	

*statistical significance at $p = \leq 0.05$

Despite the significance found between ethnicity and neck, shoulder and low back pain, it was decided not to perform any post-hoc statistical analysis as the subgroup numbers were very different. Additionally, some ethnic group's representation was too small numbers for analysis.

In addition, no statistical difference was noted between body mass index (BMI) and participants with and without neck and shoulder pain and low back pain (**Table 4.12**). Data categorized by gender and pain also showed no statistical difference for BMI. Further analysis was conducted to find associations between neck, shoulder and low back pain within the different BMI groups, as can be seen in **Table 4.12**. Using the underweight and normal range BMI groups as the base constant (the lowest measurement), a significant relationship was found between the Obese Class III and the under- and normal weight groups ($p = 0.049$) with neck pain. No comparisons were significant for low back pain.

Table 4.12: Association between different body mass index classifications and neck, shoulder and low back pain

Category	Neck and shoulder pain		Low back pain	
	Percentage (number)	*p*-value	Percentage (number)	*p*-value
Underweight: < 18.5	100.0 (n = 1)	*p* = 0.314	100.0 (n = 1)	*p* = 0.767
Normal range: 18.5-24.9	91.7 (n = 22)		77.3 (n = 17)	
Overweight: 25.0-29.9	87.5 (n = 21)		83.3 (n = 20)	
Obese Class I: 30.0-34.9	84.6 (n = 11)		75.0 (n = 9)	
Obese Class II: 35.0-39.9	66.7 (n = 2)		75.0 (n = 3)	
Obese Class III: >40.0	50.0 (n = 2)		50.0 (n = 2)	
BMI		*P* = 0.317		*p* = 0.726
Overweight vs under- and normal weight		*p* = 0.606		*p* = 0.659
Obese Class I vs under- and normal weight		*p* = 0.489		*p* = 0.827
Obese Class II vs under- and normal weight		*p* = 0.221		*p* = 0.885
Obese Class III vs under- and normal weight		*p* = 0.049*****		*p* = 0.253
Constant: under- and normal weight		*p* = 0.001		*p* = 0.011

**p* = ≤0.05

In the context of different phases of teaching, junior phase teachers experienced more neck, shoulder and low back pain in comparison to senior phase teachers (**Table 4.13**). Furthermore, there was no statistical difference shown between the number of teaching or marking hours and neck, shoulder and low back pain among primary school teachers (**Table 4.13**). Of the respondents with neck and shoulder (65.2%) and low back pain (67.7%) taught between 20-29 hours per week, while the majority spent 6-10 hours per week marking (50.8% with neck and shoulder pain; 50.0% with low back pain).

Table 4.13: Association between neck, shoulder and low back pain and teaching phase and teaching/marking hours per week

Category	Subcategory	Neck and shoulder pain			Low back pain		
		Number (n)	Percentage (%)	*p*-value	Number (n)	Percentage (%)	*p*-value
Teaching phase	Junior (grade 1-3)	34	47.2	*p* = 0.325	28	44.4	*p* = 0.899
	Senior (grade 4-7)	38	52.8		35	55.6	
Teaching hours per week	1-9 hours	8	11.6	*p* = 0.313	5	8.5	*p* = 0.115
	10-19 hours	4	5.8		3	5.1	
	20-29 hours	45	65.2		40	67.7	
	30-39 hours	8	11.6		6	10.2	
	>40 hours	4	5.8		5	8.5	
Marking hours per week	1-5 hours	18	26.1	*p* = 0.968	13	22.4	*p* = 0.862
	6-10 hours	35	50.8		29	50.0	
	11-15 hours	10	14.5		10	17.2	
	16-20 hours	3	4.3		3	5.2	
	>20 hours	3	4.3		3	5.2	

No statistical difference was found between neck, shoulder and low back pain and involvement in extramural or co-curricular activities (**Table 4.14**). Although most respondents spend only 0-5 hours per week involved in extramural or co-curricular activities, the greater majority with neck and shoulder pain (76.7%) and low back pain (75.4%) were involved in extramural or co-curricular activities.

Table 4.14: Relationships between neck, shoulder and low back pain and extramural activities

Category	Subcategory	Neck and shoulder pain			Low back pain		
		Number (n)	Percentage (%)	*p*-value	Number (n)	Percentage (%)	*p*-value
Extramural activities	Yes	56	76.7	$p = 0.413$	46	75.4	$p = 0.969$
	No	17	23.3		15	24.6	
Type of activity[a]	Sport-related	42	64.6	$p = 0.553$	34	65.4	$p = 0.631$
	Other	23	35.4	$p = 0.774$	18	34.6	$p = 0.897$
Hours involved in activity per week	0-5 hours	35	83.3	$p = 0.811$	27	81.8	$p = 0.440$
	5-10 hours	7	16.7		6	18.2	

[a] Participants could indicate either one or both types of activity

With regards to computer work, no significant relationship was found in our study between neck, shoulder or low back pain and working at a computer during or after office hours, although the majority of respondents reported to work at a computer between 0-5 hours per week during and after work hours. The majority of respondents with neck, shoulder and/or low back pain indicated that they take rest breaks between activities, most commonly of 10-20 minutes duration (**Table 4.15**).

Table 4.15 Associations between neck, shoulder and low back pain and computer work hours and rest breaks taken

Category	Subcategory	Neck and shoulder pain			Low back pain		
		Number (n)	Percentage (%)	*p*-value	Number (n)	Percentage (%)	*p*-value
Hours per week working at a computer *during* work	0 hours	27	39.7	*p* = 0.192	22	40.7	*p* = 0.457
	0-5 hours	37	54.5		29	53.7	
	5-10 hours	2	2.9		2	3.7	
	10-15 hours	0	0.0		0	0.0	
	>15 hours	2	2.9		1	1.9	
Hours per week working at a computer *after* work	0 hours	8	11.6	*p* = 0.925	8	14.3	*p* = 0.889
	0-5 hours	51	73.9		39	69.6	
	5-10 hours	7	10.1		6	10.7	
	10-15 hours	2	2.9		2	3.6	
	>15 hours	1	1.5		1	1.8	
Rest breaks	Yes	56	84.8	*p* = 0.934	43	81.1	*p* = 0.238
	No	10	15.2		10	18.9	
Rest break duration	5-10 min	14	25.0	*p* = 0.242	12	27.9	*p* = 0.186
	10-20 min	16	28.6		13	30.2	
	20-30 min	11	19.6		8	18.6	
	>30 min	12	21.4		8	18.6	
	Missing data	3	5.4		2	4.7	

About three-quarters of the respondents with neck, shoulder and low back pain considered themselves to be active in following a gym-specific and/or cardiovascular program with the majority of respondents doing so 3-4 times per week. An additional observation of interest was that 17 respondents with neck and shoulder pain and 15 with low back pain reported to have injured themselves through their active lifestyles, despite no associations between injuries from active lifestyles and neck, shoulder and low back pain being found (**Table 4.16**). The majority indicated that their injuries contributed to their neck, shoulder and low back pain. This could be as a result of acute pain developing into persistent pain (Rosenbloom *et al.*, 2013).

Table 4.16: Relationships of activity and exercise status, injuries from active lifestyles and neck, shoulder and low back pain

Category	Subcategory	Neck and shoulder pain			Low back pain		
		Number (n)	Percentage (%)	*p*-value	Number (n)	Percentage (%)	*p*-value
Active	Yes	63	80.8	$p = 0.688$	54	81.8	$p = 0.594$
	No	15	19.2		12	18.2	
Hours of exercise per week	0 hours	17	21.8	$p = 0.438$	16	24.2	$p = 0.938$
	0-5 hours	47	60.2		41	62.1	
	5-10 hours	7	9.0		5	7.6	
	Missing data	7	9.0		4	6.1	
Gym-specific program	Yes	27	34.6	$p = 0.681$	23	34.8	$p = 0.465$
	No	51	65.4		43	65.2	
Gym program times per week	1-2 times	8	29.6	$p = 0.915$	7	30.4	$p = 0.798$
	3-4 times	11	40.7		11	47.9	
	>5 times	6	22.2		3	13.0	
	Other	0	0.0		0	0.0	
	Missing data	2	7.5		2	8.7	
Cardiovascular program	Yes	19	24.4	$p = 0.338$	15	22.7	$p = 0.422$
	No	58	74.4		48	72.7	
	Missing data	1	1.2		3	4.6	
Cardiovascular program times per week	1-2 times	8	42.2	$p = 0.899$	8	53.3	$p = 0.351$
	3-4 times	9	47.4		6	40.0	
	>5 times	1	5.2		0	0.0	
	Other	1	5.2		1	6.7	
Injury from active lifestyle	Yes	17	21.8	$p = 0.111$	15	22.7	$p = 0.096$
	No	57	73.1		49	74.2	
	Missing data	4	5.1		2	3.1	
Type of injury[a]	Ligament/tendon	4	23.5	$p = 0.153$	4	25.0	$p = 0.155$
	Bone fracture	3	17.6	$p = 0.153$	3	18.8	$p = 0.159$
	Sprain/strain	4	23.5	$p = 0.153$	3	18.8	$p = 0.107$
	Dislocation	1	5.9	$p = 0.153$	1	6.2	$p = 0.164$
	Other	5	29.5	$p = 0.153$	5	31.2	$P = 0.151$
Onset of injury	0-6 months ago	4	23.5	$p = 0.370$	4	26.7	$p = 0.326$
	1-5 years ago	6	35.3		4	26.7	
	5-10 years ago	2	11.8		2	13.3	
	>10 years ago	4	23.5		4	26.7	
	Missing data	1	5.9		1	6.6	
Contribution to pain	Yes	10	58.8	$p = 0.118$	10	66.7	$p = 0.098$
	No	6	35.3		4	26.7	
	Missing data	1	5.9		1	6.6	

[a] One respondent had indicated two types of low back injuries, thus they are 16 injury types but only 15 respondents with injuries.

In contrast, a statistically significant association was found between suffering a severe trauma or injury and neck and shoulder pain (p = 0.006) and low back pain (p = 0.049). Twenty-two respondents with neck and shoulder pain and 18 with low back pain have suffered severe injuries and/or traumas, of which the majority received minor/conservative treatment. A relationship was found between neck and shoulder pain and treatment received for the injury/trauma (p = 0.047), as seen in **Table 4.17.**

Table 4.17: Relationships between severe injury/trauma and neck, shoulder and low back pain

Category	Subcategory	Neck and shoulder pain		Low back pain	
		Percentage (number)	*p*-value	Percentage (number)	*p*-value
Suffered severe injury/trauma	Yes	30.6 (22)	p = **0.006***	29.0 (18)	p = **0.049***
	No	69.4 (50)		71.0 (44)	
Type of injury/trauma	Bone fracture	18.2 (4)	p = 0.073	22.2 (4)	p = 0.087
	MVA	18.2 (4)	p = 0.073	22.2 (4)	p = 0.087
	Psychological trauma	22.7 (5)	p = 0.073	13.7 (3)	p = 0.088
	Accident	4.6 (1)	p = 0.073	4.6 (1)	p = 0.090
	Other	22.7 (5)	p = 0.073	22.2 (4)	p = 0.064
	Missing data	13.6 (3)		9.1 (2)	
Treatment	Yes	81.8 (18)	p = **0.047***	88.9 (16)	p = 0.229
	No	18.2 (4)		11.1 (2)	
Type of treatment	Surgery	27.8 (5)	p = 0.117	25.0 (4)	p = 0.319
	Hospital	16.7 (3)	p = 0.117	18.8 (3)	p = 0.305
	Minor/conservative	50.0 (9)	p = 0.117	50.0 (8)	p = 0.350
	Missing data	5.5 (1)		6.2 (1)	

*p = < 0.05

The majority of respondents suffered from medical conditions and a statistically significant relationship was found between medical conditions and neck and shoulder pain (p = 0.008) and low back pain (p = 0.031). Diabetes and cardiovascular disease were the most common conditions (**Table 4.18**). An association was noted between low back pain and musculoskeletal medications (p = 0.047), despite the low prevalence rate of musculoskeletal conditions (12.5%) amongst teachers with low back pain.

Table 4.18: Associations between neck, shoulder and low back pain and medical conditions and medications

Category	Subcategory	Neck and shoulder pain			Low back pain		
		Number (n)	Percentage (%)	*p*-value	Number (n)	Percentage (%)	*p*-value
Medical conditions	Yes	31	43.1	*p* = 0.008*	26	42.6	***p* = 0.031***
	No	41	56.9		35	57.4	
Types of Conditions[a]	Diabetes	9	24.3	*p* = 0.032*	8	25.8	*p* = 0.113
	Cardiovascular	9	24.3	*p* = 0.032*	7	22.6	*p* = 0.115
	Thyroid	4	10.8	*p* = 0.019*	4	12.9	*p* = 0.109
	Respiratory	3	8.1	*p* = 0.033*	3	9.7	*p* = 0.099
	Musculoskeletal	5	13.5	*p* = 0.033*	4	12.9	*p* = 0.109
	Other	7	19.0	*p* = 0.032*	5	16.1	*p* = 0.114
Medications[a]	Diabetic	10	28.6	*p* = 0.119	10	31.3	*p* = 0.085
	Cardiovascular	10	28.6	*p* = 0.119	9	28.1	*p* = 0.088
	Thyroid	5	14.3	*p* = 0.097	5	15.6	*p* = 0.092
	Respiratory	1	2.8	*p* = 0.122	1	3.1	*p* = 0.089
	Vitamins	2	5.7	*p* = 0.120	2	6.3	*p* = 0.084
	Musculoskeletal	2	5.7	*p* = 0.120	1	3.1	*p* = 0.047*
	Other	5	14.3	*p* = 0.113	4	12.5	*p* = 0.088

[a] Participants could indicate more than one condition and medication

* $p = \leq 0.05$

Travelling by car was the most common transportation method with an association to both neck and shoulder pain (92.3%) and low back pain respondents (95.4%) (**Table 4.19**). Moreover, a relationship was found between transportation method and low back pain (p = 0.023). This suggests that prolonged sitting results in low back pain, despite no relationship being noted between sitting and low back pain (p = 0.743), as can be seen in **Table 4.20**. Moreover, the majority (62.8%) reported spending between 0-30 minutes travelling daily, which indicates that their sitting in a vehicle was on average only 15 minutes at a time.

Table 4.19: Relationships between neck, shoulder and low back pain and transportation method and time spent travelling

Category	Subcategory	Neck and shoulder pain			Low back pain		
		Number (n)	Percentage (%)	*p*-value	Number (n)	Percentage (%)	*p*-value
Transport method	Car	72	92.3	*p* = 0.181	62	95.4	*p* = 0.023*
	Public transport	3	3.8		1	1.5	
	Walk	2	2.6		2	3.1	
	Other	1	1.3		0	0.0	
Travelling time per day	0-30 min	49	62.8	*p* = 0.845	41	63.1	*p* = 0.754
	30-60 min	10	12.8		7	10.8	
	1-2 hours	16	20.5		14	21.5	
	>2 hours	3	3.9		3	4.6	

*$p = \leq 0.05$

With regards to daily job requirements, statistically significant relationships were found between neck and shoulder pain and head in forward-bent posture (p = 0.001), head in backward-bent posture (p = 0.016) and lifting of heavy loads (p = 0.045), as well as a highly significant relationship between standing for a prolonged time and low back pain (p = 0.000). Furthermore, a borderline significant relationship was found between working in uncomfortable postures and low back pain (p = 0.054), as shown in **Table 4.20**. These associations concur with the most common daily activities that are required of teachers – marking (head in forward-bent posture), writing on blackboard (head in backward-bent posture), carrying of books and files (lifting of heavy loads) and standing for prolonged time while writing on the board, teaching and walking around the classroom. Weak/no associations were noted with those activities which teachers are not required to perform daily for example carrying heavy loads in awkward postures or above chest height, sitting or stooping for a prolonged time.

Based on the findings related to the daily job requirements of teachers, it would be appropriate to reject both null hypotheses and accept the alternative hypotheses as follows:

1. There is an association between the prevalence of low back pain and selected risk factors.

2. There is an association between the prevalence of neck and shoulder pain and selected risk factors.

Table 4.20: Associations between neck, shoulder and low back pain and selected risk factors

Category	Subcategory	Number (n)	Percentage (%)	*p*-value
Neck and shoulder	Head in forward-bent posture for prolonged time	60	40.5	*p* = 0.001*
	Head in backward-bent posture for prolonged time	20	13.5	*p* = 0.016*
	Lift heavy loads (>5kg)	15	10.1	*p* = 0.045*
	Push or pull heavy loads	11	7.4	*p* = 0.090
	Carry heavy loads	17	11.6	*p* = 0.120
	Carry heavy loads in an awkward position	8	5.4	*p* = 0.558
	Carry heavy loads with load far from the body	7	4.7	*p* = 0.190
	Carry heavy loads with a twisted trunk	4	2.7	*p* = 0.327
	Carry heavy loads with load above chest height	6	4.1	*p* = 0.766
Low back	Stand for a prolonged time	62	36.0	*p* = 0.000*
	Sit for a prolonged time	18	10.5	*p* = 0.743
	Walk for a prolonged time	21	12.2	*p* = 0.365
	Stoop for a prolonged time	7	4.0	*p* = 0.789
	Work in a bent posture for a prolonged time	27	15.7	*p* = 0.059
	Work in a twisted posture for a prolonged time	9	5.2	*p* = 0.163
	Work in a bent and twisted posture for a prolonged time	8	4.7	*p* = 0.486
	Work in uncomfortable postures	20	11.7	*p* = 0.054

*$p = \leq 0.05$

CHAPTER 5

DISCUSSION

The high prevalence of musculoskeletal disorders among school teachers is well documented (Erick and Smith, 2011; Durmus and Ilhanli, 2012; Darwish and Al-Zuhair, 2013; Abdulmonem *et al.*, 2014). There is, however a paucity of literature on MSDs amongst South African school teachers (Korkmaz *et al.*, 2011). This prompted the current study, which aimed to determine the prevalence and identify selected risk factors for neck, shoulder and low back pain among primary school teachers in the Central Durban area.

5.1 Demographic profile

This study had a response rate of 54.8%, which is satisfactory when compared to other studies' response rates which ranged between 28.5% (Chong and Chan, 2010) and 95.1% (Cardoso *et al.*, 2009).

The gender distribution of the study sample was 13.3% (n=12) male and 86.7% (n=78) female. Sub-group gender analyses showed that 9 of the 12 male respondents (75.0%) and 63 of the 78 female respondents (81.8%) reported neck and shoulder pain in the last 12 months and 7 of the male respondents (58.3%) and 54 of the female respondents (73.0%) reported low back pain in the last 12 months. There was, however no statistically significant difference between gender and neck and shoulder pain (p = 0.576) or gender and low back pain (p = 0.300). The data of this study corresponds to previous studies, which suggest that neck, shoulder and low back pain are more common in female than in male teachers (Andersson, 1999; Jensen and Harms-Ringdahl, 2007; Yue *et al.*, 2012). Moreover, this is indicative that females may be more susceptible to emotional exhaustion than males, have a lower pain threshold and possibly conduct heavier household chores than males (Yue *et al.*, 2012).

This study further revealed a significant difference between ethnicity and neck and shoulder pain (p = < 0.001) as well as low back pain (p = < 0.008). The results showed that Blacks were less likely (47.7%) to experience neck and shoulder pain in comparison to the Coloured population (94.1%). Previous studies have been conducted in the greater Durban area and documented varying prevalence rates of neck pain in the different population groups (Ndlovu, 2006; Slabbert, 2010; Muchna, 2011). Ndlovu (2006) reported a 50.0% prevalence

rate in the Black population, Slabbert (2010) a 45.0% rate in the White population and Muchna (2011) a 36.8% rate in the Indian population. In contrast, prevalence rates for low back pain in this study were 36.4% in the Black population and 80.0% in the Indian population. These rates corroborate with those documented by Muchna (2011). Other prevalence rates reported were 32.6% in the Coloured population (Docrat, 1999 as cited by Muchna, 2011) and 53.1% in the Black population (van der Meulen, 1997 as cited by Muchna, 2011).

The high prevalence rate of low back pain in the Indian population in this study may be influenced by the city of Durban having the highest population and concentration of Indians outside India (Mukherji, 2011). Indians are reported to display structural physiological differences such as a lower bone density (Sunder, 2006) and high rates of congenital abnormalities (Terry *et al.*, 1985). It is possible that such features may predispose them to osteoporosis and thus increase their risk of developing neck pain (Muchna, 2011). This study further revealed that Blacks had the lowest prevalence rate of low back pain, which may be as a result of their higher bone mineral density when compared to Whites, Indians and Coloureds, thus they have fewer fragility fractures (Schnitzler and Mesquita, 2006). An earlier study (Andersson, 1999) reported that low back pain was more common in the White population in comparison to the Black population, which supports our study. Furthermore, since pain is a subjective variable, the experience may vary between different ethnic groups (Green *et al.*, 2003 and Portenoy *et al.*, 2004; as cited by Muchna, 2011), possibly because of different pain thresholds.

Despite the lack of a statistical significant difference between age and neck, shoulder (p = 0.247) and low back pain (p = 0.594), the 45-54 years age group showed the highest prevalence of neck and shoulder pain (90.5%) and low back pain (80.0%) within the different age groups. Similar prevalence rates were previously reported for neck pain in the age group of 46-50 and 40-49 years of age (Chiu *et al.*, 2006; Korkmaz *et al.*, 2011). Advancing age was also reported by several studies to be positively related to neck, shoulder and low back pain (Croft *et al.*, 1998; Andersson, 1999; Miranda *et al.*, 2001; Cassou *et al.*, 2002; Chiu *et al.*, 2006; Abdulmonem *et al.*, 2014). It is possible that with increasing age, degenerative

changes within the joints, muscles, ligaments and tendons occurs. This subsequently increases the susceptibility of tissues to physical loads, resulting in musculoskeletal pain and disorders in older individuals (Cassou *et al.*, 2002).

In this study, the BMI of 34.3% of the respondents were within the normal range of 18.5-24.9kg/m², with a similar rate of 34.3% for the overweight categorization (25.0-29.9kg/m²). However, there were no differences in the average BMI of respondents with or without neck and shoulder (p = 0.238) or low back pain (p = 0.371). Similarly, no associations were found between males and females with neck and shoulder pain (p = 0.241) or without neck and shoulder pain (p = 0.897), as well as with low back pain (p = 0.695) or without low back pain (p = 0.469). Earlier studies have suggested that BMI may increase the risk of osteoarthritis (Sturm, 2002). Women have been shown to have a greater prevalence of being overweight than men (Baskin *et al.*, 2005; Power and Schulkin, 2008; Alaba and Chola, 2014; Mitchell and Shaw, 2015). This is attributable to differing patterns of fat deposition and mobilization due to hormonal and metabolic differences between the genders, with women having greater adipose stores than men (Power and Schulkin, 2008).

Several studies have explored the relationship between BMI and different types of pain (Miranda *et al.*, 2001; Balagué *et al.*, 2012; Abdulmonem *et al.*, 2014). Obesity was reported to be positively associated with musculoskeletal disorders such as osteoarthritis, low back pain and osteoporosis (Kortt and Baldry, 2002; Anandacoomarasamy *et al.*, 2008). Earlier reports highlighted the association between BMI and shoulder pain (Miranda *et al*., 2001), while recent studies reported a relationship between BMI and low back pain (Balagué *et al.*, 2012; Abdulmonem *et al.*, 2014). In particular, a study showed a correlation between MSDs in school teachers and BMI (Abdulmonem *et al.*, 2014). Such associations may be attributed to obesity which increases weight and pressure on the intervertebral discs, thereby leading to degeneration of the discs and subsequent pain and herniation (Zahaf *et al.*, 2015). These mechanisms occur in a similar pattern in the other joints of the body.

5.2 Prevalence of neck, shoulder and low back pain

The current study has shown that 81.3% of respondents experienced neck and shoulder pain in the last 12 months, while 71.0% experienced low back pain in the last 12 months. A recent study conducted in China found prevalence rates of 48.7% for neck and shoulder pain and 45.6% for low back pain (Yue *et al.*, 2012). Similarly, a Turkish study revealed prevalence rates of 42.5% for neck pain, 28.7% for shoulder pain and 43.8% for low back pain (Korkmaz *et al.*, 2011), and a study among secondary school teachers in Hong Kong showed a prevalence of 69.3% for neck pain (Chiu and Lam, 2007). To date, there have been no South African studies conducted on primary school teachers, thus the results from our study cannot be compared to similar South African studies. The prevalence rates for neck, shoulder and low back pain in this study do seem higher than those of the international studies mentioned above. This may be due to the limited access to affordable occupational health services such as comprehensive medical aid schemes, educational programs and appropriate healthcare interventions and primary prevention measures. Most government employees, such as those of the public primary schools, would make use of the government employees medical aid scheme (GEMS) in South Africa, which has different benefit options. All the benefit options include limited coverage of allied health services such as chiropractic and homoeopathic care, as well as physiotherapy and visits to a general practitioner, the limit of benefits being dependent on the scheme option of the worker (GEMS, 2011). Individual budgetary constraints may further limit the extent and level of medical treatment for MSDs. Additionally, the higher prevalence rate in this study could be attributed to poor legislation in South Africa to support workers suffering from MSDs (Louw *et al.*, 2007).

5.3 Correlation between neck, shoulder and low back pain and associated risk factors

Nearly half of the respondents in this study reported that their neck and shoulder pain (47.9%) and low back pain (46.7%) occurred “sometimes” (monthly). Neck and shoulder pain was reported to be most common during the afternoons, whereas low back pain was most often experienced in the evenings. This may be due to the poor or awkward postures/positions experienced during the day compared to the relaxed environments

experienced during the afternoons/ evenings, thus enabling a conscious awareness of the specific pain being experienced, or the latency period of pain.

Primary school teaching phases were subdivided in this study to allow comparisons between phases within the selected schools. Primary schools were thus subdivided into the junior (Grades 1-3) and senior phase (Grade 4-7). The majority (52.8%) of respondents with neck and shoulder pain taught in the senior phase, while the majority (55.6%) with low back pain taught in the senior phase. No significant associations were found between neck, shoulder and/or low back pain and teaching phase. A recent study by Abdulmonem *et al*. (2014) found that elementary and pre-college teachers were more vulnerable and susceptible to MSDs due to the nature of their work, which is considered repetitive since they spend most of their time standing and moving around the classroom, as compared to college teachers/lecturers who spend most of their time in static postures.

The highest prevalence of neck, shoulder and low back pain in this study was found amongst those who teach 20-29 hours per week (65.2% for neck and shoulder pain; 67.7% for low back pain). There was however, a lack of statistical significance between the number of teaching hours and neck and shoulder pain ($p = 0.313$) or teaching hours and low back pain ($p = 0.115$). This data substantiates studies conducted by others (Yue *et al.*, 2012; Darwish and Al-Zuhair, 2013; Abdulmonem *et al.*, 2014) who also failed to show any statistical associations.

No statistically significant associations were noted between neck, shoulder and low back pain and teachers' involvement in extramural or co-curricular activities. In this study, 76.7% of respondents with neck and shoulder pain and 75.4% of respondents with low back pain reported that they were involved in extracurricular activities, sport- or other-related activities in their respective schools. There is very limited literature on the involvement of teachers in extramural or co-curricular activities globally, and this should be addressed in future studies.

In this study, 80.8% and 81.8% of those with neck, shoulder and low back pain respectively, considered themselves to be active, despite the lack of relationship between neck, shoulder and low back pain and the number of hours exercised per week. Most of the respondents

follow a gym-specific and/or cardiovascular program. A recent study revealed that a lack of physical activity increases the risk of low back pain (Abdulmonem *et al.*, 2014), while physical activity interventions have proved effective for the prevention of low back pain (Balagué *et al.*, 2012). In our study, 17 respondents with neck and shoulder pain and 15 with low back pain have injured themselves through their active lifestyles, commonly between 1 and 5 years ago, with the majority stating that the injuries have contributed to their neck, shoulder and low back pain.

Injuries have been identified as a leading health issue in the United States (Hauret *et al.*, 2010). It is suggested that injuries occur more commonly due to repetitive micro-traumatic forces which are often experienced in the work place or with physical activities, rather than resulting from acute traumatic causes (Hauret *et al.*, 2010). Such injuries are frequently referred to as "overuse injuries", and often, if work-related, are known as "work-related musculoskeletal disorders", "repetitive strain injuries" or "cumulative trauma disorders" (Hauret *et al.*, 2010). In this study 30.6% of respondents experienced neck and shoulder injuries at some point, while 29.0% have experienced low back injuries. These injuries most commonly occurred more than 10 years ago, making them chronic injuries. A significant association was found between neck, shoulder and low back pain and suffering a severe trauma or injury ($p = 0.006$ for neck and shoulder pain and $p = 0.049$ for low back pain). This corroborates an earlier study in which a relationship was noted between neck pain and neck/shoulder injury (Jensen and Harms-Ringdahl, 2007). Furthermore, Porter and Gyi (2002) found that a history of a back injury was a significant predictor for future low back pain.

Most people suffer from pain following an injury (Holmes *et al.*, 2010a; Holmes *et al.*, 2010b) and may go on to develop pain beyond the acute phase, known as persistent pain (Rosenbloom *et al.*, 2013). This would be a possible explanation as to why in our study, neck, shoulder and low back injuries were reported to have occurred more than 10 years ago amongst most respondents and in general, to be of minor severity (**Table 4.6**). Findings from a recent systematic review indicate that persistent pain may be present from 3-84 months post injury/trauma (Rosenbloom *et al.*, 2013). Furthermore, a study by Jenewein *et*

al. (2009) found that almost 45% of injured patients suffered from chronic pain three years after a severe accident. However, pain is multidimensional, and the severity can be affected by a variety of factors, not necessarily only those directly related to the accident (Jenewein *et al.*, 2009).

The majority of respondents classified their neck, shoulder and low back injuries as minor (referred to as no hospitalization required) and received minor/conservative treatment. An association was found between neck and shoulder pain and treatment received for the injury/trauma ($p = 0.047$).

Neck, shoulder and low back pain are multifactorial in nature (Ariëns *et al.*, 2001; Guzmán *et al.*, 2001; Cassou *et al.*, 2002; Andersen *et al.*, 2003). This study revealed associations between neck and shoulder pain and head in forward-bent posture ($p = 0.001$), head in backward-bent posture ($p = 0.016$) and lifting of heavy loads ($p = 0.045$) which corresponds with previous studies in which significant associations between neck pain and static and repetitive neck positions, especially with prolonged neck flexion, and static and repetitive or forceful movements of the arms were found (Ariëns *et al.*, 2000; Ariëns *et al.*, 2001). Despite the lack of statistical significance between the number of marking hours and neck, shoulder and low back pain in this study, marking was the biggest aggravating factor for both neck and shoulder (70.5%) and low back pain (55.7%). The majority of respondents with neck and shoulder pain reported that teaching requires them to keep their head in a forward-bent posture for a prolonged time, which can be expected due to the hours spent marking, reading, writing and bending over desks to help scholars. Data from this study corroborates that from a study by Chiu and Lam (2007) who reported that 85.1% of neck pain was due to a head-down posture.

A recent study found causes of LBP to be associated with standing for a prolonged time, specific sitting habits, a sudden change in posture and carrying heavy objects (Abolfotouh *et al.*, 2015). This correlates with the current study, in which a highly significant relationship was found between standing for a prolonged time and low back pain ($p = 0.000$). Standing for a prolonged time was the second most common aggravating factor for low back pain, after marking. Prolonged standing resulting in LBP is explained by the lack of movement in

the spine, increasing the load on lumbar spine tissues, leading to pain development (Gallagher and Callaghan, 2015). The lack of movement is as a result of increased amount of muscle co-contraction, leading to poor hip and trunk muscle control (Gallagher and Callaghan, 2015). Andersen *et al.* (2007) revealed that LBP is predicted by standing for longer than 30 minutes. Furthermore, a recent study showed that low back pain had the highest prevalence of all the musculoskeletal regions amongst school teachers (Abdulmonem *et al.*, 2014). These aggravating factors concur with those prolonged, awkward and static positions/postures which are required of teachers on a daily basis (Ariëns *et al.*, 2000; Ono *et al.*, 2002; Durmus and Ilhanli, 2012; Yue *et al.*, 2012), resulting in shortened muscles which secondarily compress nerves, and elongated and weakened muscles causing muscles imbalances which increases pressure on nerve entrapment sites (Novak and Mackinnon, 1997).

Studies have reported that musculoskeletal disorders are the most common disorders among computer users (Eltayeb *et al.*, 2011; Ranasinghe *et al.*, 2011; Wu *et al.*, 2012; Sadeghian *et al.*, 2014; Yigit *et al.*, 2015). Despite the lack of statistical significance in this study between neck, shoulder and low back pain and the amount of hours working at a computer, an earlier study by Chiu and Lam (2007), discovered that 84.2% of respondents complained that working at a computer induced neck pain. This is due to the fact that computer work usually forces a head-down posture for a prolonged time, a big risk factor for neck pain (Ariëns *et al.*, 2000; Ariëns *et al.*, 2001; Chiu and Lam, 2007). Hills (2011) states that correct computer ergonomics including regularly movement, correct chair use, correct monitor and keyboard positions and proper workspace lighting will lead to a healthier mind and body, increased productivity and decreased risk of injury.

The majority of respondents in this study stated that they take rest breaks in between activities; however, there was no statistical significance to neck, shoulder and/or low back pain. Rest breaks are taken to decrease the risk of MSDs and musculoskeletal injuries, and counteract fatigue, thereby increasing productivity (Henning *et al.*, 1997; Lombardi *et al.*, 2014; Sallinen, 2014). In computer-related work, taking frequent rest breaks has shown to improve work performance and a person's well-being (Henning *et al.*, 1997). A recent study

by Lombardi, *et al.* (2014) showed that taking frequent rest breaks, of any duration, significantly delays the onset of work-related traumatic injury. In order to reduce the risk of neck pain, teachers should be advised to spend less than 2.5 hours a day in the head-down posture, refrain from sustaining that position for more than 15 minutes at a time and should take “breaks” at least every three hours when working (Chiu and Lam, 2007).

Literature shows that prolonged sitting may lead to acute low back pain (Andersson, 1999) due to the compressive load on the spine and changes within the passive structures (Sheahan *et al.*, 2016). It has been proven that regular rest breaks from sitting decrease the risk of developing and the severity of low back pain, thus in some cases improving work productivity (Sheahan *et al.*, 2016). In contrast, introducing frequent rest breaks (i.e. a 5 minute break every half hour) can also potentially have a negative impact on productivity due to time lost (Sheahan *et al.*, 2016).

This study further revealed that the most common method of transportation to and from work was by car with the majority of respondents spending up to half an hour travelling daily. Results revealed a statistically significant association between transportation method and low back pain (p = 0.023), suggesting that prolonged sitting could cause low back pain. Porter and Gyi (2002), found an association between increased work absenteeism due to low back pain and exposure to driving (distance and time taken to drive to work and annual mileage). They further found sitting in a car to be more detrimental to a person’s well-being than normal sitting and standing postures. The authors compared four different groups whose main work activities were driving, sitting, standing and lifting respectively (for more than 20 hours a week). Results showed that drivers suffer from low back pain the most (Porter and Gyi, 2002). The maintained fixed posture of sitting in a car causes decreased intervertebral nutrition, increased muscle fatigue and reduced blood flow, with a greater risk of disc herniation (Durkin *et al.*, 2006), which are all causes of low back pain. Although several studies (Andersson, 1999; Porter and Gyi, 2002; Durkin *et al.*, 2006) suggest that driving, and thus prolonged sitting, causes low back pain, no relationship was found between sitting and low back pain in this study.

Paresthesia (tingling) or numbness in the hand is very common in the general population (Reading *et al.*, 2003). Nearly half of the respondents in this study reported numbness or paresthesia in their hand/s. The majority of respondents were right-handed (95.9%) but stated that their neck and shoulder pain, as well as numbness and paresthesia, was felt bilaterally. This could indicate that the location of the dominant hand/side does not necessarily have a direct effect on pain, paresthesia or numbness.

Oh *et al*. (2013) suggested myofascial pain syndrome as the most common cause of hand tingling, with common trigger points around the muscles of the neck and shoulders. Other causes could be cervical radiculopathy, rotator cuff syndrome, tenosynovitis and carpal tunnel syndrome, maintaining specific postures causing overuse of muscles and tendons thereby damaging the soft tissues and creating restrictions on movement and pain due to inflammation, pressure on peripheral nerves resulting in pain, weakness and paresthesia in the involved dermal distribution (Oh *et al.*, 2013). Reading *et al.* (2003) proposes cervical spondylosis and resulting compression of cervical nerve roots as a reason for hand tingling. Furthermore, the author found an association between sensory disturbances in the hand and neck pain, especially if the pain is accompanied by restricted neck movements. However, sensory disturbances do not necessarily extend to numbness or tingling within the distribution of the median nerve, which suggests that neck pathology is not commonly the cause of these specific disturbances (Reading *et al.*, 2003). A study by Novak and Mackinnon (1997) revealed that specific postures have three major effects: a direct pressure increase on nerve entrapment sites, placement of muscles in a shortened position resulting in secondary compression of nerves and placement of muscles in elongated and weakened positions causing overuse of other muscles, resulting in a muscle imbalance, and numbness and/or paresthesia as a consequence of continual nerve compression or entrapment, the location dependent on which nerve is compressed or entrapped (Novak and Mackinnon, 1997).

The current study revealed that less than half of the respondents were exposed to a draught or air conditioner in their workplace environment, of which 51.6% stated that the draught/air-conditioner contributed to their neck and shoulder pain. A recent study

identified that air temperature had a significant effect on neck mobility, especially cervical rotation (Yigit *et al.*, 2015). The presence of a chilled draught or air-conditioner typically causes contraction of neck muscles resulting in neck stiffness, which if characterized by reduced mobility and pain is often accompanied by a headache, neck, shoulder and/or arm pain (Yigit *et al.*, 2015). They concluded that air temperatures of 20°C to 22°C and air velocities of 0.4 m/s to 0.6 m/s increased the risk of limited cervical rotation, whilst air humidity had no effect on it (Yigit *et al.*, 2015).

A recent study found correlations between MSDs in school teachers and concomitant chronic illnesses (Abdulmonem *et al.*, 2014). The results of the current study showed a relationship between the presence of medical conditions and neck and shoulder pain (p = 0.008) and the presence of medical conditions and low back pain (p = 0.031), which corroborates a recent study in 2012 which found that teachers with chronic disease had a 1.6 times greater risk of suffering from repetitive strain injuries, a type of MSD affecting the neck, shoulder, upper limb and low back areas (Chaiklieng and Suggaravetsiri, 2012). The present study further revealed that the most common medical conditions reported by respondents were diabetes and cardiovascular diseases. Diabetes mellitus is known to have musculoskeletal manifestations which although usually unspecific, occur frequently in diabetics due to their underlying neuropathy, vasculopathy and immunocompromised statuses (Boswell *et al.*, 2014). This raises an interesting point – are the MSDs in teachers with diabetes due to the illness or just from physical risk factors that teachers face?

Job modifications in the work place are arranged in an attempt to relieve pain, reduce absenteeism and work disability (Coole, Watson and Drummond, 2010). A small minority of the respondents in this study stated that their neck and shoulder pain (10.6%) and low back pain (7.7%) had caused them to modify their jobs in an attempt to relieve their pain and prevent further pain. This could be because only a small percentage indicated that their pain had progressed over the year, thus the need for the job modification would diminish. Coole, Watson and Drummond (2010) revealed that in order for participants to remain at work, they made modifications (informal), which included changes to equipment, working conditions and/or environment, workplace, work design and organization (van Oostrom *et*

al., 2009). An earlier study found work modification in persons suffering from MSDs to be an essential requirement to returning to work (Loisel *et al.*, 2005).

Results of this study showed that approximately half of the respondents with neck, shoulder and/or low back pain stated that their pain had remained constant over the last 12 months, with the minority stating that their pain had progressed. Mallen *et al.* (2006) state that determining the prognosis of MSDs has proven to be a difficult task due to the limited information on the prognosis of MSDs in primary care, with the exception of low back pain. Because MSDs are so multidimensional, a biopsychosocial approach should be taken to determine the prognosis of them (Laisne *et al.*, 2012).

Self-treatment was the most common treatment accessed/sought for both neck and shoulder pain (35.9%) and low back pain (32.9%). This may imply that most respondents perceived their pain as minor and thus self-treated. Physiotherapy was the second most common treatment option for neck and shoulder pain (34.6%), while a visit to the general practitioner was the second most common treatment option for low back pain. Homeopathy was the least common treatment choice for both, neck and shoulder and low back pain. An additional observation of interest in this study was that conventional treatment options (i.e. general practitioner and physiotherapy) were more popular choices than alternative treatment options (i.e. chiropractic, homoeopathy, biokinetics).

A recent study revealed that rest and medical therapy for chronic pain conditions is of limited use, finding that on-going behavioral treatment programs are much more effective in most cases, dependent of course, on patient and pain characteristics (O'Hagan *et al.*, 2013). These behavioral programs have been found to decrease pain-disability and improve the daily life of patients (O'Hagan *et al.*, 2013). Most respondents in this study reported self-treatment as their choice of treatment, thus it is no surprise that half of the respondents stated that that their pain had remained constant over the last 12 months. This leads to the assumption that very few school teachers follow a preventative or behavioral program for the management of their pain.

Preventative options for MSDs among teachers was previously reported (Simoneau *et al.*, 1996). These options included education and interventions regarding correct ergonomics,

exercise programs in the workplace and monitoring of those with musculoskeletal pains (Simoneau *et al.*, 1996). However, due to the multifactorial nature of low back pain, a multidisciplinary approach is necessary for the management of LBP (Guzmán *et al.*, 2001). Multidisciplinary approaches include the biopsychosocial model, which addresses the physical, psychological and social/occupational factors associated with LBP (Guzmán *et al.*, 2001).

5.4 Strengths of the study

- This study adds new information in the South African context as no studies have been conducted on school teachers in South Africa.
- The first step towards implementing a prevention strategy has been made, by finding the prevalence and selected risk factors of musculoskeletal disorders amongst teachers in South Africa.
- A new awareness has been established in South Africa regarding musculoskeletal disorders amongst teachers.

5.5 Limitations of the study

- The cross-sectional nature of the study allows for associations to be made but no inferences of causality can be established.
- A questionnaire used as the data collection tool relies on recall and self-reporting, which leads to the possibility of recall bias as well as underestimation or overestimation.
- The small sample size may misrepresent the study population and ethnic groups.
- The questionnaire used comprised several open-ended questions, which could have resulted in certain questions not being answered.
- There was a greater response from female teachers (n = 78), when compared to male teachers (n = 12), which may pose reliability limitations on the obtained results.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

This study revealed a prevalence of 81.3% for neck and shoulder pain and 71.0% for low back pain among the primary school teachers in the Central Durban area. These prevalence's seem slightly higher when compared to international studies reported, but since to the researcher's knowledge no studies have been thus far been conducted on school teachers in South Africa, this study cannot be accurately compared to others, but it does add new information to the current literature.

6.1 Main findings

- To our knowledge, this is the first South African study that explored ,MSDs among teachers.
- Prevalence's of 83.1% and 71.0% were reported for neck and shoulder pain and low back pain respectively.
- Significant associations were observed between neck and shoulder pain ethnicity (p = 0.001), history of a severe trauma/injury (p = 0.006) and the presence of concomitant medical conditions (p = 0.006).
- Similarly, significant associations were noted between low back pain and ethnicity (p = 0.008), history of a severe trauma/injury (p = 0.049) and the presence of concomitant medical conditions (p = 0.031).
- Strong associations were noted between neck and shoulder pain and a prolonged flexed (p = 0.001) and extended (p = 0.016) neck; and lifting of heavy loads (p = 0.045).
- A weak relationship was found between neck and shoulder pain and treatment options for injury (p = 0.047).
- Strong associations for low back pain included prolonged standing (p = 0.000) and daily transportation method (p = 0.023) (highest prevalence with users of motor vehicles).
- A weak association was noted between low back pain and working in uncomfortable postures.

- The results suggest that the following were risk factors for neck, shoulder and low back pain: female gender, advancing age, teaching in the junior primary (grades 1-3) phase, partaking in extramural or co-curricular activities, and marking.

6.2 Recommendations

- Future research studies should be aimed at a greater sample size to achieve more accurate results.
- If this questionnaire is used for further studies, it should be adapted to allow for questions to be more specific and less open-ended (e.g. “Do you suffer from any of the following medical conditions…” followed by specific options). Furthermore, years of teaching should be included in the questionnaire to increase the depth of the study, as most studies of a similar nature assess this.
- Further studies should be conducted in South African schools, targeting various study populations e.g. teachers of private primary schools, teachers of high schools, etc. as there seems to be a paucity in the literature in this area.
- Future studies should explore any existing interventions for MSDs in school settings, in order for a preventative intervention to be put into place.
- Due to the significant difference between the male and female response rate, a method should be put into place to ensure a fair gender representation.
- Future studies should reassess possible risk factors to evaluate whether the pain was present before the risk factor or as a consequence thereof.
- Educational drives to inform teachers of the implications of MSDs should be undertaken in all the school, as well as teaching them preventative methods, such as correct ergonomics (e.g. correct height of the chair, correct height of desk, proper sitting posture) and general prevention methods such as taking rest breaks between activities, keeping active and not maintaining the same posture for prolonged periods.

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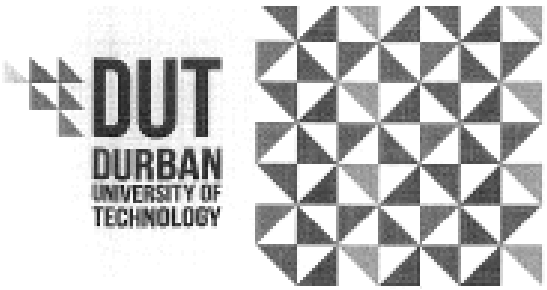
Appendices

Appendix A: Approval from Institutional Research Ethics Committee



Institutional Research Ethics Committee
Faculty of Health Sciences
Room M5 49, Marshfield School Site
Gate 8, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2900
Fax: 031 373 2487
Email: lavistad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

26 June 2015

IREC Reference Number: **REC 68/14**

Ms L S Uhlmann
P O Box 545
Dalton
3236

Dear Ms Uhlmann

Prevalence and selected risk factors for neck, shoulder and low back pain among primary school teachers in the Central Durban area- a cross-sectional study

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

We are pleased to inform you that the questionnaire has been APPROVED; you may now proceed with data collection on the proposed project.

Kindly ensure that participants used for the pilot study are not part of the main study.

Yours Sincerely

[redacted]

Professor J K Adam
Chairperson: IREC

Appendix B: Permission from Kwa-Zulu Natal Department of Education

Letter of Permission to the Kwa-Zulu Natal Department of Education to Conduct Research

KZN Department of Education

Private Bag X9137

Pietermaritzburg

3200

Dear Sir/Madam,

Permission to Conduct Research within the Department of Education Institutions

I am currently a registered MTech: Chiropractic student at the Durban University of Technology. One of the requirements for this qualification is to conduct a research study. I would like to therefore request your permission to conduct the following study, entitled: "Neck, shoulder and low back pain among primary school teachers in the Durban Central area – a cross-sectional study." The details of my intended study are briefly outlined below:

The aim of this study is to:

1) Determine the prevalence of neck, shoulder and low back pain among primary school teachers in the Central Durban Metropolitan area.
2) Identify any risk factors associated with the development of neck, shoulder and low back pain among primary school teachers.
3) Establish the relationship, if any, between the prevalence and risk factors for neck, shoulder and low back pain among primary school teachers.

With this study, I hope to broaden the knowledge about musculoskeletal disorders among teachers, a very important issue as teachers play such a vital role in the development of the future of this country. I hope that as more knowledge in this field is gained, preventative measures can be put into place to decrease the risk of musculoskeletal disorders among teachers in the future.

As such, I kindly request your permission to conduct this study among primary school teachers of the public primary schools in the Central Durban area. Participation in this study will be voluntary and participants will only be required to complete a questionnaire, in their personal time so as not to disturb the teaching program. The information will remain confidential, and will be available in the form of a dissertation in the Durban University of Technology Library after the data has been captured and analyzed, and a conclusion drawn.

Attached please find copies of the Institute of Experimental and Clinical Research (IREC) clearance forms, as well as letter of information and informed consent to the targeted principals and primary school teachers.

Please contact me should you have any queries.

_____

Researcher: **Lindy Uhlmann (0826335158)**

Supervisors: **Dr JD Pillay (0313732398)**

Dr N Govender (031 3732796)

Appendix C: Approval from Kwa-Zulu Natal Department of Education

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Nomangisi Ngubene Tel: 033 392 1004 Ref.:2/4/8/348

Miss LS Uhlmann
PO Box 545
DALTON
3236

Dear Miss Uhlmann

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"PREVALENCE AND SELECTED RISK FACTORS FOR NECK, SHOULDER AND LOW BACK PAIN AMONG PRIMARY SCHOOL TEACHERS IN THE CENTRAL DURBAN AREA – A CROSS – SECTIONAL STUDY"**, in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 15 February 2015 to 15 February 2016.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Connie Kehologile at the contact numbers below.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report / dissertation / thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education (see list attached).

[redacted]
Nkosinathi S.P. Sishi, PhD
Head of Department: Education
Date: 03 February 2015

KWAZULU-NATAL DEPARTMENT OF EDUCATION

POSTAL: Private Bag X 9137, Pietermaritzburg, 3200, KwaZulu-Natal, Republic of South Africa
PHYSICAL: 247 Burger Street, Anton Lembede House, Pietermaritzburg, 3201. Tel. 033 392 1004
EMAIL ADDRESS: kehologile.connie@kzndoe.gov.za / Nomangisi.Ngubene@kzndoe.gov.za
CALL CENTRE: 0860 596 363; Fax: 033 392 1203 WEBSITE: www.kzneducation.gov.za

Appendix D: Focus Group Statement of Confidentiality and Code of Conduct

IMPORTANT NOTICE: This form is to be read and filled in by every member participating in the focus group, before the focus group meeting convenes.

CONFIDENTIALITY STATEMENT AND CODE OF CONDUCT: Focus group

1. All information contained in the research documents and any information discussed during the focus group meeting must be kept private and confidential. This is especially binding to any information that may identify any of the participants in the focus group.

2. None of the information shall be communicated to any other individual or organization outside of this specific focus group as to the decisions of this focus group.

3. The information from this focus group will be made public in terms of a dissertation/thesis and/or journal publication, which will in no way identify any of the participants involved in this focus group.

4. The returned questionnaires will be coded and kept anonymous in the research process.

5. The focus group may be either voice or video recorded, as a transcript of the proceedings will need to be made. The data will be stored securely under password protection.

6. All data generated from this focus group (including the recording) will be kept for five years in a secure location at Durban University of Technology and thereafter will be destroyed.

Once this form has been read and agreed to, please fill in the appropriate information below and sign to acknowledge agreement.

Please print in block letters:

Focus Group Member: _____Signature:_____

Witness Name: _____Signature:_____

Researcher's Name: _____Signature:_____

Supervisor's Name: _____Signature:_____

Co-supervisor's Name: _____Signature:_____

Appendix E: Letter of information and informed consent to the pilot group

Letter of Information and Informed Consent Confidentiality Statement

Dear Participant,

Thank you for taking part in my pilot study.

Title of the study:

Prevalence and selected risk factors for neck, shoulder and low back pain among primary school teachers in the Central Durban area – a cross-sectional study

Researcher:

Lindy Uhlmann 0826335158

Supervisors:

Dr JD Pillay 031 3732398

Dr N Govender 031 3732796

Purpose of the Study:

Musculoskeletal disorders (MSD), a common occupational health issue affecting the quality of life, are known to also affect the functioning of the peripheral nervous system as well as the musculoskeletal and neurovascular systems (Farlex, 2012 and Erick and Smith, 2011). It is caused or aggravated by prolonged, repetitive and awkward movements, poor posture and ergonomics or a fast-paced workload (Farlex, 2012). It therefore poses as a major economic burden, due to compensation costs and wages arising from the subsequent disability and long-term pain (Erick and Smith, 2011). The prevalence is significantly greater amongst school teachers (Erick and Smith, 2011). Recent studies suggests this high prevalence to be due to various factors such as heavy lifting, awkward postures, bending, twisting or stooping, prolonged sitting or standing and repetitive motions (Yue *et al.*, 2012).

The aim of this study is to:

- Determine the prevalence of neck, shoulder and low back pain among primary school teachers in the Central Durban Metropolitan area.

- Identify any risk factors associated with the development of neck, shoulder and low back pain among primary school teachers.
- Establish the relationship, if any, between the prevalence and risk factors for neck, shoulder and low back pain among primary school teachers.

Outline of the Procedures:

- All participants are invited to take part in this study by completing the given questionnaire.
- This is voluntary and the participant may at any time withdraw from the study.
- The questionnaire will take approximately 20 minutes to complete.
- The questionnaire will be collected with the consent form in two different boxes (Ballot Box Method) to ensure confidentiality of the participant.
- The researcher will review the data and make the necessary changes to the questionnaire.

Inclusion criteria:

- Participants must have been teaching full-time for more than a full school year.
- Teachers between the ages of 25-65 years of age

Exclusion criteria:

- Teachers over the age of 65 years
- Substitute teachers
- Part-time teachers
- Student teachers

Risks or Discomforts to the Subject:

None

Benefits:

Your participation in this study will assist in the generation of new knowledge regarding neck, shoulder and low back pain among primary school teachers. This will contribute to the formulation of prevention strategies for the risks of developing musculoskeletal disorders.

Reason/s why the Subject May Be Withdrawn from the Study:

None

Remuneration:

None

Costs of the Study:

None

Confidentiality:

All forms of consent and questionnaires will be collected in separate boxes to ensure confidentiality. The information obtained will be available in the form of a dissertation at the Durban University of Technology.

Research-related Injury:

None

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

In the event of any questions or queries, please do not hesitate to contact the following persons:

Researcher: Lindy Uhlmann on 0826335158

Alternatively the supervisors: Dr JD Pillay on 0313732398 or Dr N Govender on 031 3732796.

I_____

give the necessary consent for this study.

Signed_____ Date_____

Witness_____ Date:_____

Appendix F: Pre-amended Questionnaire

PARTICIPANT QUESTIONNAIRE

Participant Number:				
SECTION A				
Demographics				
Gender	Male		Female	
Age at last birthday				
Height (m):		Weight (cm):		
Social History				
Exercise				
What sport do you participate in?	1		2	
	3		4	
Do you have a regular exercise program?			Yes	No
How many hours do you exercise per week?				Hours
Stress				
Do you consider yourself to currently be under a high level of stress?			Yes	No
Are you currently receiving treatment medication/counselling for stress?			Yes	No
Are you currently receiving treatment medication/counselling for anxiety?			Yes	No
Are you currently receiving treatment medication/counselling for depression?			Yes	No
Medical History				
Do you have a history of the following conditions: (please tick where appropriate)				
Anaemia			Yes	No
High Blood Pressure			Yes	No
Thyroid disease			Yes	No
Depression			Yes	No
Seizures			Yes	No
Diabetes			Yes	No
Any severe injury/trauma			Yes	No
Did you receive treatment?			Yes	No
Do you suffer from any psychiatric conditions? *Please specify*				
State any medication that you take or are prescribed (if applicable):				
1.				
2.				
3.				
4.				
5.				
SECTION B				
Teaching History				
How long, in years, have you been teaching?				years
How many hours per week do you teach?				Hours

What grade/s do you teach?	Grade R	Grade 4	
	Grade 1	Grade 5	
	Grade 2	Grade 6	
	Grade 3	Grade 7	
	Other		
Are you involved in sports coaching?		Yes	No
If yes, please indicate the sport/s which you coach?			
How many hours per week are you involved in sports coaching?		Hours	
Are you involved in extramural activities?		Yes	No
If yes, please indicate the sport/s which you coach?			
How many hours per week are you involved in extramural activities?		Hours	
Do you work at a computer?		Yes	No
How many hours per week do you work at a computer?		Hours	
Do you get sufficient rest breaks between activities?		Yes	No
SECTION C			
Neck Pain			
Have you experienced neck pain in the last 12 months?		Yes	No
If yes to the above, what is the total length of time you have had neck pain?	0 days	More than 30 days but not everyday	
	1-7 days		
	8-30 days	Every day	
	Other		
Have you injured your neck?		Yes	No
Has your neck pain caused you to change jobs?		Yes	No
Does the pain occur at certain times of the day, week or month?		Yes	No
If yes to the above, please indicate at what time the pain occurs			
Please indicate whether the pain has:	progressed?	Yes	No
	remained constant?	Yes	No
	been relieved?	Yes	No
Please indicate which factors aggravate your neck pain?	Bending/twisting body	Standing	
	Lack of sleep	Stress/tension	
	Lying down	Sneezing/coughing	
	Reaching overhead	Walking	
	Sexual activity	Weather changes	
	Sitting		
	Other		
Please indicate which factors relieve your neck pain?	Bending/twisting body	Medication	
	Compression	Movement	
	Exercising	Relaxation	
	Heat	Sitting	

	Ice/cold	Sleeping		
	Lying down	Standing		
	Massage	Stretching		
	Other			
Does your job description require you to do any of the following: *(please tick)*	Bend your neck forwards?		Yes	No
	Bend your neck backwards?		Yes	No
	Twist your neck?		Yes	No
	Hold your neck in a forward bent posture for a prolonged time?		Yes	No
	Hold your neck in a backward bent posture for a prolonged time?		Yes	No
	Hold your neck in a twisted posture for a prolonged time?		Yes	No
Do you experience the entry of draughts/winds in your workplace?			Yes	No
Shoulder Pain				
Have you experienced shoulder pain in the last 12 months?			Yes	No
If yes to the above, what is the total length of time you have had shoulder pain?	0 days		More than 30 days but not everyday	
	1-7 days			
	8-30 days		Every day	
	Other			
Have you injured your shoulder?			Yes	No
Has your shoulder pain caused you to change jobs?			Yes	No
Does the pain occur at certain times of the day, week or month?			Yes	No
If yes to the above, please indicate at what time the pain occurs				
Please indicate whether the pain has:	progressed?		Yes	No
	remained constant?		Yes	No
	been relieved?		Yes	No
Please indicate which factors aggravate your shoulder pain?	Bending/twisting body	Standing		
	Lack of sleep	Stress/tension		
	Lying down	Sneezing/coughing		
	Reaching overhead	Walking		
	Sexual activity	Weather changes		
	Sitting			
	Other			
Please indicate which factors relieve your shoulder pain?	Bending/twisting body	Medication		
	Compression	Movement		
	Exercising	Relaxation		
	Heat	Sitting		
	Ice/cold	Sleeping		
	Lying down	Standing		
	Massage	Stretching		
	Other			
Does your job description require you to do any of the	Lift heavy loads (more than 5kg)?		Yes	No
	Pull or push heavy loads?		Yes	No
	Carry heavy loads?		Yes	No

following: *(please tick)*	Carry heavy loads in an awkward position?		Yes	No
	Carry heavy loads with the load far from your body?		Yes	No
	Carry heavy loads with a twisted trunk?		Yes	No
	Carry heavy loads with the load above chest height?		Yes	No
	Carry heavy loads with a load that is difficult to hold?		Yes	No
	Carry a very heavy load (more than 20kg)?		Yes	No
	Reach with your hands and arms?		Yes	No
	Hold your arm under shoulder level?		Yes	No
	Exert force with your hands or arms?		Yes	No
	Make small movements with hands/fingers at a high workplace?		Yes	No
Do you often have to pinch your hands during work?			Yes	No
Low Back Pain				
Have you experienced low back pain in the last 12 months?			Yes	No
If yes to the above, what is the total length of time you have had low back pain?		0 days	More than 30 days but not everyday	
		1-7 days		
		8-30 days	Every day	
		Other		
Have you injured your low back?			Yes	No
Has your low back pain caused you to change jobs?			Yes	No
Does the pain occur at certain times of the day, week or month?			Yes	No
If yes to the above, please indicate at what time the pain occurs				
Please indicate whether the pain has:	progressed?		Yes	No
	remained constant?		Yes	No
	been relieved?		Yes	No
Please indicate which factors aggravate your low back pain?	Bending/twisting body	Standing		
	Lack of sleep	Stress/tension		
	Lying down	Sneezing/coughing		
	Reaching overhead	Walking		
	Sexual activity	Weather changes		
	Sitting			
	Other			
Please indicate which factors relieve your low back pain?	Bending/twisting body	Medication		
	Compression	Movement		
	Exercising	Relaxation		
	Heat	Sitting		
	Ice/cold	Sleeping		
	Lying down	Standing		
	Massage	Stretching		
	Other			
Does your job description require you to do any of the following: *(please tick)*	Stand for a prolonged time?		Yes	No
	Sit for a prolonged time?		Yes	No
	Walk for a prolonged time?		Yes	No
	Stoop for a prolonged time?		Yes	No

	Bend slightly with your trunk?	Yes	No
	Bend heavily with your trunk?	Yes	No
	Twist heavily with your trunk?	Yes	No
	Twist slightly with your trunk?	Yes	No
	Bend and twist with your trunk?	Yes	No
	Work in a slightly bent posture for a prolonged time?	Yes	No
	Work in a heavily bent posture for a prolonged time?	Yes	No
	Work in a slightly twisted posture for a prolonged time?	Yes	No
	Work in a heavily twisted posture for a prolonged time?	Yes	No
	Work in a bent and twisted posture for a prolonged time?	Yes	No
	Work in uncomfortable postures?	Yes	No
	Work in the same postures?	Yes	No
	Make the same movements with your trunk?	Yes	No
	Make the same movements with your legs?	Yes	No
General Musculoskeletal Questions			
Does your job description require you to do any of the following: (please tick)	Make sudden, unexpected movements?	Yes	No
	Perform short, but maximal force-exertions?	Yes	No
	Exert great force on tools or machinery?	Yes	No
In your job, do you have:	Enough room around you to perform your work properly?	Yes	No
	Enough room above you to perform your work without bending?	Yes	No
	Difficulty in exerting enough force because of uncomfortable postures?	Yes	No
	Too few facilities to lean on during work?	Yes	No
	Trouble in reaching things with your tools?	Yes	No

Thank you for taking the time and making the effort to complete this questionnaire.

Appendix G: Letter of information and informed consent to the relevant principals

Letter of Information and Consent to the relevant principals:

Dear Sir/Madam,

I am currently a registered MTech: Chiropractic student at the Durban University of Technology. One of the requirements for this qualification is to conduct a research study. I would like to therefore request your permission to conduct the following study, entitled: "Prevalence and selected risk factors for neck, shoulder and low back pain among primary school teachers in the Central Durban area – a cross-sectional study."

The details of my intended study are briefly outlined below:

Researcher:

Lindy Uhlmann 0826335158

Supervisors:

Dr JD Pillay (PhD: Physiology) (0313732398)

Dr N Govender (PhD: Laboratory Medicine) (031 3732796)

Purpose of this study:

Musculoskeletal disorders (MSD), a common occupational health issue affecting the quality of life, are known to also affect the functioning of the peripheral nervous system as well as the musculoskeletal and neurovascular systems (Farlex, 2012 and Erick and Smith, 2012). It is caused or aggravated by prolonged, repetitive and awkward movements, poor posture and ergonomics or a fast-paced workload (Farlex, 2012). It therefore poses as a major economic burden, due to compensation costs and wages arising from the subsequent disability and long-term pain (Erick and Smith, 2011). The prevalence is significantly greater amongst school teachers (Erick and Smith, 2011). Recent studies suggests this high prevalence to be due to various factors such as heavy lifting, awkward postures, bending, twisting or stooping, prolonged sitting or standing and repetitive motions (Yue et al, 2012).

The aim of this study is to:

1) Determine the prevalence of neck, shoulder and low back pain among primary school teachers in the Central Durban area;

2) Identify any risk factors associated with the development of neck, shoulder and low back pain among primary school teachers.
3) Establish the relationship, if any, between the prevalence and risk factors for neck, shoulder and low back pain among primary school teachers.

Procedure:

- All primary school teachers who meet the inclusion criteria are invited to take part in this study by completing the given questionnaire.
- This is voluntary and the participant may at any time withdraw from the study.
- The questionnaire will take approximately 20 minutes to complete.
- The questionnaire will be collected with the consent form in two different boxes (Ballot Box Method) to ensure the participant remains anonymous
- The researcher will capture the data and have it analysed, and a conclusion will be drawn.

Inclusion criteria:

- Participants must have been teaching full-time for two or more years.
- Teachers between the ages of 25-65 years of age

Exclusion criteria:

- Teachers over the age of 65 years
- Substitute teachers
- Part-time teachers
- Student teachers

Risks or discomfort to the teachers:
None

Benefits of participation:
Your participation in this study will assist in the generation of new knowledge regarding neck, shoulder and low back pain among primary school teachers. This will contribute to the formulation of prevention strategies for the risks of developing musculoskeletal disorders.

Reason/s why the Subject May Be Withdrawn from the Study:

None

Remuneration:

None

Costs of the Study:

None

Confidentiality:

All forms of consent and questionnaires will be collected in separate boxes to ensure that the participant remains anonymous. The information obtained will be available in the form of a dissertation at the Durban University of Technology.

Research-related Injury:

None

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

In the event of any questions or queries, please do not hesitate to contact the following persons:

Researcher: Lindy Uhlmann on 0826335158

Alternatively the supervisors: Dr JD Pillay on 0313732398 or Dr N Govender on 031 3732796.

I_____,
principal

of _____, give the necessary consent for this study.

Signed_____ Date_____

Appendix H: Letter of information and informed consent to the teachers

LETTER OF INFORMATION TO PARTICIPANTS

Title of the Research Study: Prevalence and selected risk factors for neck, shoulder and low back pain among primary school teachers in the Central Durban area – a cross-sectional study

Principal Investigator/researcher: Lindy Uhlmann (BTech: Chiropractic)
Supervisor/s: Dr JD Pillay (PhD: Physiology) (0313732398)

Dr N Govender (PhD: Laboratory Medicine) (031 3732796)

Brief Introduction and Purpose of the Study:
Musculoskeletal disorders (MSD), a common occupational health issue affecting the quality of life, are known to also affect the functioning of the peripheral nervous system as well as the musculoskeletal and neurovascular systems (Farlex, 2012 and Erick and Smith, 2012). It is caused or aggravated by prolonged, repetitive and awkward movements, poor posture and ergonomics or a fast-paced workload (Farlex, 2012). It therefore poses as a major economic burden, due to compensation costs and wages arising from the subsequent disability and long-term pain (Erick and Smith, 2011). The prevalence is significantly greater amongst school teachers (Erick and Smith, 2011). Recent studies suggests this high prevalence to be due to various factors such as heavy lifting, awkward postures, bending, twisting or stooping, prolonged sitting or standing and repetitive motions (Yue *et al.,* 2012).

The aim of this study is to:

1) Determine the prevalence of neck, shoulder and low back pain among primary school teachers in the Central Durban Metropolitan area.
2) Identify any risk factors associated with the development of neck, shoulder and low back pain among primary school teachers.
3) Establish the relationship, if any, between the prevalence and risk factors for neck, shoulder and low back pain among primary school teachers.

Outline of the Procedures:

- All primary school teachers who meet the inclusion criteria are invited to take part in this study by completing the given questionnaire.
- This is voluntary and the participant may at any time withdraw from the study.
- The questionnaire will take approximately 20 minutes to complete.

- The questionnaire will be collected with the consent form in two different boxes (Ballot Box Method) to ensure the participant remains anonymous.
- The researcher will capture the data and have it analysed, and a conclusion will be drawn.

Inclusion criteria:

- Participants must have been teaching full-time for two or more years.
- Teachers between the ages of 25-65 years of age

Exclusion criteria:

- Teachers over the age of 65 years
- Substitute teachers
- Part-time teachers
- Student teachers

Risks or Discomforts to the Participant:
None

Benefits:
Your participation in this study will assist in the generation of new knowledge regarding neck, shoulder and low back pain among primary school teachers. This may contribute to the formulation of prevention strategies for the risks of developing musculoskeletal disorders in the future.

Reason/s why the Participant May Be Withdrawn from the Study:
None

Remuneration:
None

Costs of the Study:
None

Confidentiality:
All forms of consent and questionnaires will be collected in separate boxes to ensure that the participant remains anonymous. The information obtained will be available in the form of a dissertation at the Durban University of Technology.

Research-related Injury:
None

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

Please contact the researcher (0826335158.), my supervisor, Dr Pillay (0826039111) or Dr Govender (0842582795) or the Institutional Research Ethics administrator on 031 373 2900. Complaints can be reported to the DVC: TIP, Prof F. Otieno on 031 373 2382 or dvctip@dut.ac.za.

General:

Participation is totally voluntary. Participants may also choose to withdraw from the study at any time without penalty. Participation of this study will ensure total confidentiality of the questionnaires.

INFORMED CONSENT OF PARTICIPANTS

Statement of Agreement to Participate in the Research Study:

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

_____ _____ _____ _____

Full Name of Participant Date Time Signature / Right Thumbprint

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

_____ _____ _____

Full Name of Researcher Date Signature

_____ _____ _____

Full Name of Witness Date Signature

Appendix I: Final questionnaire

PARTICIPANT QUESTIONNAIRE

Participant Number:					
SECTION A					
Demographics					
Gender	Male		Female		
Ethnicity *(for statistical purposes)*	White	Black	Indian	Coloured	Other
Age at last birthday	years				
Height (m):		Weight (kg):			
Teaching History					
How many hours per week do you teach?	Hours				
How many hours per week do you mark?	Hours				
What phase do you teach?	Junior Primary (Gr 1-3)	Senior Primary (Gr 4-7)			
Does the pain occur at certain times of the day, week or month?	Yes	No			
If yes, please tick when the pain occurs:	Morning	Afternoon	Evening		
	Beginning of week	End of week	Weekend		
	Beginning of month	End of Month	Other (specify)		
Are you involved in any extramural and co-curricular activities?	Yes	No			
If yes, please indicate the activities?					
How many hours per week are you involved in extra- and co-curricular activities?	Hours				
How many hours per week do you work at a computer during office hours?	Hours				
How many hours per week do you work at a computer after office hours?	Hours				
Do you get rest breaks between activities?	Yes	No			
If yes, please specify how long your rest breaks are:	5-10min	10-20min			
	20-30min	>30min			
Social History					
Are you an active person?	Yes	No			
Do you have a gym exercise program?	Yes	No			
If yes, please specify by ticking the option that best applies:	1-2 times/week	3-4 times/week			
	>5 times per week	Other (specify)			
Do you have a cardio exercise program?	Yes	No			

If yes, please specify by ticking the option that best applies:		1-2 times/week		3-4 times/week
		>5 times per week		Other (specify)
How many hours do you exercise per week?				Hours
Have you sustained an injury from your active lifestyle?		Yes		No
What injury did you sustain?				
If yes, do you think it contributes to your neck and/or shoulder and/or low back pain?			Yes	No
Have you suffered any severe injury/trauma?			Yes	No
If yes, what type of trauma/injury did you suffer from?				
Did you receive treatment for it?			Yes	No
If yes, which treatment did you receive?				
Do you suffer from any medical conditions?			Yes	No
If yes, please specify the conditions:				
State any medication that you take or are prescribed (if applicable):				
How do you travel to school?	Car	Public transport	Bicycle	Walk
How long do you spend travelling to and from school per day?				Hours

SECTION B			
Neck and Shoulder Pain			
Does your job require you to do any of the following:	Hold your neck in a forward bent posture for a prolonged time?	Yes	No
	Hold your neck in a backward bent posture for a prolonged time?	Yes	No
	Lift heavy loads (more than 5kg)?	Yes	No
	Pull or push heavy loads?	Yes	No
	Carry heavy loads?	Yes	No
	Carry heavy loads in an awkward position?	Yes	No
	Carry heavy loads with the load far from your body?	Yes	No
	Carry heavy loads with a twisted trunk?	Yes	No
	Carry heavy loads with the load above chest height?	Yes	No
	Carry heavy loads with a load that is difficult to hold?	Yes	No
	Carry a very heavy load (more than 20kg)?	Yes	No
	Reach with your hands and arms?	Yes	No
	Make small movements with hands/fingers at a high workplace?	Yes	No
Are you right- or left-handed?		Right	Left

Have you experienced neck and shoulder pain in the last 12 months?			Yes	No
If you answered NO to the above, proceed to Low Back Pain section				
How often do you experience neck and shoulder pain?	Sometimes (monthly)		Often (weekly)	Always (daily)
Have you injured your neck and shoulders?			Yes	No
When did you injure your neck or shoulders?				
How did you injure your neck and shoulders?				
How severe was your injury?	Major (hospitalised)		Minor	
Has your neck and shoulder pain caused you to modify jobs?			Yes	No
Where does the pain occur?	Right side	Left side		Both sides
Does the neck and shoulder pain occur at certain times of the day, week, month or year?			Yes	No
If yes, please tick when the pain occurs:	Morning	Afternoon	Evening	
	Beginning of week	End of week	Weekend	
	Beginning of month	End of Month	Other (specify)	
Please indicate whether the neck and shoulder pain has:	worsened?		Yes	No
	remained constant?		Yes	No
	been relieved?		Yes	No
Have you seen any of the following practitioners for your neck and shoulder pain?			GP	
			Chiropractor	
			Physiotherapist	
			Biokineticist	
			Homoeopath	
			Self-treated	
			Other (specify)	
Has your neck and shoulder pain caused you to take time off work?			Yes	No
If yes, how much time has the pain caused you to take time off work?				
Please indicate which factors aggravate your neck pain?	Blackboard writing	Standing		
	Marking	Sitting		
	Computer work	Carrying of books		
	Reaching overhead	Other:		
Do you experience numbness or tingling in your hands and fingers?			Yes	No
If yes, in which hand/s does it occur?	Right	Left		Both
Are you in contact with any draughts or air conditioning?			Yes	No
If yes, does it have an effect on your neck and shoulder pain?			Yes	No
Back/Low Back Pain				
Does your job description require you to do any of the following: *(please tick)*	Stand for a prolonged time?		Yes	No
	Sit for a prolonged time?		Yes	No
	Walk for a prolonged time?		Yes	No
	Stoop for a prolonged time?			

	Work in a bent posture for a prolonged time?	Yes	No
	Work in a twisted posture for a prolonged time?	Yes	No
	Work in a bent and twisted posture for a prolonged time?	Yes	No
	Work in uncomfortable postures?	Yes	No
Have you experienced back pain in the last 12 months?		Yes	No
If you answered NO to the above, proceed to the end of the questionnaire.			

How often do you experience back pain?			<u>Sometimes (monthly)</u>	<u>Often (weekly)</u> / <u>Always (daily)</u>
Have you injured your back?				Yes / No
How did you injure your back?				
How severe was your injury?		Major (hospitalised)		Minor
Has your back pain caused you to modify jobs?				Yes / No
Does the back pain occur at certain times of the day, week, month or year?				Yes / No
If yes, please tick when the pain occurs:	Morning	Afternoon	Evening	
	Beginning of week	End of week	Weekend	
	Beginning of month	End of Month	Other (specify)	
Please indicate whether the back pain has:	progressed?			Yes / No
	remained constant?			Yes / No
	been relieved?			Yes / No
Please indicate which factors aggravate your back pain?	Blackboard writing	Standing		
	Marking	Sitting		
	Computer work	Carrying of books		
	Reaching overhead	Other:		
Have you seen any of the following practitioners for your back pain?			GP	
			Chiropractor	
			Physiotherapist	
			Biokineticist	
			Homoeopath	
			Self-treated	
			Other	
Has your back pain caused you to take time off work?			Yes	No
If yes to the above, how much time has the pain caused you to take time off work?				

Thank you for taking the time and making the effort to complete this questionnaire.