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BACKPACK CARRIAGE AND MUSCULOSKELETAL PAIN AMONG PRIMARY SCHOOL LEARNERS IN KING WILLIAMS TOWN, SOUTH AFRICA

BY

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A RESEARCH SUBMITTED TO THE FACULTY OF HEALTH SCIENCES IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE MASTERS IN PUBLIC HEALTH

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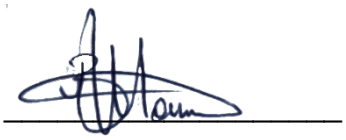
DECLARATION

I, Busisiwe Moni, declare that **BACKPACK CARRIAGE AND MUSCULOSKELETAL PAIN AMONG PRIMARY SCHOOL LEARNERS IN KING WILLIAMS TOWN, SOUTH AFRICA** is my own work, and that all the sources that I have used and or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other College, Technikon or University.



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CERTIFICATION

This mini-dissertation entitled **"BACKPACK CARRIAGE AND MUSCULOSKELETAL PAIN AMONG PRIMARY SCHOOL LEARNERS IN KING WILLIAMS TOWN, SOUTH AFRICA.",** meets the regulations governing the award of the degree of Master of Public Health of the University of Fort Hare and is approved for its contribution to scientific knowledge and literary presentation

DEDICATION

This wonderful work is dedicated to my late mother, Nomamerika Moni, she has been source of inspiration, engine of courage and secret to my achievements since my childhood. I also dedicate to my son, Luboneni Lunje Moni, as well as my Husband Buzwe Tsawu for all the love and support. This study is also dedicated to Professor DT Goon for believing in me and creating this opportunity for my study and growth.

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ABSTRACT

BACKGROUND: There is rising concern that kids are walking to school with too much weight on their backs. The weight of schoolchildren's backpacks is a persistent and divisive topic in the fields of education and health. Children who carry heavy backpacks are more likely to have back discomfort and musculoskeletal pain, which raises their risk of developing chronic back pain as adults. There is little research on this topic among South African school-age youngsters. The goal of the study was to find out how common low back and other musculoskeletal complaints were among primary school students who used a school bag.

RESEARCH AIM: The purpose of the study was to identify the prevalence and location of musculoskeletal discomfort in primary school students in King William's Town, South Africa, and describe their link with backpack use.

METHOD: In King Williams Town, Eastern Cape, South Africa, a descriptive cross-sectional survey was conducted among elementary school students between the ages of 9 and 14 years old. A systematic questionnaire and the Cornell Musculoskeletal Questionnaire were used to gather the data (body chart). Age, gender, and schoolbag details (style of backpack, carrying technique, and carrying time) were collected. The learner's waist, hip, and bag circumferences were all measured. On the data, descriptive and interferential statistics were used.

FINDINGS: The study's conclusions showed that students' musculoskeletal pain was brought on by the weight of their backpacks or school bags. The majority of the students (89.8%) complain about the difficulty they experience when lugging their heavy backpacks to class. In addition, 83.4% of the students had bags that weighed more than 10% of their body weight. Additionally, a sizable percentage of students (89.8%) carry a hefty bag to school every day and report feeling fatigued while doing so (90.8%). 90% of the students reported feeling discomfort before, during, or after carrying their schoolbags. This pain is related with carrying a schoolbag. The majority of students (53.5%) felt that their daily pain interferes with their ability to study. In order of severity, the majority of students report having discomfort in their shoulders (82.7%), lower back (59.9%), neck (47.0%), upper back (40.7%), and upper arm (16.4%).

CONCLUSION: According to the study, there is a link between students' musculoskeletal pain and carrying hefty backpacks or school bags. The shoulders are where musculoskeletal discomfort is most frequently felt. The study supported the findings of the majority of studies cited in the literature that most schoolchildren suffer from musculoskeletal pain because the weight of their backpacks is excessive compared to their size, weight, and age.

RECOMMENDATIONS: The study produced a number of recommendations, including that the Department of Basic Education inform teachers, students, parents, guardians, and other key stakeholders about the effects of heavy backpacks or schoolbags on students' musculoskeletal pain. For students' convenience and to lighten the load on their school bags, locker rooms should be available. Teachers, parents, and guardians should also pay attention to the school bags that students are using to make sure that the weight is appropriate for their age and body size.

KEY WORDS: Backpack carriage, musculoskeletal pain, backpacks, school going children, Buffalo City Metropolitan Municipality.

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LIST OF ABBREVIATIONS

BCMM:	Buffalo City Metropolitan Municipality
BMI:	Body Mass Index
BP:	Back Pain
EC:	Eastern Cape
ECDoE:	Eastern Cape Department of Education
ECDoH:	Eastern Cape Department of Health
KWT:	King Williams Town
LBP:	Low Back Pain
NP:	Neck Pain
RSA:	Republic of South Africa
VAS:	Visual Analogue Scale
WHO:	World Health Organization

CHAPTER 1: OVERVIEW OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND

Throughout the world, musculoskeletal pain in school-aged children is a significant cause of health concern (Pawaskar et al., 2018). Parents, teachers, and health professionals are concerned about how these childrens' health is impacted by carrying heavy schoolbags (Hernandez et al., 2020). Back pain in children is a real issue, and it appears that a number of factors are involved in its genesis. Between 8% and 74% of children and teenagers have had back pain at some point in their lives (Hernandez et al., 2020). School-age children range in age from 6 to 16 years, and throughout puberty and other times when skeletal and soft tissue growth is accelerated, these children go through a number of physical and psychological developmental stages. Any ongoing stress at this age could have long-term consequences that last into adulthood (Sankaran et al., 2021). The majority of children regularly endure musculoskeletal discomfort from carrying bulky backpacks or schoolbags to and from school, which is one of these stressors.

Learners all throughout the world use backpacks as a regular and required activity. In 2017, the American Academy of Orthopedic Surgeons and the Consumer Safety Commission stated that over 12,700 trips to doctors' offices, clinics, and emergency rooms were due to backpack injuries in kids between the ages of 5 and 18. According to a poll by the American Academy of Orthopaedic Surgeons, using heavy backpacks caused back and shoulder pain in 58% of children (American Academy of Orthopedic Surgeons, 2017). Children who experience additional spinal and shoulder tension may develop unneeded medical issues. Clinical issues include strained or fatigued muscles and nerve damage to the shoulder's anterior region as a result of strap placement (American Academy of Orthopedic Surgeons, 2017).

There is no international consensus on the maximum weight of schoolbags that should be carried by students, which makes it challenging to comprehend how schools, parents, and students adhere to the average weight of schoolbags. Additionally, the length of the trip is a role, but there has never been a systematic evaluation of cut-off values for

diagnosing pain caused by a schoolbag (Dockrell, Simms, & Blake, 2015). According to Dockrell et al. (2015), children can carry a schoolbag that weighs up to 10% of their own bodyweight in Europe and Australia, which is in line with the American Occupational Therapy Association's recommendations for the United States. The American Academy of Pediatrics recommends 10-20% bodyweight, while the American Physical Therapy Association suggests 10-15% bodyweight. School bags weighing more than 10% of the body weight increase energy consumption, cause the neck and trunk to slouch forward, reduce lung volume, and raise cardio-respiratory parameters, according to Geraldine et al. (2003). According to Chansirinukor et al. (2001), using a school bag causes the neck and trunk to shift forward, applying unnatural stresses to the body. The study also found that when wearing a hefty backpack, a forward head position grew. Learners who carry their bags improperly run the risk of developing postural issues and experiencing early muscle fatigue (Dockrell et al., 2006; Chansirinukor et al., 2001). The learner's body posture changes as their backpack weight increases, and their musculoskeletal system must react appropriately to make up for this stress.

Additionally, carrying a school bag or backpack on both sides, increases bending of the trunk and forward head posture, which in turn leads to musculoskeletal pain. Additionally, carrying a school bag or backpack on one shoulder or hand increases pressure on the opposite shoulder and hand and causes the spine to curve laterally (Venkatesan, Rosmah & Pedeliar, 2013). A few research revealed that a sizable proportion of kids had musculoskeletal pain associated with using a schoolbag (Puckree et al., 2004; Mwaka et al., 2014).

Due to changes in the South African National Curriculum, school bags' dimensions and weight have grown recently (Abrahams, Ellapen, van Heerden, & Vanker, 2011). Although worrisome evidence suggests that shoulder, back, and neck pain are common among South African schoolchildren, this impression has not been supported by rigorous research (Puckree et al., 2004). According to Puckree et al. (2004), the carrying of large school backpacks by children in South Africa is a suspected etiological cause. This unrecognized physical strain on learners has a negative impact on the health of their spines. Despite the health issues addressed at the worldwide and regional levels, little

study has been done on the relationship between carrying a schoolbag or backpack and musculoskeletal pain among students in South Africa.

The need to comprehend and examine the epidemiology of musculoskeletal health problems within the context of schoolbag or backpack carriage among primary school students of King Williams Town in the Eastern Cape Province resulted from the paucity of research in the context of South Africa as well as a wide range of discrepancies in the literature. This assumption served as the foundation for the study's attempt to assess the association between primary school learners' body weight, school bag weight, and musculoskeletal pain.

1.2 PROBLEM STATEMENT

Schoolchildren's regular tasks include carrying backpacks, which may have some potentially dangerous effects on their health, such as changed stride, poor posture, and discomfort (Javadivala, Allahverdipour, Dianat, & Bazargan, 2012). Researchers and school health professionals are concerned about the long-term effects of students carrying heavy weights on a regular basis (Brackley, Stevenson, & Selinger, 2009). Children who attend school today have back pain, which can impede everyday activities. Given the risks involved with using and weighting children's school bags improperly, back pain in students is a significant health concern (Farhood, 2013). Learner's musculoskeletal issues are most frequently brought on by muscular sprains and strains sustained when playing, falling, and carrying heavy backpacks. The growing spine may experience problems due to the weight of the school backpack and the detrimental effects of carrying big loads (Dockrell, Cane, & O'keeffe, 2006).

Children carrying backpacks heavier than the suggested safe load limits of 10% to 15% of the student's body weight have drawn objections from a variety of stakeholders in school health worldwide (Lyer, 2001). According to several research, carrying a hefty schoolbag is associated with musculoskeletal pain and discomfort (Diamat et al., 2013; Grimmer & Williams, 2000).

Limited prior research on musculoskeletal pain in school-aged children has been found in South Africa, and the government currently lacks data on how learners are using their

schoolbags, particularly day learners who journey to school each day. This study's goal was to determine whether the weight of the backpack affects back discomfort and musculoskeletal issues.

1.3 AIM OF THE STUDY

The aim of the study was to determine the prevalence and site of musculoskeletal pain and describe their relationship with backpack use in primary school children in King William's Town, South Africa.

1.4 RESEARCH OBJECTIVES

The objectives of the study were to:

- Determine the prevalence, site of musculoskeletal pain associated with schoolbag carriage among school learners
- Determine relationship between the school bag weight percentage to body weight and musculoskeletal pain
- Determine school learner's perception about schoolbag carriage and musculoskeletal pains.

1.5 RESEARCH QUESTIONS

The research questions framed for the study:

- What is the prevalence of musculoskeletal pain associated with schoolbag carriage among primary school learners in King Williams Town area?
- Is there any relationship between the school bag weight percentage to body weight and musculoskeletal pain?
- What is the perception of school learners about schoolbag carriage and musculoskeletal pains?

1.6 SIGNIFICANCE OF THE STUDY

This study may allow for accurate prediction of the prevalence of musculoskeletal pain and discomfort caused by use of heavy backpacks among the adolescent community because reliable data on the prevalence of musculoskeletal pain and discomfort are lacking in Buffalo City District, Eastern Cape, South Africa. This knowledge may influence preventive measures and/or health regulations intended to lessen musculoskeletal discomfort in school-aged children.

The study's findings will inform parents, teachers, and learners about how to stop musculoskeletal pain brought on by carrying a hefty backpack. It will include prevention measures and instruct them on more secure ways to transport their backpacks to and from school. Additionally, it will educate them on the recommended backpack weight for school-age children to carry as well as carrying techniques to reduce student musculoskeletal pain. As a result, the study's findings will benefit both parents and teachers in their efforts to encourage primary school learners to carry secure backpacks. The study's findings will raise awareness of learners' musculoskeletal pain brought on by carrying large backpacks and sports bags. The results of the study can be used to develop pertinent national policy for the health care and education sectors on the safety of backpacks for school-age children.

1.7 DELIMITATION OF THE STUDY

The focus of the study was on musculoskeletal complaints and bag carrying among primary school students in grades 3–7. Only kids between the ages of 7 and 14 were examined. Only the area surrounding King Williams Town was used for the study. The portion of Buffalo City outside of King Williams Town was excluded. Any orthopedic issues, such as leg length difference, foot ankle abnormalities, or children using wheelchairs that could affect anthropometric measurements of height and weight were grounds for exclusion from this study.

1.8 DEFINITIONS OF TERMS

Backpack: A school backpack that students wear on their backs while attending class.

Musculoskeletal pain: Pain in the muscles, joints, ligaments, tendons, and other parts of the musculoskeletal system that support the neck, shoulders, and back.

Ergonomic factors: Include the way you carry your backpack, how long you wear it for, how you stand while carrying it, how long the straps are, and what's inside.

Lower back pain: A pain or discomfort felt in the lower back area.

Method of carriage: Using one or both of the backpack's straps, you can carry the bag by placing it on one or both shoulders.

Type of backpack: Backpack types include those with one strap, two straps, and trolley bags.

1.9 CHAPTER OUTLINE

The chapters in the study are outlined in the following way:

Chapter 1: Introduction and overview of the study

The chapter provided the study rationale (introduction), problem statement, aim of the study, major assumptions about the study and its significance.

Chapter 2: Literature review

It dealt with the conceptual literature review based on the views of different scholars, related to schoolbag/backpack carriage and musculoskeletal pain internationally and nationally.

Chapter 3: Research methodology and data collection

It outlined the data presentation, on how the study was conducted and methods that were be used to gather or collect information from the participants.

Chapter 4: Data analysis

The chapter dealt with the analysis of data, its interpretation and discussion of the results/findings.

Chapter 5: Summary, conclusion and recommendations.

It focused on the summary, conclusion and provided necessary recommendations for the study.

1.10 SUMMARY

The introduction and context were thoroughly discussed in the study's first chapter. In order to establish a basis for the study's goal, problem statement, objectives, and research questions, the study's background was investigated. The objective of the next chapter is a review of the literature on the relationship between carrying a schoolbag or backpack and musculoskeletal discomfort among students globally, regionally, and in the context of South Africa.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter analyses a wide range of research on the occurrence and location of musculoskeletal pain linked to carrying a backpack among students in King Williams Town, Eastern Cape Province. Additionally, it discusses the connection between musculoskeletal pain, schoolbag weight as a percentage of body weight, and learner perceptions of these issues in South Africa, Africa, and globally. The search techniques used to get the material are discussed in the section below. This section covers the conceptual framework and empirical examination of the literature.

2.2 SEARCH METHODS

Electronic search databases applied were Google Scholar, Science Direct, Scopus, EMBASE, ERIC, Medline, and Web of Science, EBSCO host, PubMed, BIOMED Central, and African Journal Online. The basic search phrases were: "schoolbag or backpack carriage" OR "musculoskeletal pains" AND "school learners". Only peer-reviewed and relevant documents published in English were retrieved for review.

2.3 PREVALENCE AND SITE OF MUSCULOSKELETAL

Concern over school-age children's musculoskeletal health is spreading around the world (Rajan & Koti, 2013). Concerns about school-age children carrying backpack burdens beyond the advised safe load limits of 10% to 15% of body weight have been raised by parents, school administrators, and health professionals (Iyer, 2001). Early in the morning, it's usual to see kids stooped over as they walk to school because of the weight of their backpacks (Khalid et al., 2018). Over time, repeated trauma to the musculoskeletal system results in musculoskeletal pain. In the neck, upper back, shoulders, arms, and hands, it predominantly damages muscles and tendons and also harms nearby nerves and joints (Brzk et al., 2017). Around the world, more than 90% of students wear backpacks. The best posture is one that causes the least amount of stress and strain and promotes the body's greatest effectiveness (Kistner et al., 2013).

The backpack is the most generally used equipment for carrying goods for everyday labour in the modern world. Climbers, soldiers, schoolchildren, and university students frequently utilize various sorts of rucksacks for their unique needs (Mansoorian etal., 2018). Around the world, kids use backpacks to transport their school materials between home and school. The spine of a kid grows at its fastest pace between the ages of 10 and 12 for females and 13 to 15 for boys, with the secondary foci of ossification not fully fusing until the mid-twenties. Proper backpack use is essential to preventing postural abnormalities at this point, when the spine may be more vulnerable to harm. (2010) Ramprasad, Alias, and Raghuveer, 2010). According to a 2009 research by Brackley, Stevenson, and Selinger, the spinal curve develops when the backpack is loaded to 15% of the user's body weight.

Over 2 million children between the ages of 5 and 14 are treated annually for musculoskeletal disorders, costing an estimated $7 billion, according to the Bone and Joint Decade (Mohammadi et al., 2017). Low back discomfort affects 10 to 30 percent of healthy teenage children, according to studies (Brzk et al., 2017; Mohammadi et al., 2017). According to a research by Talbott et al. (2009) at the University of Cincinnati College in Cincinnati, Ohio, 33.5 percent of the students experienced pain when using a backpack. One of the reasons of children's musculoskeletal issues is their school backpacks (Dockrell et al., 2015). Heavy school bags can cause musculoskeletal issues, postural alterations, and injury to the spine (de Paula et al., 2015). (Dianat et al., 2011). A school backpack's weight is a risk factor for back discomfort, which can have adult-level symptoms (de Paula et al., 2015).

Many complaints of the neck, shoulders, lower back, and other possible risk factors are brought on by the usage of school bags (Dianat et al., 2011; Dianat et al., 2014; Dockrell et al., 2015; Al-saleem et al., 2016). To preserve musculoskeletal function, it is essential to identify symptoms in the neck, shoulders, wrists, back, knees, and feet as soon as possible (Tomaru et al., 2019).

Children frequently complain of musculoskeletal pain brought on by normal activity (Cattalini & Cimaz, 2017). Gender is linked to the high frequency of related musculoskeletal issues. Since it can be challenging to diagnose musculoskeletal limb

symptoms in children, early preventative and treatment efforts are essential (Fuglkjr et al., 2017). There should be safeguards and appropriate backpack load restrictions since schoolchildren have a relatively high frequency of musculoskeletal ailments (Dianat, Javadivala, and Allahverdipour, 2011). Children's posture and gait alterations may result from the usage of an inappropriate backpack.

2.3.1 International Perspective on musculoskeletal pain

Global research have revealed that schoolchildren experience pain or discomfort in their musculoskeletal system (Iyer, 2001; Negrini et al., 2007; Grimmer et al., 2000). Numerous physiological reactions, biomechanical stressors, and a high prevalence of musculoskeletal complaints connected to the recurrent stress of backpack carrying have been assessed and discovered by research investigations (Grimmer et al., 2000; Negrini et al., 2007; Pascoe et al., 1997; Wang et al., 2001)

According to earlier research, learners carry their daily textbooks in backpacks and use other tools and equipment throughout the day (Mohammadi etal., 2012). Therefore, the factors that contribute to changes in the direction and curvature of the spine, as well as musculoskeletal disorders and pains like backaches and shoulder pain, include overweight carrying tools, habits, manners, and the length of time spent carrying a backpack. Additionally, research has shown a direct impact of backpack use on the lumbar lordosis of school-age adolescents (Zakeri et al., 2016). The findings of earlier research suggested that backpacks should include a broad shoulder strap or a pad to give comfort by dispersing weight on learner’s shoulders, since previous studies had shown a high frequency of musculoskeletal problems caused by wearing large backpacks (Lasota, 2014). The backpack need to have a back pad to evenly distribute the weight across the body, which would carefully safeguard kids' bodies (Mwaka et al., 2014).

Numerous research have investigated the connection between musculoskeletal load and kids' backpacks (Adeyemi, Rohani & Abdul Rani, 2014; de Paula, Silva & Silva, 2015; Dockrell, Simms & Blake, 2015). Musculoskeletal issues may limit a child's ability to exercise (Krul et al., 2009). However, it is challenging to diagnose musculoskeletal symptoms, necessitating the use of preventative techniques (Fuglkjaer, Dissing & Hestbk,

2017). Use a high-quality questionnaire to obtain accurate findings from the musculoskeletal assessment (Tomaru et al., 2019). Researchers looked at the connection between schoolbags and musculoskeletal symptoms among 529 primary school learners, the majority of whom carried backpacks (93.8%) and carried them over their shoulders (89.7%) (Dockrell, Simms & Blake, 2015). Idiopathic musculoskeletal discomfort was reported by as many as 165 youngsters in India (55.2 percent) (Kumar et al., 2017). Children's lower limbs tend to experience musculoskeletal complaints more frequently than their upper limbs do (Fuglkjr, Dissing & Hestbk, 2017). More than 70% of the 615 samples of pre-adolescents (7 to 12 years old) show that the weight of a backpack significantly affects back discomfort (Adeyemi, Rohani & Abdul Rani, 2014).

According to the American Academy of Orthopedic Surgeons (2018), children and teens may experience issues if their backpacks are too heavy or are worn inappropriately. Backpacks worn improperly can harm joints and muscles. In addition to postural issues, this can cause excruciating back, neck, and shoulder discomfort. According to Mackenzie et al. (2003), a number of risk factors, such as the total weight carried, the frequency and duration of carrying the weight, and the way the weight is carried, have an impact on the musculoskeletal system and can influence how frequently school-age children experience musculoskeletal pain and discomfort. Back discomfort is a health issue for school children, restricting their everyday activities, according to research by Rodriguez-Oviedo et al. (2012) on a cross-section of Spanish school-going children. The study also states that experts advise against having schoolchildren carry loads greater than between 10% and 15% of their body weight. According to the study's findings, 61.4 percent of participants carried backpacks weighing more than 10% of their body weight, while 18.1 percent carried bags weighing more than 15% of their body weight. Additionally, 25.9 percent of participants said they had back pain for more than 15 days in the year prior. Girls showed a larger risk of back discomfort than boys did, with the youngsters carrying the heaviest backpacks having a 50% higher risk of back pain and a 42% higher chance of pathology. Children also had discomfort in their upper bodies, including their neck, shoulders, and upper back, in addition to low back pain. Carrying large burdens is linked to pain in certain locations (Haselgrove et al., 2008).

Whittfield et al. (2005) study examined the incidence of musculoskeletal problems among 140 learners from five secondary schools. We measured the weight of the pupils' bodies and their backpacks. They came to the conclusion that carrying a big school bag contributes to symptoms in the neck, shoulder, upper, and lower back. With the use of standing magnetic resonance imaging, Neuschwander et al. (2010) studied the impact of backpacks on school-age children's lumbar spines. The study's goal was to gauge healthy children's lumbar spine responses to school bag loads. They came to the conclusion that children who carry heavy backpacks have a large amount of back discomfort, which may be brought on by changes in the height or curvature of the lumbar disc.

According to a research by Ogana (2016), the majority of the 379 schoolchildren interviewed reported feeling pain when carrying their backpack. According to the study, 16.9 percent of students had neck discomfort and 25.1% of students reported having lower back pain; backpack weight was also a risk factor for musculoskeletal pain. Additionally, just 16 percent of the students carried backpacks that were less than 10% of their body weight, while 28% of the students carried bags that were 15% heavier. Another research conducted in Northeast England in 2002 revealed a prevalence of low back pain of 24%, with females being more at risk than boys. In a research conducted in Northwest Iran in 2013, Dianat et al. (2013) found that females were more likely than boys to experience low back, neck, and shoulder complaints.

According to Negrini and Negrini's 2007 study in Italy, 58.4% of 11-year-old children who wore backpacks weighing up to 20 percent of their body weight reported experiencing pain more at least once in their lifetime. Shamsodinni et al. (2010) discovered that secondary school students' complaints of shoulder, neck, back, and extremity discomfort appeared to be substantially correlated with the weight of their backpacks. This study supports the findings of Farhood (2013), who showed that carrying a large school bag was related to lower back discomfort in 56.7 percent of participants and shoulder pain in 35.1 percent.

Evidence from the study by Dockrell, Simms, and Blake (2015), however, shows that schoolbag weight is not a contributing factor in primary school learners' back or shoulder discomfort. This could be because the youngsters were only exposed for a brief time while

the schoolbags were filled; otherwise, the results would have been different. Most of the kids in the research commuted to school by automobile in many instances. As a result, the average time spent in the carriage was 10.9 minutes. The length of the ride may also depend on the student's educational level and how far the classrooms are from one another. For example, most elementary school students spend the entire day in the same courses; only secondary and high school students switch classes. However, most of the kids wore backpacks that were heavier over the suggested limit of 10% of their body weight. On average, 12.6 percent of their body weight was taken up by their school backpacks.

According to Dianat, Sorkhi, Pourhossein, Alipour, and Asghari-(2013) Jafarabadi's study, neck issues are associated with carrying the schoolbag for longer lengths of time each day. The study also discovered that carrying a school bag on both shoulders was the best way to carry a school bag and that no technique of carrying a school bag increased the risk of neck, back, or shoulder pain. It has been shown that carrying a bag on one shoulder increases your chance of developing back and shoulder pain. Other research also support the practice of carrying a schoolbag on both shoulders (Korovessis et al., 2005; Pascoe et al., 1997).

2.3.2 African perspective on musculoskeletal pain

Few research have looked at the issue of musculoskeletal pain among school-age children in Africa, much less the connection between backpack use and musculoskeletal discomfort (Mwaka et al., 2014; Johnson et al., 2011). Notably, these few studies were carried out in Nigeria, Cameroon, Kenya, and Uganda (Johnson et al., 2011; Abaragou et al., 2020; Guessogo et al., 2020; Ogana, Osero & Wachira, 2017; Mwaka et al., 2014). They revealed that a sizable number of kids experienced musculoskeletal pain that is connected to schoolbag use. Although there are conflicting recommendations for backpack weights, experts concur that many children's backpacks are hefty and should be kept under a certain weight to prevent musculoskeletal issues (Cavallo et al., 2002; Dianat et al., 2012). According to a study by Johnson et al. (2011), there has been a significant increase in low back discomfort among children and adolescents in Nigeria, which made research on backpack weights in this population necessary. There is a

significant prevalence of musculoskeletal discomfort among secondary school students in Nigeria, according to a different study by Abaragou et al. (2020), but it is unrelated to carrying a bag. They advise more study to determine the causes of the musculoskeletal pain and to develop effective therapies to lessen its effects in this group (Abaragou et al., 2020).

According to Guessogo et al. (2020)'s study, the schoolbag weight in Cameroon is higher than average by worldwide standards and is linked to frequent musculoskeletal discomfort. Therefore, schoolchildren's musculoskeletal suffering is linked to carrying large schoolbags. The method of transportation to and from school is a major risk factor for developing musculoskeletal discomfort, and students who speak French at school experience less neck pain than students who use English at school (Guessogo et al., 2020).

According to Ogana, Osero, and Wachira's (2017) study in Kenya, there is a significant prevalence of musculoskeletal discomfort associated with backpack use among school-age children in that country. Students with backpacks that weigh more than 15% of their body weight (BTSW) are more likely to develop musculoskeletal discomfort (Ogana, Osero & Wachira, 2017).

Mwaka et al. (2014) study conducted in Uganda, highlighted that 37.8% of students reported having low back discomfort, with male students being less severely affected than female students. Boys may, however, underreport their symptoms and worry less about them than females do (Dianat, Sorkhi, Pourhossein, Alipour, & Asghari-Jafarabadi, 2013). There is no gender difference in back pain, according to a recent research (Adeyemi et al., 2014).

2.3.3 South African perspective on musculoskeletal pain

Concern has been expressed on a national and international level regarding the increase in musculoskeletal pain cases among schoolchildren who use backpacks. The severity of this issue in South Africa, however, has not been adequately documented. The only notable research done in South Africa found that although the majority of the children's bags were less than or equal to 10% of their body weight, a statistically significant

percentage of them still reported considerable pain (Puckree et al., 2004). The discomfort of the schoolchildren has been linked to a large increase in the weight and size of the school backpacks (Johnson et al., 2011). In a retrospective study that tracked the frequency of musculoskeletal pain caused by carrying a school bag among adolescent students in the eThekwini area of Kwa-Zulu Natal, South Africa showed that 64.97% of the group has musculoskeletal pain from carrying a school bag and the spinal column and shoulders were the two anatomical regions where discomfort was most common (Abrahams et al., 2011). The weight of the backpack and the narrowing of the craniovertebral angle were significant risk factors for the pain, and the participants feel musculoskeletal pain from carrying their school bags (Abrahams et al., 2011). Other South African research, however, have not concentrated on identifying links between musculoskeletal discomfort and characteristics associated with students' school bags.

2.4 RELATIONSHIP BETWEEN THE SCHOOL BAG WEIGHT PERCENTAGE TO BODY WEIGHT AND MUSCULOSKELETAL PAIN

The pediatric age group frequently reports health issues related to excessive schoolbag weight (Mwaka, Munabi & Ochieng, 2014). Numerous body biomechanics problems or ailments, including alterations in posture and balance in the sagittal plane, spine curvature, consistency of repositioning, and musculoskeletal pain, are linked to carrying large schoolbags (Chow et al., 2006; Dockrell, Simms & Blake, 2015; Al Shahry et al., 2018). Studies examining the relative weight restriction of schoolbags, which has less of an influence on the imbalance of physiological and biomechanical processes, are based on the specific scenario of musculoskeletal discomfort (Dockrell, Simms & Blake, 2015;Al Shahry et al., 2018). Previous research revealed that in order to prevent musculoskeletal discomfort, schoolbags should not exceed 10-15 percent of a child's body weight (Poornajaf et al., 2016;Sahib, 2016).

As youngsters lean forward to support the weight on their backs rather than their shoulders because the backpack is heavier, greater pressure is placed on the spinal column and back muscles, leading to the development of neck and back pain (Puck Ree et al., 2004). Numerous youngsters wear backpacks that weigh more than 10% of their body weight (Mwaka et al., 2014). There have been reports of backpacks weighing up to

20% of the children's individual body weights (Iyer et al., 1999). In a different study, Wang et al. (2001) found that even a school bag that weighed 10% of the schoolchild's body weight caused the trunk to slant forward. Therefore, if body inclination results in low back issues, school bags weighing 10% of the child's body weight are too heavy for them to carry (Wang et al., 2001). Other studies have advised limiting the weight of a child's school backpack to no more than 10% of the child's body weight due to the observed aberrations in spinal posture (Lohman et al., 2006).

Schooling occurs during adolescents' vulnerable development spurts and alterations to their musculoskeletal systems (Milbradt et al., 2011; Rodrigues et al., 2008). Postural alterations brought on by excessive loads on these structures are extremely likely to happen in children at this age because they are prone to a variety of variables that make them more likely to develop poor posture (Brackley & Stevenson, 2004; Hong & Cheung, 2003; Pascoe et al., 1997). Students carry roughly the same quantity of educational materials for each grade, however the amount varies between grades. Students' weight varies widely for a variety of factors, including age and heredity. The burden of their baggage affects each student differently. This exposes pupils to a variety of health problems, most notably MSP (George et al., 2015). However, the most compelling estimates are not to surpass 10% of their body weight (Drza-Grabiec, 2013; Goodgold et al., 2002; Moore et al., 2007). The suggested bag pack weight by health organizations varies, ranging from not exceeding 5% to 20% of the student's body weight (Rai & Agarawal, 2013). Numerous studies show that students carry backpack packs weighing more than 10% of their body weight (Al Hazzaa, 2006; Limon et al., 2004). Several studies have reported heavy bag packs are also linked to MSP (Papadopoulou et al., 2014; Paui & Rausavljevi, 2009; Paui et al., 2013; Walicka-Cupry et al., 2015).

Transporting and carrying a bag that weighs more than the advised limit puts you at danger, and as children and teenagers are still developing their neuromusculoskeletal systems, their risk is exacerbated (Quintana et al., 2005). According to the International Chiropractic Pediatric Association (ICPA), a child's school backpacks shouldn't carry more than 15% of their body weight (Dianat et al., 2013). The shift in posture caused by a hefty backpack that weighs more than 15 percent of the student's body weight can

cause discomfort in the upper-, mid-back, neck, and low back in addition to more localized symptoms such headaches, muscular weakness, tingling in the arms, and slouched posture (Moore et al., 2007; Ingrid et al., 2016; Avantika & Shalini, 2013). Compared to children with rucksack weights under 10%, those with backpack weights over 10% have a greater prevalence of musculoskeletal discomfort (Bauer & Freivalds, 2009).

The bulk of reports indicate that student loads are higher than the advised limits, according to research in this field, even if average loads vary widely between studies (Gimmer & Williams, 2000). According to some experts, children's frequent claims of back discomfort may be caused in part by their usage of heavy backpacks (Negrini & Carabalona, 2002). While the lifetime prevalence of low back pain (LBP) in children has been estimated to be as high as 65% (Negrini, 2000), it typically varies from 30% to 50%. (Kjaer et al., 2011) The suggested load limits of 10 percent to 15 percent of a child's body weight (BW) by various health professional groups are based on the theory that too-heavy a school bag causes LBP (Haselgrove et al., 2008). Although similar weight restrictions have been advocated in a number of states or nations, there is still debate in the research on the impact of backpack weight on childhood back discomfort. Backpack loads should be lowered since they commonly cause discomfort and exceed the limitations established for adults (Wedderkopp et al., 2005), as well as because backache risk factors include tiredness from carrying a backpack and the length of time it is carried on the shoulders.

Contrarily, some research indicate that although back discomfort is common in youngsters, it is not related to how much weight is carried in a backpack and may result from causes other than mechanical ones (Watson et al., 2003; Kaspiris, 2010; Yamato et al., 2018; Oka et al., 2019). Many nations, like India, have sought to determine a precise body weight percentage to limit the weight carried by students in their school backpacks (Dockrell, Simms & Blake, 2013; PTI, 2018). There are no established worldwide rules on this topic, and European nations have backpack weight restrictions of 10% of body weight whereas American occupational therapy suggests a limit of 15% of body weight. There isn't enough conclusive data to support the claims made in certain research that body mass index (BMI) and gender differences are important factors in the causes of low back pain in school-aged children (Al-Aseem et al., 2016; Adeyemi, Rohani & Rani, 2015).

For students in grade 10, the Ministry of Human Resource Development in India has suggested a bag weight of up to 5 kg, 4.5 kg for grades 8 and 9, and 4 kg for grades 6 and 7. (Sankaran et al., 2021). According to earlier surveys, private schools have a bigger baggage than public schools. Although it hasn't been well studied, the effect of the backpack on musculoskeletal pain (MSP) in both public and private schools (Sankaran et al,, 2021). Given the diversity of the literature, it is unclear to healthcare professionals and the general public if there is a need to place restrictions on the weights that children can carry in their backpacks and what modifications should be made in light of these children's demographics (Sankaran et al., 2021).

2.5 LEARNER'S PERCEPTION ABOUT SCHOOLBAG CARRIAGE AND MUSCULOSKELETAL PAINS

Children have a significant impact on a nation's demographic dynamics. They will grow up to become tomorrow's parents and grownups. Therefore, safeguarding children's health, especially during their formative years, is essential since being unwell often will hinder students' ability to study in the classroom. This action will guarantee that the children obtain the intended basic necessities, including a fulfilling life, health, identity, and education, without endangering their health (Gillam, Yates, & Badrinath, 2012). Investigating the health issues affecting children is crucial for achieving this aim since it calls for action at the individual, family, community, and societal levels as well as cross-disciplinary and intersectional cooperation. Concern over school-age children's musculoskeletal health is one of the issues of worldwide concern (Gillam et al., 2012).

Continuous usage of a backpack causes the back to adjust for the weight being carried, resulting in a forward lean that impairs posture, increases muscle strain, and irritates the muscles (Cavallo et al., 2002). According to a different study by Chiang et al. (2006), carrying a school bag dramatically changed the posture and gait of kids between the ages of 11 and 13 by shortening strides, increasing stride frequency, and encouraging a more forward lean of the trunk (Chiang et al., 2006).

Studies have shown that carrying a schoolbag affects the likelihood that primary school students will experience musculoskeletal symptoms like pain and discomfort in various

body regions. These variables include the weight of the bag, how it is carried, the length of the strap, and the amount of time spent carrying the bag (Javadivala et al., 2012; Mwaka et al., 2014). Despite being included as one of the variables that may affect the development of musculoskeletal complaints, there is no reported optimal strap length for any age or height. Therefore, it follows that there are no established standards or benchmarks by which strap lengths can be compared.

2.6 SUMMARY

Children across the world who attend school now frequently wear backpacks. Studies mentioned in the literature before have demonstrated that people who carry backpacks for school may have musculoskeletal diseases including discomfort and pains. Concern has been expressed on a national and international level regarding the increase in musculoskeletal pain cases among schoolchildren who use backpacks. However, at the time of this investigation, the scope of the issue in South Africa was not well known. Studies carried out elsewhere concentrated on identifying relationships between musculoskeletal discomfort and parameters related to school bags, such as bag weight, bag content, and the ratio of the weight of the backpack to the student's weight. This study aimed to learn more about these documented school bag factors in the population of South Africa school-going children where there is a paucity in terms of available literature. The study also examined crucial aspects of the use of school bags that were not previously documented, such as how the student perceives the weight of the bag and the carrying position.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter's goal is to go into more detail on the research design as well as the numerous methods and tools that were used to collect the study's data. In addition to the study population and its inclusion criteria, sample size, sampling strategy, source and method of data collecting, data analysis methodologies, validity and reliability of the research instrument, and ethical issues are all covered in the chapter's opening section.

3.2 RESEARCH DESIGN

In order to ascertain the prevalence of low back and other musculoskeletal symptoms linked with schoolbag use among primary school students, the study was a school-based cross-sectional quantitative epidemiologic investigation. This cross-sectional methodology was chosen due to its many benefits, including its affordability, speed, ability to estimate the prevalence of an outcome, and ability to simultaneously evaluate many outcomes and risk factors (Walsh, 2001).

3.3 POPULATION

The target population was made up of students in Buffalo City Metropolitan Municipality, Eastern Cape, South Africa, who were enrolled in public and private elementary schools and ranged in age from 7 to 14. Following contact with and consent from the Department of Basic Education, pertinent school principals, and parents, study participants were chosen. The study used the quintile system in selecting the respondents in the targeted primary schools. For example, the poorest (Quintile 1), next poorest (Quintile 2) which are classified as “no fee paying schools) and the least poor (Quintile 5) which are classified as “fee paying” were included in the study in order to gather up different perspectives on musculoskeletal pain.

3.4 SAMPLING

3.4.1 Sample size estimation

In this case, there were 9641 children in total throughout the 50 primary schools in King Williams Town, Buffalo City District, which determined the sample size. Using EPINFO 7, a sample of 463 was taken from a population of 9641, with a 95% confidence level, to create a sample of 370. The sample size was 463 individuals after taking into account a 25% contingency for missing data and multiple comparisons in the data analysis. The sample size allows for the most precise generalization while maximizing representativeness.

3.5 SELECTION AND RECRUITMENT OF PARTICIPANTS

3.5.1 Participants who fulfilled the following criteria were included in the study

Children aged 7 to 14 who went to a public or private school in the King Williams Town region, who could walk on their own, and who carried a school bag while standing on a scale were included in the study. Participants with orthopedic issues, such as leg length disparity, foot ankle abnormalities, or any kid using a wheelchair that could affect anthropometric measurements of height and weight were excluded from the study.

3.6 INSTRUMENTATION

Data were gathered using a standardized questionnaire that was created by the researcher. The questionnaire was broken down into three sections, including the learner's perception of the weight of their backpack and any musculoskeletal issues they may have had while using their backpacks. The demographic profile, anthropometry (height, weight, hip, and waist circumference), and weight of school backpack were also covered.

The study made use of the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ), which was created by Professor Alan Hedge and graduate ergonomics students at Cornell University (Hedge et al., 1999). It includes a list of questions along with a body map illustration showing the frequency of musculoskeletal aches and pains in various

body regions. It focuses on musculoskeletal pain associated to carrying a backpack and is used for screening reasons. This is done to aid the students in giving more correct answers to the questions asked, and the use of VAS in conjunction with a questionnaire is quite popular in studies involving school-aged children because it is much simpler for them to comprehend because it is more pictorial than verbal.

3.7 DATA COLLECTION PROCEDURE

The researcher collected data with the help of 4 research assistants who received a day of rigorous training before beginning data collection (University Students). The training was organised for the research assistants to enable them to become competent in all aspects of the project, (i.e. anthropometric measurements and questionnaire administration). Prior to the real data collection, a pilot research was conducted with 10 primary school students from one school in King Williams Town. The children were not allowed to take part in the primary investigation. To ensure inter-test reliability of measurement, the study ensured this by training data collectors, providing them with a guide for recording their observations, monitoring the quality of the data collection over time, and offering a chance to discuss difficult issues or problems.

3.7.1 Pilot Study Procedures and methods of collecting data Used

The students were already sat at their desks and had their backpacks next to them when the researcher entered the classroom the school principal had provided. When the researcher arrived, the instructor who had agreed to help with data collection had to leave because of other commitments. Each learner in the classroom received a copy of the survey. Only the willing participants and those whose assent (since the learners had not reached the legal consent to participate in the activity an assent was sought from them) was obtained were given the questionnaire after the purpose and nature of the study were described and read to the participants.

3.7.2 School backpack weight and Anthropometric measurements

All anthropometric measurements were taken according to the recommendations of the International Society for the Advancement of Kinanthropometry (ISAK) (Norton, 2018).

Each student was invited to get up and present all of the bags that they use to go to and from school. We measured the weight of their bodies and their students' backpacks. The learner's weight was initially measured while wearing a backpack before it was removed. Two measurements—one with and one without a backpack—were obtained to assure accuracy. Calculated was the ratio of bag weight to body weight.

The body weight of the learner's was measured in light clothing without shoes using a calibrated digital electronic weighing scale (Seca 813, Seca, UK) to the nearest 0.1 kilogramme. The learners were not wearing any shoes or headgear and were standing comfortably when they were measured. The weighing scale was set to zero and put in the designated room on a flat surface. A calibrated vertical stadiometer (Seca Portable 217 Seca, UK) was used to measure height to the nearest 0.1 centimetre. The waist and hip circumferences were measured with a Lufkin non-extensible flexible anthropometric tape (W606PM, Rosscraft, Canada) and recorded to the nearest 0.1 centimetre. Standing still, the participant's waist was measured by wrapping the measuring tape at the level of the narrowest point between the lower costal border (tenth rib) and the iliac crest. At the level of the greater trochanter, which is the widest part of the buttocks, the hip circumference was measured. By dividing the waist circumference by the hip circumference, the waist-to-hip ratio was calculated. By dividing the waist circumference by the height, the waist-to-height ratio was calculated. These measurements were done with minimal clothing as per the recommendations in the ISAK protocol.

Another measurement that was done by the research was the measurement of straps (short and long straps) of the school bags that were carried by the learners in school. This was important in order to understand the distribution of the weight of the backpack. Straps were also used if the padding of the shoulders offered comfort and protection of shoulders from excessive pressure. The length of the straps was quite prudent in understanding they were a proper fit for proper positioning.

The students were then interviewed in the same classroom the school administrator offered, first using the structured questionnaire and then the Cornell Musculoskeletal questionnaire, which listed the body parts affected by the use of a backpack.

The students were asked to identify on the body map, Cornell musculoskeletal questionnaire, the body region they felt achy or uncomfortable while carrying their backpacks or afterward. This was done to make sure that the pain the students were feeling was coming from using the backpack.

3.7.3 Interview with learners

With the help of the school principal and teachers, a large, peaceful classroom free from interruptions was set up to be used for the interview with the students. The class teacher chose the participants at random based on their availability because they have different sports commitments on different days, at different hours, and after school, among other factors. The teacher gave notice to the students and their parents of the date, time, and length of the pilot study, which would take 45 to 60 minutes to complete.

It was intended to measure and interview each of the ten participants who were available that day during or after school, whenever it was suitable for the students and the teachers to avoid interfering with their academic work. The interview environment was positive. The students approached the interview with positivity and enthusiasm.

Based on assessments of the pilot study, the measuring methodologies were modified and corrected. The lead investigator oversaw the data collection procedure every day to make sure it was accurate, thorough, and consistent. As a result, changes and improvements were made prior to the beginning of the following workday.

3.7.4 Questionnaire administration

The students were asked to complete the questionnaire in a special room provided by the school's principal. Only consenting participants and those whose informed consent was obtained were given the questionnaire after explaining the study's purpose and nature to them.

All students who were present at the time of the study and whose parents gave approval were included. The study eliminated both pupils with musculoskeletal issues who were also not enrolled in the school at the time the data were collected.

A visual analogue scale (VAS) (United States Acute Pain Management Guideline Panel, 1992) was used as a pain scale survey to understand varying degrees of pain experienced by the pupils in relation to musculoskeletal pain from carrying school bags.

3.8 ETHICAL CONSIDERATIONS

The University of Fort Hare's Human Research Ethics Committee gave their approval to this project **(REF: FER011SMON01)**. Prior to collecting data, approval from the Department of Education and school administrators was obtained. Before the interview could begin, a written informed consent form was given home with each student and required to be signed by their parents.

In order to confirm that they were willing to take part in the study, the participants were required to sign a consent form. The researcher also read the permission form to participants in a language they could understand.

The researcher employed an assent form to obtain consent before interviewing school-age children older than seven years old. The researcher did this by explaining the research's contents in simple, child-friendly language that was kept to a minimum. The form was signed by the researcher, the learners, and the parents, while a copy was handed to the parents.

Since there will be no harm from participating in the study, ethical factors such as confidentiality and anonymity, fair treatment, beneficence, and harm prevention were given careful attention.

3.8.1 Informed consent

The study's goal, aims, and aim were fully disclosed in the informed consent form that participants were required to sign.

3.8.2 Confidentiality and anonymity

The researcher made sure that the information gathered from the participants was kept private and used only for the study's goals and objectives.

3.8.3 Respect and dignity

The decision to engage in a study or not is entirely up to the respondents, and there is no pressure to do so. Participants were made aware of their freedom to choose whether or not to engage in the study willingly. They were made aware that they might revoke their consent and stop taking part without being intimidated.

3.8.4 Validity and reliability of instrument

The researcher made sure that none of the work or data used in the planned study was faked or altered in any manner.

To reduce inter-observer variation, the measurements were regularly made by the same assessor. Before usage, each measuring device was calibrated for validity and accuracy. In order to determine the logistical and technical steps for data collection as well as to confirm the validity of techniques to ascertain the prevalence of low back and other musculoskeletal pains associated with backpack use, a pilot test with ten students was also conducted prior to data collection.

The reliability of the CMDQ has been confirmed and validated. According to Sim and Wright (2005), the correlation between VAS responses and T-CMDQ frequency scale responses was 0.617 to 0.917 across body areas. The Spearman correlation coefficients across body parts ranged from 0.463 to 0.834 (i.e., p 0.005), indicating a positive association between VAS ratings and T-CMDQ severity scale scores. For frequency, severity, and interference scales, the reliability Kappa coefficients varied from 0.564 to 0.948, 0.589 to 0.972, and 0.598 to 0.944, respectively (Sim & Wright, 2005). The frequency, severity, and interference scales each had a Cronbach's alpha score of 0.876, 0.895, and 0.875, respectively, indicating a good level of internal consistency for the T-CMDQ (Bland & Altman, 1997).

3.9 DATA ANALYSIS

Statistics that combined descriptive and inferential methods were used to analyze the data. The data on the socio-demographic parameters were summarized using descriptive statistics, such as means, frequency counts, and percentages. Student t-tests were used to compare the variations in all variables between males and females. In unadjusted analysis, stratified analysis, and multivariate models, the relationship between demographic and anthropometric variables and the prevalence of low back and other musculoskeletal problems related to schoolbag use was examined. The statistical significance of relationships between musculoskeletal pain and each of the category independent factors was examined using the chi-squared test for independence. The corresponding indicators of the strength and direction of relationships were odds ratios. Odds ratios less/greater than one indicate the existence of a negative/positive association, whereas odds ratios less/equal to one indicate the lack of an association. All analyses were presented with a 95% confidence interval, and a p-value of less than 0.05 was regarded as statistically significant. The Statistical Package for Social Sciences (SPSS), version 24.0 for Windows, was used for all statistical analyses (SPSS Inc., Chicago, IL, USA).

3.10 SUMMARY

This chapter contains a list of the analysis techniques employed in the study. The demographic, sampling, methods of sampling, and techniques of data collection, including data analysis, were all described, along with the methodology and design of the study. Its main objective was to fairly explain and defend the study's methodology and design, along with a thorough analysis of the research process, sampling strategies, and data gathering. The research strategy was directed by the study's aims. The presentation of the findings, analysis, and interpretation of the findings regarding the prevalence and location of musculoskeletal pain related to schoolbag carrying among students are covered in the next chapter.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter summarises the findings of data collection related to the prevalence, location, and musculoskeletal discomfort associated with carrying a schoolbag among students, as well as the relationship between the proportion of body weight that the school bag contributes to and musculoskeletal pain. Additionally, the findings regarding the learner's perspective of carrying a schoolbag and musculoskeletal pain. Similar to that, this chapter presents the discussion of the results.

4.2 DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS

Shown in Table 4.1 is the demographic characteristics of the participants. The information that was sought included the following: gender, age, race, home language, school and grade. The mean age of study participants was xx years (SD=xx years). Most of the study participants were females (66.0%), predominantly in the age group of 10-11 years (50.5%), black Africans (89.6%), and of IsiXhosa speaking (84.6%). In addition, the highest number of learners were from Schornville school (148/26.1%), followed by West Bank school (141/24.8%), while Dale Junior had the least learners (61/10.1%). Most of the learners were in grade 5 (157/27.6%) and grade 4 (134/23.6%).

Table 4.1: Demographic characteristics of participants

Variables	Frequency	Percentage
Gender		
Male	193	34.0
Female	375	66.0
Age (years)		
7-8	23	4.0
8-9	83	14.6
10-11	287	50.5
12-13	169	29.8
14 and above	6	1.1

Race		
African	509	89.6
White	21	3.7
Coloured	35	6.2
Indian	3	0.5
Home language		
IsiXhosa	479	84.3
English	43	7.6
Afrikaans	28	4.9
Other	18	3.2
School		
Dale Junior	61	10.7
Kingsridge	117	20.6
Schornville	148	26.1
St Thomas	101	17.8
West Bank	141	24.8
Grade		
Grade 3	104	18.3
Grade 4	134	23.6
Grade 5	157	27.6
Grade 6	124	21.8
Grade 7	49	8.6

4.3. TRANSPORTATION TO SCHOOL AND TIME DURATION OF CHILDREN WHO WALK TO OR FROM SCHOOL

As shown in Table 4.2, 318 (56.0%) of the learners indicated that they are being driven to school by car, and by taxi (206/12.6%). Only a small proportion walked to school (3.2%). In terms of the time taken to travel to school; children who walk to or from school, 416 (73.2%) spent less than 10 minutes in walking to school; 81 (14.3%) between 11 and 15 minutes; 49 (8.6%) between 16 and 30 minutes; while 22 (3.9%) between 30 and above minutes.

Table 4.2: Mode of transportation to school and time duration

Variables	Frequency	Percentage
Transport mode		
Walking	18	3.2
Car	318	56.0
Bus	17	3.0
Taxi	206	36.3
Other	9	1.6

Trip duration (minutes)		
< 10	416	73.2
11-15	81	14.3
16-30	49	8.6
30 and above	22	3.9

In the study, students were exposed to several modes of transportation, and one student stated during interviews that;

> *I walk every day from home to school and that usually takes less than 30 minutes as I do not stay far away from school. However, a majority of students in my class are privileged enough that they use cars and other modes of transport to get to school and this takes them a short time to get to school. They are either drop off by parents during school runs and in some instances they use scholar transport.* (Interview with Participant 1)

The aforementioned statement is consistent with the data shown in the table above, which shows that the majority of students commute to school in either cars or taxis (scholar transport). In comparison to pupils who would walk to school, this guarantees that they travel less time.

4.4 BAG CARRYING EXPERIENCES

The majority of the learners indicated carrying a heavy schoolbag to school (510/89.8%), takes breaks from carrying bag (419/73.8%), felt tired carrying heavy bag (516/90.8%). In addition, majority of the learners spent less than 10 minutes daily in carrying schoolbag (388/68.4%), and those who spent 10-20 minutes carrying schoolbag were 131(23.1%). The daily frequency of bag carriage shows the majority of the learners carry their schoolbag twice to and from school (408/72.0%).

Table 4.3: Bag carrying experiences of the learners

Variables	Frequency	Percentage
Whether school bag is heavy		
Yes	510	89.8
No	58	10.2
Taking breaks from carrying bag		

Yes	419	73.8
No	149	26.2
Whether carrying bag is tiring		
Yes	516	90.8
No	52	9.2
Daily duration of carrying bag		
<10 minutes	388	68.4
10-20 minutes	131	23.1
20-30 minutes	39	6.9
30 minutes and above	9	1.6
Daily frequency of carrying bag		
Once-to school only	44	7.8
Twice-to & fro school	408	72.0
Over twice-Classes & Break	112	19.8
Other	3	0.5

When quizzed about the bag carrying experiences during interviews, learners indicated the following:

> *I carry a heavy bag to school every day during the schooling days. I cannot accurately measure the weight of the bag but I know that I carry it every day to and from school. The only time I get to take a break from carrying my bag is when I am in class but apart from that it is always on my back* (Interview with Participant 2)

> *Carrying a bag to school frequently is very tiring considering that I walk to school on a daily basis. In a majority of cases, my schoolbag is always heavy and I take more than 30 minutes to walk from home to school* (Interview with Participant 3)

During interviews, students mentioned carrying large luggage and feeling exhausted as aspects of the experience. Additionally, kids take brief rests while carrying their luggage because they typically do so when going to school or returning home, especially for those who are walking.

4.5 BAG CARRYING STYLE

Most of the learners were sports participants (363/63.9%). A majority carried extra bag for sports item (303/53.3%), affirmed carrying their schoolbag on both shoulders (470/82.7%), and one shoulder (88/15.5%). Majority of the learners carried all their books home daily (358/63.0%), and there was no locker to keep the books at school (564/99.3). In terms of the bag carrying style, a majority of the learners (470/82.7%) indicated that they used both shoulders, meanwhile (88/15.5%) used one shoulder. Other learners opted for a sling bag (1/0.2%) and a push-pull-trolley bag (9/1.6%). Books were identified as one of the essential goods carried by learners in their schoolbags and when quizzed on whether they carry books daily home, a majority (358/63.0%) indicated that they carry them home daily while (210/37.0%) revealed that they did not. This is largely owed to the unavailability of learners as indicated by a majority of the learners (564/99.3%).

Table 4.4: Bag carrying style of the learners

Variables	Frequency	Percentage
Sports participation		
Yes	363	63.9
No	205	36.1
Need for extra sports bag		
Yes	303	53.3
No	265	46.7
Style of carrying bag		
One shoulder	88	15.5
Both shoulders	470	82.7
Sling bag	1	0.2
Pull-Push-trolley bag	9	1.6
Carrying all books home daily		
Yes	358	63.0
No	210	37.0
Locker availability		
Yes	4	0.7
No	564	99.3

The learners as represented in the above table experienced different bag carrying experiences. In order to explain further these experiences, learners during interviews highlighted the following in the excerpts below:

Apart from schooling, I am also involved in sporting activities and thus my school bag carries both books and my sporting gear and equipment as well. Therefore, my bag needs to be supplemented by a bigger one so I can be able to carry all of my books and sporting items to school (Interview with Participant 4)

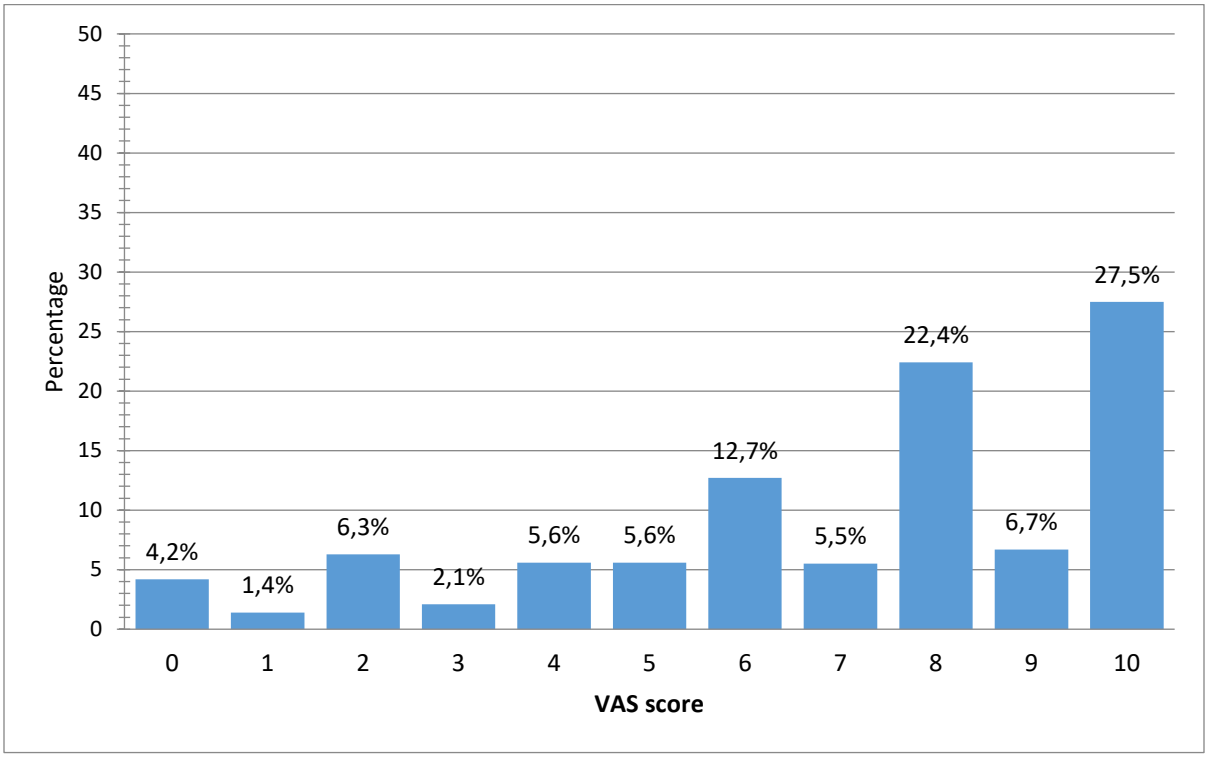
I usually carry a backpack to school on my back and thus I use both my shoulders in carrying my bag. Furthermore, I carry my books to and from home daily as there are no lockers available in the school where we can keep our books safe (Interview with Participant 5)

In addition to academics, students participate in extracurricular activities at school, such as sports, which has increased the weight of their bags. Additionally, students said that these backpacks needed to be expanded to fit all of their books and athletic gear. Students use both shoulders to carry their belongings by using backpacks as part of their carrying practice. To and from home, this is a daily occurrence. The issue is made worse by the lack of locker facilities, which forces students to carry all of their textbooks and sporting goods every day.

4.6 VISUAL ANALOGUE SCALE (VAS)

The Visual Analogue Scale scores ranged between 0 and 10. More than a quarter of the participants scored 10 (156 (27.5%), followed by those who scored 8 (127/22.7%), and 6 scoring (72/12.7%) (Figure 4.1). The other scores received the following results; 0 (4.2%), 1 (1.4%), 2 (6.3%), 3 (2.1%), 4 (5.6%), 5 (5.6%), 7 (5.5%) and 9 (6.7%).

Figure 4.1: Distribution of VAS scores among the participants



4.7 PAIN EXPERIENCES

The majority of the learners expressed pain while carrying schoolbag to school (487/85.7%); and felt the pain during and after carrying the schoolbag (250/45.7%). The location of the pain was mostly felt on both shoulders (325/58.1%) followed by the lower back (140/25.0%), while the frequency of the pain was felt everyday (368/65.7%). Overwhelming majority of the learners indicated the pain they experienced is associated with the schoolbag carriage (521/91.7%).

Table 4.5: Pain experiences of schoolbag carriage

Variables	Frequency	Percentage
Pain when carrying bag		
Yes	487	85.7
No	81	14.3
Stage of feeling pain		
During	165	30.2
After	132	24.1
Both	250	45.7
Location of pain when carrying bag		
One shoulder	64	11.4
Both shoulders	325	58.1
Lower back	140	25.0
Other	30	5.4
Frequency of pain		
Once a week	83	14.8
Twice a week	54	9.6
Thrice or more a week	55	9.8
Every day	368	65.7
Whether school bag causes the pain		
Yes	521	91.7
No	47	8.3

Students were negatively impacted by the pain associated with carrying baggage to and from school every day. During the interview process, some of the pains were openly acknowledged. As a result, students agreed with the following statements:

> *I feel pain in my back in a majority of the times when I am carrying my school bag. This pain is felt on a daily basis and usually feel it the most the most at the end of the day when I am home and trying to rest* (Interview with Participant 6)

> *I carry a heavy back pack to school and this has resulted in pain in both of my shoulders. The weight of the school bag is usually felt within the shoulders and the situation has been worsened by the fact that I carry the bag to school on a daily basis* (Interview with Participant 2)

While carrying their school bags, the students complained of back and shoulder ache (often both). The everyday carrying of these suitcases to and from school made this agony

worse. As a result, students connected this discomfort to their experiences carrying their school bags.

4.8 EXTENT OF PAIN IN PAST WEEK

With regard to extent of pain, 227 (41.1%) of learners felt moderate pain while 165 (29.9%) felt severe pain from carrying the school bags during the week before data collection week. Most of the learners agreed that the pain interferes with their school work (304/53.5%), others disagreed (138/24.3%), and yet some were not sure (126/22.2%). The majority of participants felt the pain daily (284/51.9%) followed by 165 (30.1%) who felt the pain once or twice in the previous week.

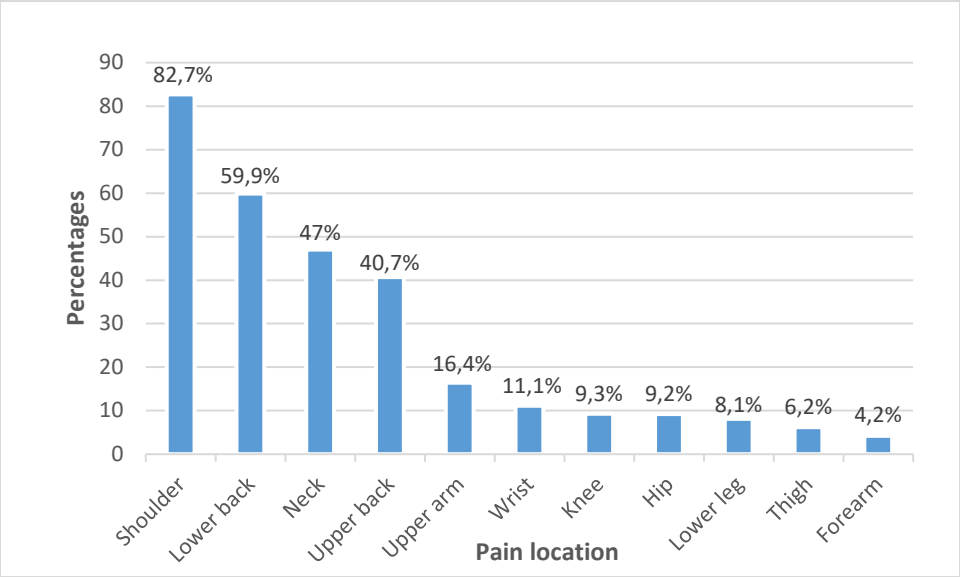
Table 4.6: Extent of pain in past week

Variables	Frequency	Percentage
Pain frequency in past week		
1-2 a week	165	30.1
3-4 a week	99	18.1
Once daily	173	31.6
Daily-several times	111	20.3
Extent of pain		
Slight	160	29.0
Moderate	227	41.1
Severe	165	29.9
Pain interference with school work		
Yes	304	53.5
No	138	24.3
Don't know	126	22.2

4.9 PAIN LOCATION

Figure 4.2 displays proportion of the pain location associated with schoolbag carriage by the learners. Learners indicated having pain in the order of severity as follows: shoulder (82.7%), lower back (59.9%), neck (47.0%), upper back (40.7%), upper arm (16.4%), wrist (11.1%), knee (9.3%), hip (9.2%), lower leg (8.1%), thigh (6.2%) and fore arm (4.2%).

Figure 4.2: Pain location



In terms of the pain location, learners during the interview highlighted the following:

> *I usually experience pain in the shoulders (usually both) because I carry a backpack to and from school on a daily basis* (Interview with Participant 3)

> *My back is usually affected due to the heavy school bag that I carry to school. I always feel pain in my lower back* (Interview with Participant 4)

As a result of carrying bags, students sometimes feel a variety of pains, the shoulders and lower back being the most typical. However, students also mentioned pain in their necks, upper backs, upper arms, wrists, knees, hips, lower legs, thighs, and forearms during the administration of the survey questionnaire.

4.10 OBSERVATIONAL CHECKLIST

As indicated in Table 4.7 below, the vast majority of the learners use backpacks as their school bags (545/96.0%). Most of them use their bags to carry books, stationery, sports kit and lunch (237/41.7%), 190 (33.5%) carried books, while 190 (33.5%) stationery only. Most of the learners carried their bags on both shoulders (407 /71.7%), and 142 (25.0%)

use one shoulder. Most of learners use short strap length when carrying their school bags (326/57.5%) and most had an upright posture (324/57.1%).

Table 4.7: Observational checklist

Variables	Frequency	Percentage
Type of bag		
Backpack	545	96.0
Sling bag	2	0.4
Trolley bag	10	1.8
Other	11	1.9
Bag contents		
Books & Stationery	190	33.5
Books-Stationery and Sportskit	25	4.4
Books-Stationery-Sportskit and Lunch	237	41.7
Other	116	20.4
Bag carrying style		
Sling bag on one shoulder	9	1.6
Push-pull trolley back	10	1.8
Backpack on one shoulder	142	25.0
Backpack on both shoulders	407	71.7
Strap length		
Long strap backpack	241	42.5
Short strap backpack	326	57.5
Posture		
Stoop	243	42.9
Upright	324	57.1

4.11 MULTIVARIATE LOGISTIC REGRESSION ANALYSIS

This part of the analysis corresponds to the hypothesis of association between musculoskeletal pain and age, gender, body weight, bag weight, bag contents, strap length, posture, bag carrying method and duration of carriage. The results presented above show that 89.8% of the learners found their school bags to be heavy and 85.7% felt pain from carrying their bags. The analysis presented below is based only on those who felt the pain and the association between pain site and each of the independent variables.

Musculoskeletal pain was measured as present or absent binary variable, that is, whether the learner felt pain at a particular body site or not. The independent variables were all

measured on a categorical scale, except body and bag weight, which were measured in kilograms. The relationship between musculoskeletal pain and body and bag weight was tested through comparison of mean body and bag weight of the learners who felt the pain against those who did not experience the pain.

The results of the analysis are presented separately for each independent variable across all the pain location sites The majority of the learners had bag weight greater than 10% of body weight (475/83.4%).

4.12 MUSCULOSKELETAL PAIN AND GENDER

Shown in Table 4.8 is the association between gender and pain site. There was a statistically significant association between gender and wrist pain (Chisq=4.01; p=0.045). Since the p-value is less than the significance level of 0.05, the hypothesis of no association between gender and wrist pain is rejected. Male learners are more likely to feel wrist pain compared to female learners (OR=1.8; 95% CI: 1.01-3.08). Among the 487 learners who felt any pain from carrying their school bags, 154 (31.6%) were males and 333 (68.4%) females. Of the 154 males, 25 (16.2%) felt wrist pain compared to 33 (9.9%) of the 333 females. The percentage of males who felt wrist pain is higher than the percentage of females who felt wrist pain.

Table 4.8: Association between gender and pain site

Pain site	Gender	Pain presence		Total	Chisq	df	p-value	OR	95% CI	
		Yes	No						Lower	Upper
Neck	Male	72 (46.8)	82 (53.2)	154 (31.6)	0.58	1	0.448	0.9	0.59	1.26
	Female	168 (50.5)	165 (49.5)	333 (68.4)						
Shoulder	Male	127 (82.5)	27 (17.5)	154	3.80	1	0.051	0.6	0.34	1.01
	Female	296 (88.9)	37 (11.1)	333						
Upper back	Male	67 (43.5)	87 (56.5	154	0.01	1	0.907	1.0	0.70	1.50
	Female	143 (42.9)	190 (57.1)	333						
Upper arm	Male	34 (22.1)	120 (77.9)	154	2.73	1	0.099	1.5	0.93	2.42
	Female	53 (15.9)	280 (84.1)	333						
Lower back	Male	102 (66.2)	52 (33.8)	154	0.05	1	0.818	1.0	0.70	1.57
	Female	217 (65.2)	116 (34.8)	333						
Forearm	Male	4 (2.6)	150 (97.4)	154	1.61	1	0.205	0.5	0.16	1.50
	Female	17 (5.1)	316 (94.9)	333						
Wrist	Male	25 (16.2)	129 (83.8)	154	4.01	1	0.045	1.8	1.01	3.08

	Female	33 (9.9)	300 (90.1)	333						
Hip/Butt	Male	17 (11.0)	137 (89.0)	154	0.15	1	0.703	1.1	0.61	2.10
	Female	33 (9.9)	300 (90.1)	333						
Thigh	Male	13 (8.4)	141 (91.6)	154	1.63	1	0.202	1.6	0.77	3.38
	Female	18 (5.4)	315 (94.6)	333						
Knee	Male	16 (10.4)	138 (89.6)	154	0.03	1	0.870	1.1	0.56	1.98
	Female	33 (9.9)	300 (90.1)	333						
Lower leg	Male	19 (12.3)	135 (87.7)	154	3.44	1	0.064	1.8	0.96	3.42
	Female	24 (7.2)	309 (92.8)	333						

4.13 MUSCULOSKELETAL PAIN AND AGE

The association between age and pain site is display in Table 4.9. Musculoskeletal pain was significantly associated between age and neck (Chisq=13.4, p=0.004), shoulder (Chisq=8.4, p=0.039), upper back (Chisq=12.9, p=0.005), lower back (Chisq=23.9, p<0.001) and fore arm (Chisq=8.3, p=0.040) pain. Learners at age 8-9 years (OR=0.5; 95% CI: 0.27-0.87) and 10-11 years (OR=0.5; 95% CI: 0.32-0.72) were significantly less likely to experience neck pain compared to the 12 years and above. Similarly, the 8-9 years (OR=0.3; 95% CI: 0.18-0.64) and 10-11years (OR=0.3; 95% CI: 0.21-0.53) learners were significantly less likely to feel lower back pain compared to those older than 12 years. Learners 10-11 years were significantly less likely to feel shoulder (OR=0.5; 95% CI: 0.27-0.95) and upper back (OR=0.5; 95% CI: 0.32-0.78) pain compared to the older children.

Table 4.9: Association between age and pain site

Pain site	Age (years)	Pain presence		Total	Chisq	p-value	OR	95% CI	
		Yes	No					Lower	Upper
Neck	7-8	9 (50.0)	9 (50.0)	18	13.36	0.004	0.6	0.24	1.69
	8-9	29 (43.3)	38 (56.7)	67			0.5	0.27	0.87
	10-1	106 (43.3)	139(56.7)	245			0.5	0.32	0.72
	12+	96 (61.1)	61 (38.9)	157					
Shoulder	7-8	18 (100.0)	0 (0.0)	18	8.36	0.039			
	8-9	60 (89.6)	7 (10.4)	67			0.9	0.35	2.33
	10-11	203 (82.9)	42 (17.1)	245			0.5	0.27	0.95
	12+	142 (90.4)	15 (9.6)	157					
Upper back	7-	9 (50.0)	9 (50.0)	18	12.95	0.005	0.8	0.32	2.25
	8-9	27 (40.3)	40 (59.7)	67			0.6	0.32	1.02

	10-11	89 (36.3)	156 (63.7)	245			0.5	0.32	0.78
	12+	85 (54.1)	72 (45.9)	157					
Upper arm	7-8	4 (22.2)	14 (77.8)	18	2.10	0.552	1.6	0.48	5.22
	8-9	10 (14.9)	57 (85.1)	67			1.0	0.44	2.16
	10-1	49 (20.0)	196 (80.0)	245			1.4	0.81	2.37
	12+	24 (15.3)	133 (84.7)	157					
Lower back	7-8	13 (72.2)	5 (27.8)	18	23.91	0.001	0.6	0.21	1.93
	8-9	39 (58.2)	28 (41.8)	67			0.3	0.18	0.64
	10-11	141 (57.6)	104 (42.2)	245			0.3	0.21	0.53
	12+	126 (80.3)	31 (19.7)	157					
Fore arm	7-8	0 (0.0)	18 (100.0)	18	8.30	0.040			
	8-9	0 (0.0)	67 (100.0)	67					
	10-11	9 (3.7)	236 (96.3)	245			0.46	0.19	1.12
	12+	12 (7.6)	145 (92.4)	157					
Wrist	7-8	0 (0.0)	18 (100.0)	18	5.40	0.144			
	8-9	5 (7.5)	62 (92.5)	67			0.4	0.16	1.23
	10-11	29 (11.8)	216 (88.2)	245			0.7	0.42	1.33
	12+	24 (15.3)	133 (84.7)	157					
Hip/Buttocks	7-8	1 (5.6)	17 (94.4)	18	7.51	0.057	0.7	0.09	5.81
	8-	3 (4.5)	64 (95.5)	67			0.6	0.56	2.08
	10-11	34 (13.4)	211 (86.1)	245			1.9	0.98	3.89
	12+	12 (7.6)	145 (92.4)	157					
Thigh	7-	0 (0.0)	18 (100.0)	18	4.81	0.187			
	8-9	4 (6.0)	63 (94.0)	67			0.6	0.19	1.88
	10-11	12 (4.9)	233 (95.1)	245			0.5	0.22	1.07
	12+	15 (9.6)	142 (90.4)	157					
Knee	7-8	3 (16.7)	15 (83.3)	18	2.31	0.510	1.8	0.46	6.75
	8-9	9 (13.4)	58 (86.6)	67			1.4	0.57	3.27
	10-11	21 (8.6)	224 (91.4)	245			0.8	0.42	1.64
	12+	16 (10.2)	141(89.8)	157					
Lower leg	7-8	3 (16.7)	15 (83.3)	18	1.60	0.661	2.2	0.57	8.66
	8-9	5 (7.5)	62 (92.5)	67			0.8	0.31	2.61
	10-11	22 (9.0)	223 (91.0)	245			1.1	0.53	2.24
	12+	13(8.3)	144 (91.7)	157					

4.14 MUSCULOSKELETAL PAIN AND BAG CONTENTS

Bag contents was significantly associated with lower back pain (Chisq=8.2; p=0.043) and fore arm pain (Chisq=19.0; p<0.001). Learners who carry only books and stationery in their bags are less likely to feel lower back pain compared to those who carry other items in their bags (OR=0.6; 95% CI:0.34-0.98); carry only books and stationery (OR=0.3; 95%

CI: 0.13-0.91); and carry sports items and lunch in their bags (OR=0.1; 95% CI: 0.02-0.36). There was no other significant associations with bag contents (Table 4.10).

Table 4.10: Association between bag contents and musculoskeletal pain site

Pain site	Contents	Pain presence		Total	Chisq	p-value	OR	95% CI	
		Yes	No					Lower	Upper
Neck	Books/Stationery	85 (51.8)	79 (48.2)	164	1.5	0.678	1.2	0.74	1.96
	Plus Sports kit	10 (58.8)	7 (41.2)	17			1.6	0.58	4.62
	Plus Lunch	96 (47.8)	105 (52.2)	201			1.0	0.65	1.68
	Other	49 (46.7)	56 (53.3)	105					
Shoulder	Books/Stationery	145 (88.4)	19 (11.6)	164	4.4	0.221	1.6	0.78	3.17
	Plus Sports kit	17 (100.0)	0 (0.0)	17					
	Plus Lunch	174 (86.6)	27 (13.4)	201			1.3	0.70	2.55
	Other	87 (82.9)	18 (17.1)	105					
Upper back	Books/Stationery	73 (44.5)	91 (55.5)	164	2.3	0.516	1.1	0.65	1.75
	Plus Sports kit	10 (58.8)	7 (41.2)	17			1.9	0.67	5.39
	Plus Lunch	82 (40.8)	119 (59.2)	201			0.9	0.57	1.48
	Other	45 (42.9)	60 (57.1)	105					
Upper arm	Books/Stationery	30 (18.3)	134 (81.7)	164	0.9	0.825	0.9	0.48	1.67
	Plus Sports kit	2 (11.8)	15 (88.2)	17			0.5	0.11	2.52
	Plus Lunch	34 (16.9)	167 (83.1)	201			0.8	0.45	1.49
	Other	21 (20.0)	84 (80.0)	105					
Lower back	Books/Stationery	99 (60.4)	65 (39.6)	164	8.2	0.043	0.6	0.34	0.99
	Plus Sports kit	15 (88.2)	2 (11.8)	17			2.9	0.62	13.30
	Plus Lunch	129 (64.2)	72 (35.8)	201			0.7	0.41	1.15
	Other	76 (72.4)	29 (27,6)	105					
Fore arm	Books/Stationery	7 (4.3)	157 (95.7)	164	19.0	0.001	0.3	0.13	0.91
	Plus Sports kit	0 (0.0)	17 (100.0)	17					
	Plus Lunch	2 (1.0)	199 (99.0)	201			0.1	0.02	0.36
	Other	12 (11.4)	93 (88.6)	105					
Wrist	Books/Stationery	16 (9.8)	148 (90.2)	164	4.1	0.249	1.2	0.49	2.71
	Plus Sports kit	3 (17.6)	14 (82.4)	17			2.3	0.55	9.47
	Plus Lunch	30 (14.9)	171 (85.1)	201			1.9	0.85	4.11
	Other	9 (8.4)	96 (91.4)	105					
Hip/Butt	Books/Stationery	17 (10.4)	147 (89.6)	164	2.3	0.510	1.1	0.48	2.50
	Plus Sports kit	0 (0.0)	17 (100.0)	17					
	Plus Lunch	23 (11.4)	178 (88.6)	201			1.2	0.56	2.69
	Other	10 (9.5)	95 (90.5)	105					
Thigh	Books/Stationery	9 (5.5)	155 (94.5)	164	0.4	0.949	0.8	0.29	2.25
	Plus Sports kit	1 (5.9)	16 (94.1)	17			0.9	0.10	7.59
	Plus Lunch	14 (7.0)	187 (93.0)	201			1.0	0.41	2.68
	Other	7 (6.7)	98 (93.3)	105					

Knee	Books/Stationery	13 (7.9)	151 (92.1)	164	2.1	0.547	0.6	0.25	1.24
	Plus Sports kit	2 (11.8)	15 (88.2)	17			0.9	0.18	4.20
	Plus Lunch	20 (10.0)	181 (90.0)	201			0.7	0.35	1.49
	Other	14 (13.3)	91 (86.7)	105					
Lower leg	Books/Stationery	16 (9.8)	148(90.2)	164	0.6	0.894	1.0	0.45	2.36
	Plus Sports kit	1 (5.9)	16 (94.1)	17			0.6	0.07	4.96
	Plus Lunch	16 (8.0)	185 (92.0)	201			0.8	0.36	1.88
	Other	10 (9.5)	95 (90.5)	105					

4.15 MUSCULOSKELETAL PAIN AND STRAP LENGTH

Strap length was defined as long or short straps. Of the 487 learners who reported pain from carrying their school bags, 210 (43.2%) learners use long strap on their school bags and 276 (56.8%) use short straps. The musculoskeletal pain was not associated with the length of the straps school bags of the learners (Table 4.11).

Table 4.11: Association between strap length and pain location

Pain site	Strap length	Pain presence		Total	Chisq	p-value	OR	95% CI	
		Yes	No					Lower	Upper
Neck	Long	107 (51.0)	103 (49.0)	210	0.47	0.495	1.1	0.79	1.62
	Short	132 (47.8)	144 (52.2)	276					
Shoulder	Long	186 (88.6)	24 (11.4)	210	0.77	0.380	1.3	0.74	2.20
	Short	237 (85.9)	39 (14.1)	276					
Upper back	Long	83 (39.5)	127 (60.5)	210	2.05	0.152	0.8	0.53	1.10
	Short	127 (46.0)	149 (54.0)	276					
Upper arm	Long	37 (17.6)	173 (82.4)	210	0.02	0.887	1.0	0.60	1.55
	Short	50 (18.1)	226 (81.9)	276					
Lower back	Long	140 (66.7)	70 (33.3)	210	0.17	0.677	1.1	0.74	1.58
	Short	179 (64.9)	97 (35.1)	276					
Forearm	Long	9 (4.3)	201(95.7)	210	0.00	0.973	1.0	0.41	2.38
	Short	12 (4.3)	264 (95.7)	276					
Wrist	Long	25 (11.9)	185 (88.1)	210	0.00	0.986	1.0	0.57	1.73
	Short	33 (12.0)	243 (88.0)	276					
Hip	Long	27 (12.9)	183 (87.1)	210	2.64	0.104	1.6	0.90	2.92
	Short	23 (8.3)	253 (91.7)	276					
Thigh	Long	11 (5.2)	199 (94.8)	210	0.81	0.369	0.7	0.33	1.51
	Short	20 (7.2)	256 (92.8)	276					
Knee	Long	24 (11.4)	186 (88.6)	210	0.74	0.390	1.3	0.72	2.34
	Short	25 (9.1)	251 (90.9)	276					
Lower leg	Long	18 (8.6)	192 (91.4)	210	0.04	0.852	0.9	0.50	1.77
	Short	25 (9.1)	251 (90.9)	276					

4.16 ASSOCIATION BETWEEN MUSCULOSKELETAL PAIN AND POSTURE

Shown in Table 4.12 is the association between posture and pain location. Posture was defined as stoop or upright. The results show that of the 487 learners who reported pain from carrying their school bags, 208 (42.8%) learners had a stoop posture and 278 (57.2%) had an upright posture. The musculoskeletal pain the learners feel was not associated with their posture.

Table 4.12: Association between musculoskeletal pain and posture

Location	Posture	Pain		Total	Chisq	p-value	OR	95% CI	
		Yes	No					Lower	Upper
Neck	Stoop	106 (51.0)	102 (49.0)	208	0.46	0.496	1.1	0.79	1.62
	Upright	133 (47.8)	145 (52.2)	278					
Shoulder	Stoop	179 (86.1)	29 (13.9)	208	0.31	0.578	0.9	0.51	1.46
	Upright	244 (87.8)	34 (12.2)	278					
Upper back	Stoop	94 (45.2)	114 (54.8)	208	0.58	0.445	1.2	0.80	1.65
	Upright	116 (41.7)	162 (58.3)	278					
Upper arm	Stoop	39 (18.8)	169 (81.3)	208	0.18	0.673	1.1	0.69	1.76
	Upright	48 (17.3)	230 (82.7)	278					
Lower back	Stoop	144 (69.2)	64 (30.8)	208	2.08	0.149	1.3	0.90	1.94
	Upright	175 (62.9)	103 (37.1)	278					
Forearm	Stoop	9 (4.3)	199 (95.7)	208	0.00	0.996	1.0	0.41	2.43
	Upright	12 (4.3)	266 (95.7)	278					
Wrist	Stoop	24 (11.5)	184 (88.5)	208	0.05	0.816	0.9	0.54	1.63
	Upright	34 (12.2)	244 (87.8)	278					
Hip/Butt	Stoop	22 (10.6)	186 (89..4)	208	0.03	0.856	1.1	0.59	1.90
	Upright	28 (10.1)	250 (89.9)	278					
Thigh	Stoop	12 (5.8)	196 (94.2)	208	0.23	0.634	0.8	0.40	1.76
	Upright	19 (6.8)	259 (93.2)	278					
Knee	Stoop	24 (11.5)	184 (88.5)	208	0.85	0.356	1.3	0.73	2.38
	Upright	25 (9.0)	253 (91.0)	278					
Lower leg	Stoop	23 (11.1)	185 (88.9)	208	2.20	0.138	1.6	0.86	3.01
	Upright	20 (7.2)	258 (92.8)	278					

4.17 ASSOCIATION BETWEEN MUSCULOSKELETAL PAIN AND CARRYING METHOD

Carrying method was defined as one shoulder or both shoulders. The results show that of the 487 learners who reported pain from carrying their school bags, 137 (28.1%) learners use a single shoulder to carry their school bags, while 350 (71.9%) use both

shoulders. Musculoskeletal pain the learners feel was not associated with how they carry their school bags (Table 4.13)

Table 4.13: Association between musculoskeletal pain and carrying method

Pain site	Method	Pain presence		Chisq	p-value	OR	95% CI	
		Yes	No				Lower	Upper
Neck	One shoulder	69 (50.4)	68 (49.6)	0.1	0.722	1.1	0.72	1.59
	Two shoulders	170 (48.6)	180 (51.4)					
Shoulder	One shoulder	118 (86.1)	19 (13.9)	0.1	0.766	0.9	0.51	1.63
	Two shoulders	305 (87.1)	45 (12.9)					
Upper back	One shoulder	55 (40.1)	82 (59.9)	0.7	0.407	0.8	0.56	1.26
	Two shoulders	155 (44.3)	195 (55.7)					
Upper arm	One shoulder	30 (21.9)	107 (78.1)	2.1	0.146	1.4	0.88	2.36
	Two shoulders	57 (16.3)	293 (83.7)					
Lower back	One shoulder	83 (60.6)	54 (39.4)	2.0	0.153	0.7	0.49	1.12
	Two shoulders	236 (67.4)	114 (32.6)					
Fore arm	One shoulder	4 (2.9)	133 (97.1)	0.9	0.344	0.6	0.19	1.78
	Two shoulders	17 (4.9)	333 (95.1)					
Wrist	One shoulder	14 (10.2)	123 (89.8)	0.5	0.471	0.8	0.42	1.50
	Two shoulders	44 (12.6)	306 (87.4)					
Hip/Buttock	One shoulder	11 (8.0)	126 (92.0)	1.0	0.309	0.7	0.35	1.40
	Two shoulders	39 (11.1)	311 (88.9)					
Thigh	One shoulder	6 (4.4)	131 (95.6)	1.3	0.261	0.6	0.24	1.48
	Two shoulders	25 (7.1)	325 (92.9)					
Knee	One shoulder	16 (11.7)	121 (88.3)	0.6	0.458	1.3	0.67	2.39
	Two shoulders	33 (9.4)	317 (90.6)					
Lower leg	One shoulder	14 (10.2)	123 (89.8)	0.5	0.499	1.3	0.64	2.46
	Two shoulders	29 (8.3)	321 (91.7)					

4.18 MUSCULOSKELETAL PAIN AND BAG CARRYING DURATION

Table 4.14 shows the association between duration of carrying bag and pain location**.** Upper back pain was associated with duration of carrying the bag (Chisq=5.9; p=0.041). The associations were such that those who carry their bags for less than 10 minutes (OR=0.5; 95% CI: 0.23-0.89); and carry their bags for between 10 and 20 minutes (OR=0.4; 95% CI: 0.20;-0.89) were significantly less likely to feel upper back pain compared to those who carry their bags for more than 20 minutes. All the p-values for the other musculoskeletal pain sites were greater than the significance level of 0.05, showing that the associations are not statistically significant.

Table 4.14: Association between duration of carrying bag and pain location

Pain Location	Duration	Neck pain		Total	Chisq	p-value	OR	95% CI	
		Yes	No					Lower	Upper
Neck	<10mins	166 (50.5)	163 (49.5)	329	5.0	0.081	0.6	0.32	1.26
	10-20mins	50 (42.0)	69 (58.0)	119			0.4	0.21	0.92
	>20mins	24 (61.5)	15 (38.5)	39					
Shoulder	<10mins	286 (86.9)	43 (13.1)	329	0.4	0.810	0.8	0.26	2.25
	10-20mins	102 (85.7)	17 (14.3)	119			0.7	0.22	2.18
	>20mins	35 (89.7)	4 (10.3)	39					
Upper back	<10mins	138 (41.9)	191 (58.1)	329	5.9	0.041	0.5	0.23	0.89
	10-20mins	48 (40.3)	71 (59.7)	119			0.4	0.20	0.89
	>20mins	24 (61.5)	15 (38.5)	39					
Upper arm	<10mins	56 (17.0)	273 (83.0)	329	1.8	0.413	0.6	0.27	1.29
	10-20mins	21 (17.6)	98 (82.4)	119			0.6	0.26	1.47
	>20mins	10 (25.6)	29 (74.4)	39					
Lower back	<10mins	218 (66.3)	111 (33.7)	329	2.6	0.275	1.7	0.86	3.29
	10-20mins	80 (67.2)	39 (32.8)	119			1.8	0.84	3.67
	>20mins	21 (53.8)	18 (46.2)	39					
Fore arm	<10mins	12 (3.6)	317 (96.4)	329	1.1	0.569	0.7	0.15	3.25
	10-20mins	7 (5.9)	112 (94.1)	119			1.2	0.23	5.81
	>20mins	2 (5.1)	37 (94.9)	39					
Wrist	<10mins	36 (10.9)	293 (89.1)	329	1.7	0.427	0.6	0.23	1.37
	10-20mins	15 (12.6)	104 (87.4)	119			0.7	0.24	1.76
	>20mins	7 (17.9)	32 (82.1)	39					
Hip/Buttock	<10mins	31 (9.4)	298 (90.6)	329	2.8	0.252	0.5	0.19	1.17
	10-20mins	12 (10.1)	107 (89.9)	119			0.5	0.19	1.41
	>20mins	7 (17.9)	32 (82.1)	39					
Thigh	<10mins	19 (5.8)	310 (94.2)	329	1.1	0.571	1.1	0.25	5.06
	10-20mins	10 (8.4)	109 (91.6)	119			1.7	0.36	8.10
	>20mins	2 (5.1)	37 (94.9)	39					
Knee	<10mins	33 (10.0)	296 (90.0)	329	3.5	0.174	0.5	0.21	1.25
	10-20mins	9 (7.6)	110 (92.4)	119			0.4	0.13	1.08
	>20mins	7 (17.9)	32 (82.1)	39					
Lower leg	<10mins	24 (7.3)	305 (92.7)	329	5.2	0.073	0.4	0.14	0.90
	10-20mins	12 (10.1)	107 (89.9)	119			0.5	0.19	1.41
	>20mins	7 (17.9)	32 (82.1)	39					

4.2 DISCUSSION OF FINDINGS

The purpose of this study was to determine how common LBP and musculoskeletal pain were among primary school students in King Williams Town, Eastern Cape Province. Additionally, the study looked into the relationship between LBP and the weight of a student's backpack. The study aims to add to the body of knowledge in this area of study because there is a dearth of information on LBP, musculoskeletal pain, and its contributing variables in the King Williams town region and throughout South Africa.

4.2.1 Prevalence of heavy schoolbag carriage

The study's findings showed that 89.8% of students carried heavy school bags to class and that 85.7% complained of pain while doing so. To comprehend the prevalence of pain experienced by students who carry heavy backpacks, the prevalence of musculoskeletal complaints reported by children in the schools under investigation may be compared to the results of a study conducted in Iran by Geok Sok et al. (2017). The majority of students, or 83.4%, had bags that weighed more than 10% of their body weight, according to the survey's findings. The findings supported a study by Mohan et al. (2007) that found a child would be unable to maintain normal cervical and shoulder posture while carrying a backpack weighing 10% of their body weight. Suggestions for a weight restriction for carrying a school backpack should take other aspects into account as it indicates that the demands on children's musculoskeletal systems may not be effectively represented by their proportion of body weight (Geok Sok et.al, 2017).

Despite the lack of a direct correlation, some research revealed that students who carried bigger backpacks were more likely to experience back pain (Grimmer & Williams, 2000; Sheir-Neiss et al., 2003; Viry et al., 1999). The weight of the backpack, however, was not linked to back pain in other studies (Van Gent et al., 2003; Watson et al., 2003). No conclusive evidence was identified in the Jones and Macfarlane (2005) study to connect heavy backpack weight to an increased risk of future lower back pain. However, the majority of the respondents in this survey linked the pain they experienced from the hefty school bags they carried to and from school each day with the backpacks' weight.

4.2.2 Bag carrying experiences

The finding of the study indicated that majority of the learners' carry heavy schoolbag to school (89.8%) daily and felt tired carrying heavy bag (90.8%). The frequency of idiopathic musculoskeletal pain among schoolchildren between the ages of 5 and 16 is considerable for everyday activities (Kumar et al., 2015). Children studied in New Zealand by McGowan, Whatman, and Walters (2019) revealed that there is no significant correlation between the first movements made during exercise and a history of injury in the group of kids aged 10 to 13. Contrastingly, the findings of the study by de Paula (2015: 37), showed that "the weight of student backpacks does not adhere to biomechanics and ergonomics, particularly for younger children and women who are still in the growth phase, so there is a higher risk of developing spinal cord injuries that have an impact on adulthood".

In this study, learners in South African schools carry heavy school bags that contain books, stationery, and sporting items and lunch as well which significantly contributes to musculoskeletal pain. This ends up resulting in learners being confronted with tiredness that heavily impacts on their concentration in school and their overall health and well-being. In the long run, this can have devastating consequences in terms of permanent injuries to the spinal cord for these learners. The situation is aggravated by the realities that learners are confronted with in terms of carrying these heavy bags on a daily basis. Therefore, mechanisms should be put in place in order to ensure learners do not carry overweight bags that have detrimental impacts on their health.

4.2.3 Bag carrying style

The present study demonstrated that majority of the learners carry extra bag for sports items (53.3%), affirmed carrying their schoolbag on both shoulders (82.7%), and some, on one shoulder (15.5%). According to a research by Nauzeer and Jaunky (2021: 98), "carrying a bag over one shoulder might lead to postural alterations that are connected to spine discomfort". Yet, carrying a single shoulder bag may aggravate neck and back pain (Siambanes et al., 2004). According to research, at least 90% of students in wealthy nations use backpacks (Goodgold et al., 2002). There is evidence that carrying weight using a backpack rather than a shoulder bag is healthier. According to one study, there

is no correlation between using a pack and developing LBP (Natasha et al., 2018). Inappropriate bags and backpacks, which appear to be the primary causes of musculoskeletal pain problems, are carried by a sizable proportion of high school students who have musculoskeletal illnesses (Dianat et.al, 2013). Due to different economic conditions in the context of South African learners, some do not afford to carry back packs to accommodate both shoulders and hence end up carrying bags that accommodate one shoulder. This largely contributes to musculoskeletal pain.

Majority of the learners carried all their books home daily (63.0%) as there was no locker to keep the books at school (99.3). Clinicians are regularly asked for advice on how to carry a backpack and how it affects neck and back discomfort (Wigram, 2002). The physical exposure of using a bag depends on its weight, as well as on how long it is carried for and how it is transported. A longer duration of time spent wearing a backpack raises the risk of high blood pressure, according to Grimmer and Williams (2000). Risk factors for musculoskeletal pain include carrying a schoolbag for an extended period of time, the impact of large loads, the shape and size of the load, and the location of the stress on the body (Chansirinukor et al., 2001). The presence of a heavy burden on the back and its extended carrying are the first signs of the lower BP syndrome (Haselgrove et al., 2008; Paui et al., 2013). Students who commute to school from home while toting bulky backpacks are more likely to develop BP. Since they carry their luggage to and from school every day, the study's participants are particularly vulnerable to musculoskeletal pain.

4.2.4 Visual analogue scale (VAS)

The finding of this study revealed that more than a quarter of the learners scored 10 (27.5%), followed by 8 (22.7%) on the Visual Analogue Scale (VAS). A study conducted by Kabilimiharbi and Santhirasegaram (2017) used the VAS to gather information regarding the occurrence of discomfort experienced by the learners aged 7-9 in Malaysia. The VAS helped the students to “provide more accurate responses to the intended questions and the usage of VAS with a questionnaire is very common in research conducted among school children as it would be much easier for kids to understand since

it is more graphical rather than in words" (Whittfield et.al, 2005: 18). Therefore, the use of the VAS was appropriate for the study in ensuring an accurate measurement of the level of pain and discomfort experienced by the learners in the study.

4.2.5 Pain experiences

Overwhelming majority of the learners experienced pain, which is associated with the schoolbag carriage (91.7%) during and after carrying the schoolbag. According to Raid an Agarawal (2013), the strain on the backpack strap on the shoulder increases with increasing rucksack weight. According to additional studies, a person's physiological capability may be impacted by the sort of strap used to secure a load carried on the shoulder (Bakri, 2012). Growing youngsters lack the skeletal and bone development necessary to withstand the strain and physical demand of carrying a school backpack, which causes musculoskeletal diseases (Nazari et.al, 2020). With greater weights, the mean pressure on the body rises. It is also suggested that carrying a hefty backpack results in an increase in mechanical stress and a change in the spatiotemporal characteristics of the gait (Ahmad and Barbosa, 2019). As evidenced in literature, learners experience different pains associated with carrying their school bag and this also resonates with the findings of this study. Learners indicated feeling pain in the shoulders and lower back significantly as compared to other areas that experience pain.

In addition, most of the learners agreed that the pain interferes with their schoolwork (53.5%), and the pain is daily. Rest periods are advised since there seems to be evidence that wearing a backpack for an extended period of time is linked to back pain (Grimmer & Williams, 2000; Negrini & Carabalona, 2007). The best predictors of spinal pain were shown to be reported weight and experienced weariness. Previous research has shown mixed results. In contrast to perceived weight, felt exhaustion was positively correlated with back pain among young adolescents, according to a research by Negrini and Carabalona (2002). However, in a comparable research of 745 teenagers between the ages of 12 and 14, those pupils who felt their backpack was heavy reported more severe back or neck issues (van Gent et al 2003). It may be due to physical (such as weak muscle control and endurance) or neurophysiological (such as reduced pressure pain thresholds)

aspects why one feels the school bag is heavy or taxing (Haselgrove et.al, 2008). Learners in this study are greatly affected in terms of their studies due to musculoskeletal pain and this greatly impacts in their concentration in their school work. The situation is further worsened by daily routines of carrying their school bags to and from school on a daily basis.

4.2.6 Pain location

The finding of this study indicated that majority of the learners experience pain in the order of severity: shoulder→(82.7%)→lower back (59.9%)→neck (47.0%)→upper back (40.7%)→ and upper arm (16.4%). These results are consistent with a research by Suciati and Pratiwi (2018), which found that the prevalence of musculoskeletal problems was highest in the shoulder region (32.5%), followed by the neck (29.9%%), back (22.7%), and waist (14.9%) among primary school pupils.

The vast majority of the learners use backpacks as their school bags (96.0%), most of them use their bags to carry books, stationery, sports kit, and lunch carried books, while others carry stationery only. According to Sahib, the size and weight of the books carried, as well as any extra items such lunchboxes, water bottles, pencil bags, sporting goods, coats, and computers, directly determine how much the backpack weighs (2016). Other unintentional influences include not being aware of how carrying large items might impair children's health, physical development, and schoolwork as well as how to handle and carry luggage safely (Sahib, 2016).

Most of the learners carried their bags on both shoulders (71.7%) and other use one shoulder (25.0%). This was in line with the majority of research that found that students who carried backpacks that were more than 15% of their body weight on one shoulder experienced higher pain (Negrini & Negrini, 2007; Trevelyan & Legg, 2010; Zimbler). 57.5 percent of students carry their school backpacks with short straps, and the majority of them are seated upright (57.1%). According to the research that is now accessible, neither a suggested optimal strap length for backpacks at a certain age nor particular norms or criteria against which the strap lengths may be measured. Experts advise using a few ergonomic elements to safeguard your back when using a backpack. These have

extra-wide, cushioned, adjustable shoulder straps for additional comfort and better weight distribution. Additionally, various pockets on backpacks are necessary to distribute the weight and improve comfort (Jansport backpacks, n.d.). However, school-age children utilize these functions less frequently and at a higher cost. Many of the backpacks that learners frequently use include movable straps that let the user position the bag on their back anyway they like. Particularly for those who must travel more than 20 minutes each way to and from school every day, schoolchildren should be taught the correct usage and significance of the many features on their backpacks. They should also be urged to utilize two shoulder straps.

This study revealed that male learners were more likely to feel wrist pain compared to female learners (OR=1.8; 95% CI: 1.01-3.08). This result is consistent with a study by Spiteri et al. (2017) that found back discomfort is statistically connected to gender, body mass index (BMI), education level, and the ratio of bag weight to body weight. Independent research links carrying large backpacks to self-reported back discomfort in students (Spiteri et.al, 2017).

In addition, musculoskeletal pain was significantly associated between age and neck (p=0.004), shoulder (p=0.039), upper back (p=0.005), lower back (p<0.001) and fore arm (p=0.040) pain. Pradnya Ayu Dewantari and Adiputra (2017) study demonstrates a link between primary school children' complaints of low back discomfort, shoulder pain, and neck pain with the weight of their backpacks. Additionally, t shoulder discomfort were more common than those of neck pain and low back pain (Pradnya Ayu Dewantari and Adiputra, 2017).

Gender wise, learners at age 8-9 years (OR=0.5; 95% CI: 0.27-0.87) and 10-11 years (OR=0.5; 95% CI: 0.32-0.72) were significantly less likely to experience neck pain compared to the 12 years and above. Similarly, the 8-9 years (OR=0.3; 95% CI: 0.18-0.64) and 10-11years (OR=0.3; 95% CI: 0.21-0.53) learners were significantly less likely to feel lower back pain compared to those older than 12 years. Learners 10-11 years were significantly less likely to feel shoulder (OR=0.5; 95% CI: 0.27-0.95) and upper back (OR=0.5; 95% CI; 0.32-0.78) pain compared to the older children. Numerous studies have shown that as people age, their likelihood of experiencing neck or shoulder

symptoms and high blood pressure increases (Hakala et al., 2002; Siivola et al., 2004). (Sato et al., 2008; Watson et al., 2002). Age is associated with an increase in musculoskeletal discomfort(Panicker& Sandesh,2014). Dianat et al. (2013) found no association between age and neck, shoulder, or low back complaints, although they did find a decreased relationship between age and neck pain (NP) (Malik et al., 2017).

Females are often more likely than males to have musculoskeletal discomfort. According to Mikkelsson et al. (1997b), this tendency may start as early as childhood and continue until maturity (Linton, 1990). Lower back problems (LBP) are explained by both gender and age (Balague et al., 1998). For instance, females are more prone than boys to experience dorsal pain (DP) and lower back discomfort at the age of 14 (Korovessis, 2004). Teenage MSP prevalence varies, and several research indicate that girls are more likely than boys to experience these symptoms (Dianat, 2013; Hakala et al., 2012). In addition, Siivola (2003) contends that women are more sensitive in their symptom diagnosis and presentation than men.

Females are typically more likely than males to experience musculoskeletal pain. According to Mikkelsson et al. (1997)b, this pattern is common in childhood and continues into maturity (Linton, 1990). Lower back problems (LBP) are explained by both gender and age (Balague et al., 1998). For instance, girls are more prone than boys to experience dorsal pain (DP) and lower back discomfort at the age of 14 (Korovessis, 2004). Teenage MSP prevalence varies, and numerous research indicate that girls are more likely than boys to experience these pains (Dianat, 2013; Hakala et al., 2012). In addition, Siivola (2003) contends that women are more sensitive in their symptom diagnosis and presentation than men. Yeun (2017) asserts that gender is a factor in the prevalence of neck and shoulder pain, particularly in women. The study by Malik et al. (2017), however, found no correlation between NP and gender. According to Yeun (2017), gender has a role in the occurrence of neck and shoulder discomfort, especially in women.

Future studies should look at the leg muscles, anterior and posterior trunk muscles, to see how the bag style impacts those areas. Female students who carried loads in two strapped rucksacks higher than 10% of their body weight may have back pain, whereas those who carry unilateral bags may feel exacerbated shoulder ache, according to

Rebecca (2015). Other studies have not found any appreciable gender difference in the prevalence of musculoskeletal pain in school children, in contrast to earlier research that suggested males had a reduced risk of pain than girls (Moore, White & Moore, 2007). Boys may have reported more discomfort than young females due to their increased exposure to sports and rigorous activities (Akbar et al., 2019), which could be explained by a stronger perception of pain (Kovacs et.al, 2006).

4.2.8 Musculoskeletal pain and bag contents

The findings of this study indicated that learners who carry only books and stationery in their bags were less likely to feel lower back pain compared to those who carry other items in their bags (OR=0.6; 95% CI:0.34-0.98), only books and stationery (OR=0.3; 95% CI: 0.13-0.91), and learners who carry sports items and lunch in their bags (OR=0.1; 95% CI: 0.02- 0.36). There are a number of reasons why school-age children carry bigger backpacks, some of which include: pressure to do better academically, which results in children receiving more homework (Mwaka et.al, 2014). Furthermore, Mwaka et al. (2014: 73) contend that "while the schoolbags' contents were academic in nature, urban schoolchildren carried more text books and hard cover counter books than their rural counterparts did. In addition, urban students also brought lunch packs and drink bottles, which added to the weight of their schoolbags". Many specialists advise limiting the weight of the school bag to 10% to 15% of body weight in order to prevent low back discomfort and related muscular ache, strain, and other major back problems (Negrini, Carabalona & Sibilla, 1999). The carrying of a lot of items such as books, stationery, sports items and lunch has contributed significantly to the weight of school bags by learners in this study. This added weight contributed significantly to experiences of pain amongst these various learners. Moreover, little knowledge on the part of parents and teachers on the acceptable weight of these school bags has contributed to the situation.

4.2.9 Musculoskeletal pain and strap length

The study found no correlation between musculoskeletal pain and the length of the students' backpack straps. According to Nauzeer and Jaunky, carrying a bag while walking activates the right upper trapezius, left upper trapezius, right erector spinae, and

left erector spinae (2021). The length of the straps may have an effect on these muscle actions. One's posture appears to be significantly impacted by the length of the straps (Brzek et al., 2017). Yoon (2014) discovers no clear correlation between these behaviors and the width of the bag straps. However, some studies show that two strap backpacks are better ergonomic than those with just one (Grimmer et al., 1999; Springett, 2007). However, according to (Rai and Agarawal, 2013), correctly padded and fitted backpack straps may lessen MSDs brought on by backpacking, hence promoting exercise. In contrast to earlier findings of research carried out in other settings, the length of the school bags' straps had no effect on the study's participants' learning. However, this necessitates further research into the effects of the length of the school bag straps on musculoskeletal discomfort in South African schools.

4.2.10 Musculoskeletal pain and bag carrying duration

The finding of this present shows that learners who carry their bags for less than 10 minutes (OR=0.5; 95% CI: 0.23-0.89) and between 10 and 20 minutes (OR=0.4; 95% CI: 0.20;-0.89) were significantly less likely to feel upper back pain compared to those who carry their bags for more than 20 minutes. Hernandez et al's (2020) study evaluated the carrying time and backpack size. This led to the conclusion that "99.3 percent of kids wear backpacks that are too big for their bodies; if the backpack's height is greater than the child's torso length, it touches the child's head and restricts movement, and if the wheels are too high, the handle does not stay well-adapted, increasing stress on the shoulder and back muscles" (Mohammadi et.al, 2017: 112). Mwaka et al. (2014) stress the necessity of having a comfortable, appropriately sized backpack to limit the risk of injury. In particular, these authors note a greater incidence of lower back discomfort in kids who carry overly big and heavy backpacks for more than 20 minutes. Therefore, in this study the longevity of carrying school bags particularly for those who did so for a duration of more than 20 minutes had a huge impact on back pain. The study concluded that there was a correlation between carrying time and back pack/school bag size as well.

4.3SUMMARY

The study's findings, which were based on data collected using various methods and then analysed and discussed, were summarized in this chapter. Several methods were used to collect the data. The next chapter provides examples of the research study's review of findings, conclusion, and suggestions (Chapter Five).

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter summarises the study's findings as well as its limits, conclusions, and suggestions. The purpose of this study was to identify the prevalence and location of musculoskeletal pain in primary school students in King William's Town, South Africa, and to characterize how this pain is related to backpack use. Chapter one raises and discusses research-related questions, highlighting prudent parts of the study's findings. Additionally, the main focus of this chapter is to show how the analysis's objectives were met. The study also provided advice on how to reduce musculoskeletal pain brought on by using a backpack for policymakers, parents or guardians, and teachers.

5.2 SUMMARY OF THE STUDY

A prominent global health problem is the link between carrying a schoolbag or backpack and musculoskeletal pain in students. The majority of research on the prevalence of this phenomenon among kids of school age has been done on a global basis. A few studies have also been conducted in Africa to confirm the link between musculoskeletal pain and youngsters carrying large backpacks or school bags while in class. There has only been a small amount of research conducted in South Africa to date on the pains that are brought on by youngsters frequently carrying their school bags to and from school. Children are increasingly frequently prone to back pain, which is mostly attributable to the weight of their school bags, the sort of backpacks they use, and how they carry them. According to a number of studies, children's school bags weigh more than is reasonable to expect, which is cause for concern. The back, neck, lower arm, fore arm, shoulders, wrist, hip, knee, and thigh are just a few places on the body where this has caused pain or discomfort. In other cases, these pains have impacted the spine, which has serious health repercussions for young children as they get older. This inspired the researcher to investigate the occurrence and location of musculoskeletal pain related to carrying a backpack among elementary school students.

In Buffalo City Metropolitan Municipality, Eastern Cape, South Africa, students in public and private elementary schools between the ages of 7 and 14 participated in the study. A school-based cross-sectional quantitative epidemiologic research design was adopted to carry out the study's goals and objectives. By conducting interviews and distributing survey questionnaires, data was gathered. Additionally, anthropometric measures were used in the study to collect information on the weight of the school bag.

5.3 MAJOR FINDINGS OF THE STUDY

The major findings of the study constituted the following:

i. Majority of the learners (89.8%) carry heavy school bags to school and felt pain from carrying their schoolbags.
ii. The majority of the learners had bag weight greater than 10% of body weight (83.4%).
iii. The majority of the learners' carry heavy schoolbag to school (89.8%) daily and felt tired carrying heavy bag (90.8%).
iv. The majority of the learners carry extra bag for sports items (53.3%).
v. Majority of the learners carried all their books home daily as there was no locker to keep the books at school.

vi. The finding of this study revealed that more than a quarter of the learners scored 10 (27.5%), followed by 8 (22.7%) on the Visual Analogue Scale.
vii. Overwhelming majority of the learners experienced pain, which is associated with the schoolbag carriage (91.7%) during and after carrying the schoolbag.
viii. Most of the learners agreed that the pain interferes with their schoolwork (53.5%), and the pain is daily.
ix. The majority of the learners experience pain in the order of severity: shoulder→(82.7%)→lower back (59.9%)→neck (47.0%)→upper back (40.7%)→ and upper arm (16.4%).
x. The vast majority of the learners use backpacks as their school bags (96.0%) and most of them use their bags to carry books, stationery, sports kit, and lunch carried books, while others carry stationery only.

xi. Most of the learners carried their bags on both shoulders (71.7%) and other use one shoulder (25.0%).

xii. Most of learners use short strap length when carrying their school bags (57.5%) and most had an upright posture (57.1%).

xiii. Male learners were more likely to feel wrist pain compared to female learners (OR=1.8; 95% CI: 1.01-3.08).

xiv. Musculoskeletal pain was significantly associated between age and neck (p=0.004), shoulder (p=0.039), upper back (p=0.005), lower back (p<0.001) and fore arm (p=0.040) pain.

xv. Gender wise, learners at age 8-9 years (OR=0.5; 95% CI: 0.27-0.87) and 10-11 years (OR=0.5; 95% CI: 0.32-0.72) were significantly less likely to experience neck pain compared to the 12 years and above.

xvi. Learners in the age group of 8-9 years (OR=0.3; 95% CI: 0.18-0.64) and 10-11years (OR=0.3; 95% CI: 0.21-0.53) were significantly less likely to feel lower back pain compared to those older than 12 years.

xvii. Learners 10-11 years were significantly less likely to feel shoulder (OR=0.5; 95% CI: 0.27-0.95) and upper back (OR=0.5; 95% CI; 0.32-0.78) pain compared to the older children.

xviii. Learners who carry only books and stationery in their bags were less likely to feel lower back pain compared to those who carry other items in their bags (OR=0.6; 95% CI:0.34-0.98), only books and stationery (OR=0.3; 95% CI: 0.13-0.91), and learners who carry sports items and lunch in their bags (OR=0.1; 95% CI: 0.02-0.36).

xix. Musculoskeletal pain was not associated with the length of the straps school bags of the learners.

xx. Learners who carry their bags for less than 10 minutes (OR=0.5; 95% CI: 0.23-0.89) and between 10 and 20 minutes (OR=0.4; 95% CI: 0.20;-0.89) were significantly less likely to feel upper back pain compared to those who carry their bags for more than 20 minutes.

5.4 LIMITATIONS OF THE STUDY

The prevalence, kind, and associated factors of musculoskeletal pain in schoolchildren in the King Williams Town area have been thoroughly examined by this study. Even though the researcher measured the weight of the bags, it is likely that the weight on the day the data was collected did not accurately reflect the weight on other school days. This is probably an underestimation of the relationship between the weight of school bags as assessed and musculoskeletal pain.

Additionally, data was gathered during the exam time, which may have led to more students leaving their textbooks at home. The fact that this study only included pain history and pain experienced before, during, and after carrying the school bag rather than current discomfort may have affected how the association between school bag weight and pain was estimated. Additionally, home aspects such as assistance with domestic chores or farming were not taken into account, which could have contributed to musculoskeletal pain.

The findings are based on children's self-reported pain, therefore they should be regarded with caution. When youngsters express their discomfort, there is a chance that social desirability bias will arise from their need for social attention. At the same time, it is challenging to undertake an impartial assessment of children's pain. Nevertheless, in order to lessen musculoskeletal pain, schools must implement weight monitoring programs for school bags. With the use of the structured questionnaire and the students' subjective responses, musculoskeletal discomfort and its contributing components were evaluated. Particularly in regards to the schoolchildren's responses on their experience of pain in the recent days before to completing the data collection, some recall bias may be present and unaccounted for. The cross-sectional approach used in the study has some drawbacks, making it challenging to identify or account for long-term alterations that could develop over time with frequent schoolbag carrying while using different postures. The study was also limited to King Williams Town, South Africa, an urban area, therefore the findings cannot be extrapolated to more rural areas.

5.5 CONCLUSION

According to the study, there is a link between students' musculoskeletal pain and carrying hefty backpacks or school bags. The shoulders are where musculoskeletal discomfort is most frequently felt. This is partly attributable to the carrying bags' hefty weight, which puts a strain on the shoulders. The study supported the findings of the majority of studies cited in the literature that most schoolchildren suffer from musculoskeletal pain because the weight of their backpacks is excessive compared to their size, weight, and age. The discomfort that students feel makes them tired, especially because the majority of them only regularly walk for a maximum of 20 minutes to school.

Though it has been determined that both sexes are at risk for health issues, concerns have been made about the gender differences in musculoskeletal discomfort given that girls are more likely than boys to experience problems. These results are consistent with literature that has established that girls typically suffer more discomfort from carrying heavier school backpacks. Concerns were expressed about the length of the straps so that the school bag may be adjusted for comfort as well as the types of bags carried by the students. Since school-age children's shoulders are still developing, a backpack was preferred versus a shoulder bag, which is highly taxing on them.

Each day, students carried their books to and from class. The study found that this greatly increased the school bag's weight. Exercise books, counterbooks, and textbooks all contribute significantly to the weight of students' backpacks or school bags. The students' discomfort feelings came first both during and after carrying the school bag. The time spent lugging the school backpack is thus an important consideration that added to the agony. Additionally, this discomfort keeps them from studying during and after school. The shoulder was the area of the body where students reported feeling musculoskeletal pain the most frequently. Other body areas included the upper and lower back, neck, lower arm, forearm, wrist, knee, and hip, to name a few. The shoulders that balance the straps were the most painful because the pain was not distributed equally.

5.6 RECOMMENDATIONS

From the study's findings, policymakers, parents or guardians, and teachers can take a number of actions to reduce musculoskeletal pain brought on by carrying a backpack.

5.6.1 Knowledge dissemination on schoolbag weight and musculoskeletal pain

To ensure that teachers, parents, students, and all other key stakeholders are aware of the health concerns connected with carrying large school bags or backpacks and musculoskeletal pain, the government should conduct knowledge dissemination through the Department of Basic Education. To date, not enough information has been disseminated to raise awareness of this phenomenon among schools and students. The spread of knowledge regarding the effects of backpack weights and other ergonomic variables on the musculoskeletal system can assist in reducing the amount of daily learning materials that students are expected to carry in their school bags.

5.6.2 Availability of school locker rooms

Schools ought to make sure that they offer secure locker rooms where students can leave some of the books they do not need to use for their coursework or for assignments. As a result, the pain caused by carrying large backpacks will be much reduced by the weight they carry on their school bags. Additionally, this will go a long way toward preventing students who travel great distances from having to carry large school bags for long distances, which is a major cause of musculoskeletal pain. Instead of forcing students to carry both stationery and athletic clothes or related gear, these locker rooms can store additional sporting equipment in addition to books.

5.6.3 Proportionate weight of school bags

Students should be able to carry school bags that are appropriate for their height, weight, and age. Therefore, parents and guardians should have access to backpacks that allow kids to travel comfortably and without being overly burdened. Additionally, it's important to check that the backpacks' straps are adjustable and that students can wear them on both shoulders to evenly distribute the weight. Less than 15% of the student's body weight

should be carried in the form of a backpack, and both shoulders should be used to carry the bag, according to school administration and teachers.

5.6.4 Duration of carrying school bags

The benefits of carrying school bags for a shorter period of time as opposed to a longer period should be taught to students. As a result, they must refrain from using their school backpacks while in class. They should switch to using their backpacks when they are merely leaving the house to go to school, and vice versa.

5.6.5 Limited stationery to take to school and home

In order to study at home or in class during instructional hours, learners should be able to carry the minimal amount of stationery required. By doing this, it will be made sure that the amount of stationary, including books and textbooks, which significantly adds to the weight of school bags, is reduced. As a result, the type of stationery students bring to school should be able to be double checked by school administration, teachers, and parents to ensure that it does not exceed the size and weight of the students.

5.5.6 Encouragement and support for further study/research

Given the health hazards and problems connected with it, musculoskeletal pain among students brought on by carrying heavy school bags or backpacks requires further comprehensive research in South Africa. The lives of children in South Africa during their childhood, adolescence, and adulthood are in grave danger due to the lack of research in this field. Therefore, extensive nationwide study involving schools, students, instructors, the Department of Basic Education, and other relevant stakeholders is required to address the health consequences linked to musculoskeletal discomfort.

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APPENDICES

Appendix A: Ethical Clearance certificate

University of Fort Hare
Together in Excellence

ETHICAL CLEARANCE CERTIFICATE
REC-270710-028-RA LEVEL 01

Certificate Reference Number:	**FER011SMON01**
Project title:	**Backpack carriage and musculoskeletal pain among primary school learners in King William's Town, South Africa**
Nature of Project	Masters of Public Health
Principal Researcher:	Moni B
Supervisor:	Prof S Feresu
Co-supervisor:	Prof DT Goon

On behalf of the University of Fort Hare's Research Ethics Committee (UREC), I hereby give ethical approval in respect of the undertakings contained in the above-mentioned project and research instruments(s). Should any other instruments be used, these require separate authorization. The Researcher may therefore commence with the research as from the date of this certificate, using the reference number indicated above.

Please note that the UREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the document
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research

The Principal Researcher must report to the UREC in the prescribed format, where applicable, annually, and at the end of the project, in respect of ethical compliance.

Special conditions: Research that includes children as per the official regulations of the act must take the following into account:

Note: The UREC is aware of the provisions of s71 o the National Health Act of 2003 and that matters pertaining to obtaining the Minister's consent are under discussion and remain unresolved. Nonetheless, as was decided at a meeting between the National Health Research Ethics Committee and stakeholders on 6 June 2003, university ethics committees may continue to grant ethical clearance for research involving children without the Minister's consent, provided that the prescripts of the previous rules have been met. This certificate is granted in terms of this agreement.

The UREC retains the right to

- Withdraw or amend this Ethical Clearance Certificate if
  - Any unethical principal or practices are revealed or suspected
  - relevant information has been withheld or misrepresented
  - regulatory changes of whatsoever nature so require
  - the conditions contained in the Certificate have not been adhered to

- Request access to any information or data at any time during the course or after completion of the project.

- In addition to the need to comply with the highest level of ethical conduct principal investigators must report back annually as an evaluation and monitoring mechanism on the progress being made by the research. Such a report must be sent to the Dean of Research's office.

The Ethics Committee wished you well in your research.

Yours sincerely

25/01/2019

Professor Eunice Seekoe
Dean of Faculty of Health Science
30th November 2018

Professor Pumla Dineo Gqola
Dean of Research
30th November 2018

Appendix B: Informed consent form

INFORMED CONSENT FORM

I *(name of participant)* ……. have been informed about the study by *(provide name of researcher/ project leader/ fieldworker)* …….....

I understand the purpose, procedures, and risk-benefit ratio of the study.

I have been given opportunity to ask questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any procedurals that I would usually be entitled to.

I have been informed about any available compensation or medical treatment if injury occurs to me as result of study-related procedures

I understand that I will be given a copy of this informed consent.

I understand that if I have any questions or complaints about my rights as a study participant, or if I may have concerns about any aspect of the study or the researcher/s then I may contact the Chairperson of University Research Ethics Committee, Prof Renuka Vithal (details available from the Researcher or by contacting the University of Fort Hare or Website www.ufh.ac.za)

Participant signature: ……

Consenting for Audio Recording– when necessary

YES / OR

Participant signature: ……

Witness signature: ……...

(to be altered according to the study)

Translator signature: ……...

(to be altered according to the study)

Data curation – I understand that the information that I provide will be stored electronically and will be used for research purposes now or at a later stage (to be altered according to the study)

Participant signature: ……

Date: ……

Appendix C: Minor Assent

My name is Busisiwe Moni. I am a student at the University of Fort Hare. I am inviting you to participate in a research study about Backpack carriage and musculoskeletal pain among school learners in King Williams Town, South Africa. Your parent(s) know we are talking with you about the study. This form will tell you about the study to help you decide whether or not you want to take part in it.

What am I being asked to do?

If you decide to be in the study, I will ask you to do several things that include measurements on your waist, height etc to find out how backpack carriage contributes to musculoskeletal pain.

What are the benefits to me for taking part in the study?

If you take part in this study, you might be able to assist on how we can understand how backpacks you carry everyday to school may cause pain and discomfort to your shoulders and any other part of your body which is known as musculoskeletal pain. Taking part in this study may not have direct benefits to you, but it will help me learn more about backpacks and musculoskeletal pain amongst learners in your school.

Can anything bad happen if I am in this study?

I do not expect anything bad happening to you but some learners will be fatigued, bored or have anxiety. In order to minimize this, the research will either take breaks or not take long during the interview process. ,

Who will know that I am in the study?

If you decide to be in the study I will not tell anyone else how you respond or act as part of the study. Even if your parents or teachers ask, I will not tell them about what you say or do in the study.

Do I have to be in the study?

No, you don't. The choice is yours. No one will get angry or upset if you don't want to do this. And you can change your mind anytime if you decide you don't want to be in the study anymore.

What if I have questions?

If you have questions about the study, you can ask me now or anytime during the study. You can also call me at [insert your phone number] or e-mail me at [insert your csusm e-mail address]. [

Signing below means that you have read this form and that you are willing to be in this study:

Name of the Participant (Write your name on the line): _____

Signature of the Participant (Put your signature on the line): _____

Date:_____

Appendix D: Letters of approval

Province of the
EASTERN CAPE
EDUCATION

STRATEGIC PLANNING POLICY RESEARCH AND SECRETARIAT SERVICES
Steve Vukile Tshwete Complex • Zone 6 • Zwelitsha • Eastern Cape
Private Bag X0032 • Bhisho • 5605 • REPUBLIC OF SOUTH AFRICA
Tel: +27 (0)40 608 4691/4773 • Fax: +27 (0)86 742 4942 • Website: www.ecdoe.gov.za

Enquiries: B Pamla Email: babalwa.pamla@ecdoe.gov.za Date: 12 June 2019

Ms. Busisiwe Moni

1460 N.U. 14

Mdantsane

5219

Dear Ms. Moni

PERMISSION TO UNDERTAKE A MASTERS: BACKPACK CARRIAGE AND MUSCULOSKELETAL PAIN AMONG SCHOOL LEARNERS IN KING WILLIAM'S TOWN, SOUTH AFRICA

1. Thank you for your application to conduct research.
2. Your application to conduct the above mentioned research involving over 500 participants from 5 selected schools in the Buffalo City District under the jurisdiction of the Eastern Cape Department of Education (ECDoE) is hereby approved based on the following conditions:
    a. there will be no financial implications for the Department;
    b. institutions and respondents must not be identifiable in any way from the results of the investigation;
    c. you seek parents' consent for minors;
    d. it is not going to interrupt educators' time and task;
    e. you present a copy of the written approval letter of the Eastern Cape Department of Education (ECDoE) to the Cluster and District Directors before any research is undertaken at any institutions within that particular district;
    f. you will make all the arrangements concerning your research;
    g. the research may not be conducted during official contact time, provided that an arrangement to do research at the school including getting inside a classroom has been arranged and agreed upon in writing with the Principal and the affected teacher;

h. should you wish to extend the period of research after approval has been granted, an application to do this must be directed to Chief Director: Strategic Management Monitoring and Evaluation;

i. your research will be limited to those institutions for which approval has been granted, should changes be effected written permission must be obtained from the Chief Director: Strategic Management Monitoring and Evaluation;

j. you present the Department with a copy of your final paper/report/dissertation/thesis free of charge in hard copy and electronic format. This must be accompanied by a separate synopsis (maximum 2 – 3 typed pages) of the most important findings and recommendations if it does not already contain a synopsis.

k. you present the findings to the Research Committee and/or Senior Management of the Department when and/or where necessary.

l. you are requested to provide the above to the Chief Director: Strategic Management Monitoring and Evaluation upon completion of your research.

m. you comply with all the requirements as completed in the Terms and Conditions to conduct Research in the ECDoE document duly completed by you.

n. you comply with your ethical undertaking (commitment form).

o. You submit on a six monthly basis, from the date of permission of the research, concise reports to the Chief Director: Strategic Management Monitoring and Evaluation

3. The Department reserves a right to withdraw the permission should there not be compliance to the approval letter and contract signed in the Terms and Conditions to conduct Research in the ECDoE.

4. The Department will publish the completed Research on its website.

5. The Department wishes you well in your undertaking. You can contact the Director, Ms. NY Kanjana on the numbers indicated in the letterhead or email nelisa.kanjana@ecdoe.gov.za should you need any assistance.

NY KANJANA
DIRECTOR: STRATEGIC PLANNING POLICY AND RESEARCH

FOR SUPERINTENDENT-GENERAL: EDUCATION

Appendix E: Data Collection Instruments

QUESTIONNAIRE

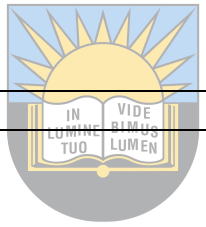
Participant questionnaire

University of Fort Hare
Together in Excellence

Musculoskeletal Pain and School bag use Questionnaire

SECTION A: Demographic Data
You are kindly requested to complete Section A, B and C. Please circle correct response, and specify where applicable.

Name of school



1. Gender (circle correct response)

Male	1
Female	2

2. Age

7 -8 years	1
8-9 years	2
10-11 years	3
12-13years	4
14 year-above	5

3. Race

African	1

White 2

Coloured 3

Indian 4

4. Home language

IsiXhosa 1

English 2

Afrikaans 3

Other 4

5. Grade

Grade 3 1

Grade 4 2

Grade 5 3

Grade 6 4

Grade 7 5

SECTION B: Anthropometry

1. Weight of pupil without school bag (in Kg)	
2. Weight of pupil with school and sport bag (in Kg)	
3. Weight of school bags (in Kg)	
4. Percentage of bag weight to body weight	
5. Hip and weight circumference	
6. Height of pupil	

SECTION C:
Please answer the following questions, by circling correct response, explain where applicable.

1. How do you get to school? Circle your response

Walk	1
Parent's car	2
Bus	3
Taxi	4
Other	5 please specify _____

2. How long does it take to travel from home to school while carrying your bag?

5-10 minutes	1
11-15 minutes	2
16-30 minutes	3
Longer than 30 minutes	4

3. Do you feel pain while carrying the school bag to school?

Yes	1
No	2

4. When do you feel the pain, during or after carrying the school bag?

During carrying back	1
After carrying bag	2
Both	3

5. Do you think your school bag is heavy?

Yes	1
No	2

6. Do you have to take a break when carrying the school bag?

Yes	1
No	2

7. Does carrying your bag make you tired?

Yes	1
No	2

8. For how long do you have to carry your bag throughout the day?

Between 10-20 minutes	1

Between 20-30 minutes 2

More than 30 minutes 3

I don't need to carry my bag at all 4

9. How many times do you have to carry your bag in one school day?
   Once, on my way to school only 1

   Twice, to and from school 2

   More than 2 times, between classes, and during break times. 3

   Other 4

If other, please specify_____

10. Do you participate in sports?
    Yes 1

    No 2

11. Are you required to carry an extra sports bag?
    Yes 1
    No 2

12. How do you carry your school bag most of the time?
    One shoulder 1
    Both shoulder 2
    Sling bag 3
    Pull/push trolley 4

13. Do you have to take all your books home, every day?
    Yes 1
    No 2
    If No, where do you keep the books you have left at school?

    _____

14. Does your school have school lockers?
    Yes 1
    No 2

If yes, do you make use of it? _____

15. Where do you feel the pain when carrying your school bag?

One shoulder	1
Both shoulders	2
Lower back	3
Other	4

If other, please specify_____

16. How often do you feel the pain in a week?

Once a week	1
Twice a week	2
More than 2 times a week	3
Every day	4

17. Do you think your school bag weight is the cause of this musculoskeletal pain?

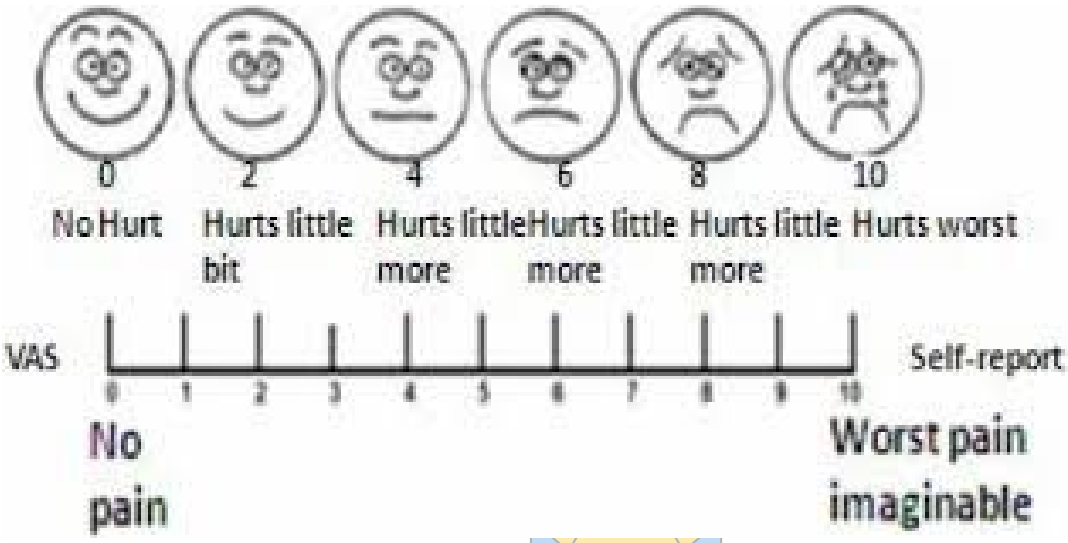
Yes	1
No	2

18. <u>Visual Analogue Scale</u>

Circle between 1- 10, how much pain you feel after carrying your school bag, 0 indicating no pain felt and 10 being the worst pain felt.

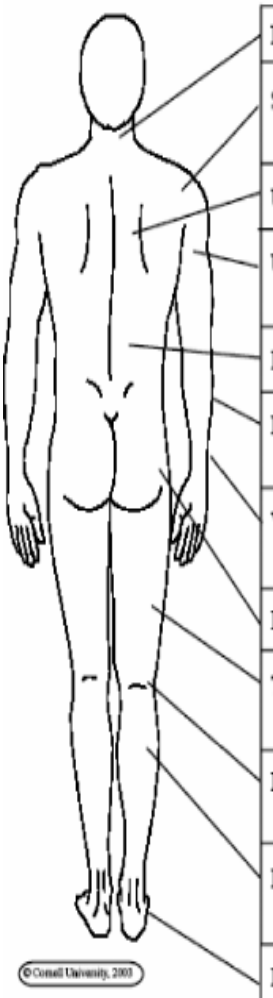
0----------1----------2----------3----------4----------5----------6----------7----------8---------9----------10

No pain worst pain ever



From: Acute Pain Management: Operative or Medical Procedures and Trauma, Clinical Practice Guideline (1992)

The diagram below shows the approximate position of the body parts referred to in the questionnaire. Please answer by marking the appropriate box.



		During the last work week how often did you experience ache, pain, discomfort in:					If you experienced ache, pain, discomfort, how uncomfortable was this?			If you experienced ache, pain, discomfort, did this interfere with your ability to work?		
		Never	1-2 times last week	3-4 times last week	Once every day	Several times every day	Slightly uncomfortable	Moderately uncomfortable	Very uncomfortable	Not at all	Slightly interfered	Substantially interfered
Neck		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Shoulder	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Upper Back		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Upper Arm	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lower Back		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Forearm	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wrist	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hip/Buttocks		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Thigh	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Knee	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lower Leg	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Foot	(Right)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	(Left)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

A Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) developed by Professor Alan Hedge and the ergonomics graduate students at the Cornell University (Hedge et al., 1999).

19. Look at the diagram provided above and answer the following questions.

Which part/s of your body become painful when carrying your bag? Circle the correct response,

Neck	1
Shoulder	2
Upper back	3
Upper arm	4
Lower back	5
Forearm	6
Wrist	7
Hip/buttocks	8
Thigh	9
Knee	10
Lower leg	11

During the last week, how often have you felt pain, ache or discomfort?

1-2 a week	1
2-3 times week	2
Once every day	3
Several times every day	4

When you felt the pain, ache and discomfort, how uncomfortable were you?

Slightly uncomfortable	1
Moderately uncomfortable	2
Severely uncomfortable	3

when you feel the pain, ache and discomfort, does it interfere with the ability to do your school work?

Yes	1
No	2
I don't know	3

THANK YOU FOR YOUR PARTICIPATION