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Prevalence and associated risk factors of musculoskeletal disorders in flight baggage handlers at an international airport in South Africa

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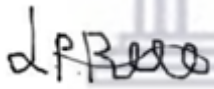
DECLARATION

I hereby declare that the study entitled, "*Prevalence and associated risk factors of musculoskeletal disorders in flight baggage handlers" is* my own work, it has never been submitted before for any other degree in any other university, and that the sources I have used have been indicated and acknowledged as complete references.

Livhuwani Phylist Ramashiya March 2023

Signed 

DEDICATION

Thank you to all my family, Lucy (Mother), Elina (Grandmother), Mercy, Tshilidzi and David for your constant prayers, support and motivation. To the late Nyawasedza (Stepmother), I know you are watching down and smiling, you raised me well. To my partner, Khuthadzo, who always believed in me and this journey, your unmatchable support and love carried me through every step of the way. Thank you.

I would not have wanted this journey to be any different.

If it does not challenge you, it will not change you.

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%	percentage
cm	centimetres
con	concentric
$^{o}\bullet sec^{-1}$	degrees per second
ecc	eccentric
kg	kilograms
ROM	range of motion
SD	standard deviation
MSDs	musculoskeletal disorders
UWC	University of the Western Cape
BMI	body mass index
ACSA	Airport Company in South Africa
LBP	lower back pain
MSI	musculoskeletal injuries

ABSTRACT

Background: Flight baggage handlers are prone to musculoskeletal disorders, due to the nature of their work that involves repetitive motion at certain joints, which over time, results in injury.

Aim: The aim of the study was to examined the prevalence and associated risk factors of musculoskeletal disorders in flight baggage handlers at an international airport in South Africa.

Methods: The study was a quantitative, cross-sectional, descriptive and correlation design. The study used convenient sampling of 100 female and male flight baggage handlers, aged 18 to 65 years, from one international airport in South Africa. A researcher-generated questionnaire was used to collect sociodemographic information, such as age, gender, marital status, and race. Anthropometric measurements were recorded, including stature, body mass, and waist and hip circumferences using standard equipment and procedures. The previously validated Dell's questionnaire for baggage handlers was used to determine the prevalence and associated risk factors of musculoskeletal disorders among flight baggage handlers. The previously validated Nordic musculoskeletal disorders questionnaire was used to identify the involved limb(s) presenting with musculoskeletal disorder in flight baggage handlers. Psychosocial factors were assessed using, the previously validated Copenhagen Psychosocial Questionnaire. Descriptive statistics were used to analyze the data on musculoskeletal disorder using SPSS version 25. The Chi-square test was used to assess the relationship between sociodemographic variables (such as age and gender) and musculoskeletal disorders, with the significance level set at $p<0.05$.

Results: The results showed that there was a high prevalence (100%) of musculoskeletal disorders in flight baggage handlers. The results showed that incapacitation, due to injury was highest in those who had experienced a lower back injury (46.0%), followed by upper back injury (36.0%), then injury in the shoulders (24.0%), wrists/hands (20.0%), and the lowest was injury in the ankles (10.0%). Blacks were more likely to feel musculoskeletal pain in the neck

($\chi^2(1) = 4.62$, p = 0.032), shoulders ($\chi^2(1) = 7.16$, p = 0.007), and elbows ($\chi^2(1) = 7.34$, p = 0.007). The low socio-economic status of the blacks limits their level of awareness to engage in physical exercises that help minimize musculosketal pains or pay for gym. There was a significant relationship between psychosocial factors and musculoskeletal disorders in flight baggage handlers. More than a quarter (27.0%) of the flight baggage handlers sometimes fell behind with their work, due to psychosocial factors that involved working under pressure which led to emotional disturbances, and forced them to work at a high pace that caused muscular fatigue. In relation to baggage handling from the point of surface check-into ground baggage handling and sorting, and aircraft conveyor transference, there was an exact time frame stipulated for flight baggage handlers in order for the airplane to depart on time. Consequently, working at a high pace sometimes (52.0%) causes flight baggage handlers to have more stress, led to emotional disturbances (41.0%). There was no significant association between musculoskeletal disorders in flight baggage handlers and wrist pain (28.4%, p=0.100). The results showed that there was no significant relationships between age and musculoskeletal disorders in flight baggage handlers.

Conclusion: In conclusion, a high prevalence of musculoskeletal disorders in flight baggage handlers was associated with psychosocial stress. The baggage room and aircraft compartment were more likely to cause high rates of lower back pain, shoulder pain and neck pain, due to the awkward posture adopted at work. The risk of musculoskeletal disorders in baggage handlers increased with increased psychosocial stress at work. This meant that increased baggage-handling duty may cause chronic or long-lasting musculoskeletal disorders in flight baggage handlers and may lead to prolonged sick leave, early retirement and retrenchment.

Keywords: flight baggage handler, work-related musculoskeletal disorders, cumulative traumatic disorders, and psychosocial stress.

CHAPTER ONE: STATEMENT OF THE PROBLEM

1.1. INTRODUCTION

Manual baggage lifting and handling are considered the main causes of musculoskeletal disorders (MSDs) or injuries in flight baggage handlers (FBHs) (Lu, Afanuh, Dick, Werren, Waters & Cincinnati, 2015). These injuries do not occur only among FBHs, but also in people who work in an environment that involves repetitive weight lifting (Tafazzol, Aref, Mardani, Haddad & Parnianpour, 2016). Back injuries are a common problem during lifting, and many production companies have implemented a weightlifting belt in order to reduce the prevalence of injuries (Reddell, Congleton, Huchingson & Montgomery, 2015). Koblouch (2016) found that one-in-twelve FBHs experienced back injuries, whereas, more than half complained of shoulder, knee, and low back pain.

Moreover, FBHs are exposed to many safety and health hazards that could lead to serious injury (Lu, Afanuh, Dick, Werren, Waters & Cincinnati, 2015). Flight baggage handlers perform physically demanding tasks, because their duties require a lot of manual loading and unloading of different types of heavy baggage to and from airplanes (Salomon, 2004). Flight baggage handlers also rotate through different work stations (i.e., baggage room, cargo hold, and baggage sorting area), some indoors and others outdoors, and in all types of weather conditions that are also associated with work station-specific types of MSDs (Salomon, 2004).

According to Lu et al. (2015), manual lifting and materials handling are the main causes of MSDs in FBHs. A large part of the FBH's job requires moderate-to-heavy physical labour

(Salomon, 2004). The average weight of checked bags at an international airport is about 14.5 kg, and the maximum baggage weight can reach up to 31.7 kg (Lu et al., 2015).

Injuries often occur to FBHs, because they must adopt awkward postures that are stressful, and lift loads that are usually too heavy (Scott, 2011). Furthermore, some baggage are not designed for ease of handling, and some workplaces are compactly designed, such as baggage rooms, conveyor stations, and cargo holds that increase the risk of injury (Salomon, 2004). Several studies have been done on occupational lifting and MSDs, however, the causes related to the chronic effects of cumulated exposure to occupational stresses are not clear (Bern, Brauer, Moller & Mikkelsen, 2013; Punnett, 2014; Hilliar, 2018; Solomon, 2004; Saudi, Shafii, Khairul & Kamarudin et al., 2018).

There is a high prevalence of MSDs in FBHs (Berstern, 2017), which shows a great need for more in-depth studies to be conducted. Flight baggage handlers are regularly exposed to risk factors associated with MSDs (Saudi, Shafii, Khairul & Kamarudin et al., 2018). This is a serious issue that needs to be addressed, since the aviation industry is continuously growing to support the increasing demand for commercial flight travel, both locally and globally.

Many factors may influence FBHs risk of sustaining MSDs, due to work-related stressors, such as psychosocial factors, physical factors, and environmental conditions (Bergsten, 2017; Bergsten, Mathiassen, & Vingard, 2015). These factors have a negative impact on FBHs, and long-term chronic MSDs that affect their daily activities and performance during work (Saudi, Shafii, khairul & Kamarudin et al., 2018).

According to Tafazzol, Aref, Mardani & Parnianpour (2014), the most common MSDs occurred in the low back region, the knees, neck, and upper back. The results from the National Institute for Occupational Safety and Health (2017; 2018) confirmed that many manual workers lifted loads heavier than the permitted limit and that their lifting postures were inappropriate, due to the awkward postures engaged while working.

1.2. Statement of the Problem

The work of FBHs, which involves lifting and carrying heavy baggage at the airport, makes FBHs vulnerable to developing MSDs or injuries (MSIs) (Salomon, 2004). This can lead to poor posture, muscle imbalance, limited range of motion (inflexibility), deformity, joint instability, poor muscle endurance, and poor muscle strength (Bern et al., 2013).

Musculoskeletal disorders can affect many different parts of the body, including the upper and lower back, neck, shoulders, and extremities, such as the arms, legs, feet, and hands (William, 2018). Examples of debilitating chronic MSDs include carpal tunnel syndrome, epicondylitis, tendinitis, back pain, tension neck syndrome, and hand-arm vibration syndrome (William, 2018).

In other countries such as Switzerland, Swedend previous studies focused on workplace risk factors that put workers at increased risk of MSDs in general and among FBHs (Bern et al., 2013; Solomon, 2004; Wang, Cao, Maimaiti & He et al., 2018). FBHs are prone to MSDs, due to the lifting of heavy baggage, when on duty National Institute for Occupational Safety and Health, 2012). However, there has been no specific study in South Africa based on MSDs in

FBHs employed by the Airports Company of SA (ACSA). Therefore, such a study is needed in order to better understand the prevalence and risk factors associated with MSDs in FBHs.

1.3. Aim of the Study

The aim of the study was to determine the prevalence and associated risk factors of musculoskeletal disorders (MSDs) in flight baggage handlers (FBHs) at an international airport in South Africa.

1.4. Objectives of the Study

The objectives of the study are to:

1.4.1. Determine the prevalence of MSDs in FBHs at an international airport in South Africa.

1.4.2. Determine the risk factors associated with MSDs in FBHs at an international airport in South Africa.

1.4.3. Determine the relationship between the sociodemographic variables and MSDs in FBHs at an international airport in South Africa.

1.4.4. Determine the relationship between psychosocial factors and MSDs in FBHs at an international airport in South Africa.

1.5. Hypothesis of the Study

The hypotheses of the study are the following:

1.5.1. There will be a high prevalence of MSDs in FBHs at an international airport in South Africa.

1.5.2. Flight baggage handlers will present with multiple risk factors associated with MSDs at an international airport South Africa.

1.5.3. There will be a significant relationship between the sociodemographic variables and MSDs in FBHs at an international airport in South Africa.

1.5.4. There will be a significant relationship between psychosocial factors and MSDs in FBHs at an international airport in South Africa.

1.6. Significance of the Study

Understanding the MSDs in FBHs is important because such knowledge can be used preventatively in order to avoid or minimise MSDs, as well as therapeutically to inform interventions on how to rehabilitate such MSDs (Berstern, 2017). In general, there is sufficient proven research data to show the magnitude of the problem in relation to MSDs, which has been ranked number one in terms of chronic impairments in many countries worldwide (Woolf, & Akesson, 2001). Understanding the MSDs in FBHs at an international airport will influence their quality of life, mental health, and health-seeking patterns of care in this population (Antonopoulou, Alegakis, Hadjipavlou & Lionis, 2009).

According to Tüzün (2007), the physical health consequences and chronic musculoskeletal pain can have profound negative impacts on an individual's emotional and social well-being. Previous research results indicated that people experiencing MSDs have a worse health-related quality of life than those who do not suffer from MSDs (Antonopoulou, Alegakis, Hadjipavlou & Lionis, 2009). However, MSDs cause physical functioning limitations that could have a negative impact on physical health, due to working at a high pace within a short time-period.

The musculoskeletal disorders in FBHs if left untreated or unattended it could led to a high rate of mortality, more joint surgical procedures and less quality of life span. Flight baggage handlers who experienced MSDs complains of repetitive joint and muscles pains due to previous injuries and this is because once they got injured then not receive proper medical care it worsen the condition (chronic) and cause muscle imbalance.

It is important to conduct such study because none of the cited studies on the risk factors and disorders role of the psychosocial work environment in causing or aggravating MSDs in FBHs (Bergsten, Mathiassen & Vingard, 2015). It is suggested that psychosocial factors at work are associated with risk of developing MSDs in the lower back(LBP), neck/shoulder region and upper extremities (Bergsten, Mathiassen & Vingard, 2015; Bongers, Kremer & Laak, 2002; Hauke, Flintrop, Brun & Rugulies, 2011). The lack of social support in FBH is one of the risk factor associated with musculoskeletal morbility, sicknes absence, restricted activities and not returning to work.

The other psychosocial risk factors of MSDs in FBHs include health beliefs and expectations, social status, accessibility to health care, functional status, and co-morbidity (Patten, Williams & Wang, 2006). In addition, the baseline data of the study will therefore assist in guiding individualized exercise prescription for those at risk of experiencing MSDs, as well as providing guidance on how to enhance work performance , productivity and social support. The study will also add a remarkable value in the country, as it is a first study to be done in South Africa among the FBHs at an international airport and the results will provide a positive value for the study to be continuously conducted in future.

1.7. Definitions of Terms

A **flight baggage handler (FBH)** refers to an employee of the Airports Company of South Africa (ACSA) who sorts and loads baggage (suitcases or luggage) to and from airplanes (Bergsten, Mathiassen, & Vingard, 2015).

A **risk factor** refers to any attribute, characteristic or exposure of an individual that increases the chance of developing a disease or injury (Amarican heritage, 2011).

Work-related musculoskeletal disorders (WRMSDs) refer to a group of painful disorders of soft and hard tissues, such as muscles, tendons, ligaments and nerves, as well as skeletal tissue, such as bones and cartilage, that occur due to repetitive movements and poor posture, sustained specifically in the work environment (Canadian Centre for Occupational Health and Safety, 2018).

Cumulative traumatic disorders (CTDs) refer to the excessive wear-and-tear on tendons, muscles and nerve tissue caused by continuous overuse for an extended or prolonged period of time (Health Page Team, 2018).

Musculoskeletal disorders (MSDs) refer to musculoskeletal injuries (MSIs) and/or dysfunctions that affect human movement that involves the nervous, musculoskeletal and cardiovascular systems, such as muscles, tendons, joints, ligaments, cartilage, bone, nerves, discs, and blood vessels (National Institute for Occupational Safety and Heath, 201).

Psychosocial stress refers red as organizational or interpersonal factors resulting in increased actual or perceived stress (Jasobanta, Jaspal, & Vijay, 2011).

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This study reviewed the literature on the prevalence and associated risk factors of MSDs in FBHs. The literature focused on the prevalence of MSDs in FBHs at an international airport, the risk factors associated with MSDs in FBHs, the relationship between the sociodemographic variables and MSDs in FBHs, and the relationship between psychosocial factors and MSDs in FBHs. However, poor channels of communication and poor support in the workplace have also been reported to negatively impact productivity, as FHBs do not have access to the resources that help them do their jobs, and they do not have the passion and motivation to perform well or even exceed expectations (Field Service Digital, 2020).

The following electronic search databases were used to access the related literature: Google Scholar, Science Direct, Scopus, EMBASE, and ERIC, Medline, and Web Science, EBSCO host, PubMed, BIOMED Central, and African Journal Online. The basic search phrases included: "prevalence" OR "associated risk factors" OR "Musculoskeletal disorders" OR "flight baggage handlers". Only peer-reviewed and relevant documents published in English were retrieved for review.

According to Bestern (2007; Eval, Bergstern), the first commercial airline flight on January 1, 1914, carried only one passenger, while today, a hundred years later, on this same date, 8.5 million passengers flew on approximately 100 000 passenger flights operated by almost 1400 airlines with a total fleet of 25 000 aircraft serving 4 000 airports. If, approximately, every fourth passenger checked in a single 10 kg bag (a rather conservative assumption), 43 million

kilograms of luggage would have to be loaded and unloaded every day. Repetitive movement tends to cause FBHs to experience MSDs (Bestern, 2007).

2.2. Prevalence of Work-Related Musculoskeletal Disorders in Flight Baggage Handlers

According to Tafazzol et al. (2016), there is high prevalence of MSDs in FBHs, due to manual materials handling. Baggage handling is associated with several physical factors that increase the risk of developing MSDs, such as the manual handling of heavy materials, frequent lifting, adopting awkward body postures under physical stress, and pushing and pulling excessive loads (Bergsten, Mathiassen & Vingard, 2015). However, MSDs in FBHs are caused by injury to bones, joints, muscles, tendons, ligaments or nerves (Cleveland Clinic, 2014). This is due to overuse of muscles, poor posture, prolonged immobilization, jerking movements, falls, fractures, sprains, dislocations, and direct blows to the muscle during loading and unloading of passenger baggage (Cleveland Clinic, 2014).

The symptoms of musculoskeletal pain can differ from person to person and depend on whether the pain is caused by an injury or overuse, and whether it is acute or chronic (Eley Law Firm, 2020). Common symptoms of MSDs include localized pain that often worsens with movement, aching or stiffness of the entire body, the feeling that muscles are pulled or overworked, persistent fatigue, sleep disturbances, twitching muscles, and a burning sensation in muscles (Cleveland Clinic, 2014).

Repetitive stress injuries are common among baggage handlers and can cause carpal tunnel syndrome, lower back pain, neck and shoulder pain, aching knees, and damage to muscles and

tendons (Eley Law Firm, 2020). However, repetitive stress injuries are not the only injury airport workers sustain in the line of duty (Cleveland Clinic, 2014). Lifting items with only one hand can put intense stress on one side of the body, and cause hand fatigue (Bergsten, Mathiassen & Vingard, 2015). Handling uneven loads or two bags at a time, as well as using extended arms to lift and move bags can result in injuries to muscles, ligaments, and the back (Eley Law Firm, 2020).

According to the Cleveland Clinic (2014), parking a cart too close to the belt-loader can result in repeated twisting when transferring baggage, and increase the possibility of injury. Alternatively, parking a cart too far from the belt-loader can needlessly increase a worker's exertion and cause MSDs in FBHs (Cleveland Clinic, 2014). Back injuries can also occur when reaching too far into a cart to retrieve an item (Bergsten, Mathiassen & Vingard, 2015). Shoulder injuries can occur when removing bags from the second shelf of the cart (Eley Law Firm, 2020). Furthermore, positioning the end of a belt-loader too high or too low relative to the cart can also result in stress to the shoulders, arms, and back (Cleveland Clinic, 2014). Inside the baggage compartment of a plane, workers can suffer back and neck injuries, due to the cramped space or when a FBH is required to twist the torso repeatedly (Eley Law Firm, 2020). Injuries can also occur when workers take heavy or oddly shaped items down from the loading bridge (Berstern, 2017). Pushing heavy carts or baggage containers can injure the back and shoulders (Cleveland Clinic, 2014).

The excessive, repetitive work performed by FBHs leads to MSDs, such as ligament sprain, tension neck syndrome, thoracic outlet compression, rotator cuff tendinitis, epicondylitis, radial

tunnel syndrome, digital neuritis, trigger finger, impingements, strains, degenerative disc disease, and ruptured or herniated discs (NIOSH, 2018).

Musculoskeletal conditions and injuries are not just conditions of old age, but are also prevalent across the life-course (World Health Organisation, 2020). Musculoskeletal conditions are prevalent in one-third to one-half of multi-morbidity conditions, particularly in older people and among baggage handlers engaged in heavy lifting (WHO, 2020). Other common health problems associated with MSDs are depression and anxiety, and they increase the risk of developing other chronic health conditions, such as hypertension and cardiovascular disease (Lunde et al., 2014).

Musculoskeletal disorders have a profound impact on an individual's health, illness, work absenteeism, and early retirement, particularly in physically demanding occupations (Lunde et al., 2014). There are many health problems associated with MSDs in FBHs that affect them throughout their life (NIOSH, 2018), for example, some of the health problems include obesity, cancer, diabetes, drug and alcohol abuse, heart disease, flu, and mental illness.

Worker absenteeism can affect an individual's daily productivity (Field Service Digital, 2020). There is a lot of worker absenteeism, due to poor communication in the workplace (Field Service Digital, 2020). This leads to a high percentage of sick leave and job absenteeism (Field Service Digital, 2020). Moreover, it also tends to put more pressure on some FBHs, when others are absent (Field Service Digital, 2020). Increased job absenteeism leads to poor work performance (Lunde et al., 2014). When FBH is absent regularly, the rest of the team may be

unable to complete their work by a given deadline (Andrew, 2017). Failure to come to work regularly impedes the FBHs ability to complete a task and causes a knock-on effect on job delays and loss of productivity (Andrew, 2017).

There is a strong relationship between disability, early retirement, and MSDs in FBHs (Field Service Digital, 2020). According to Andrew (2017), musculoskeletal conditions are leading contributors to disability worldwide, with low back pain being the single most leading cause of disability globally. Therefore, FBHs tend to have musculoskeletal conditions that limit mobility and dexterity, leading to early retirement from work, reduced accumulated wealth, and reduced ability to participate in social activities and functions (Lunde et al., 2014).

There are several risk factors present in the work environment of flight baggage handling, such as stressful work postures and movements, repetitiveness and pace of work, the force of movement, extreme environmental temperatures, increased work pressures, poor channels of communication, low worker support, excessive vibration and monotonous tasks (Canadian Centre for Occupational Health and Safety, 2018). Stressful work postures and movements can cause discomfort and fatigue, when they are maintained for prolonged periods of time (CCOHS, 2014). For example, standing is a natural body posture, by itself, and generally poses no particular health hazards. However, working for prolonged periods in a standing position can cause sore feet, general muscular fatigue, and low back pain (Lunde et al., 2014). In addition, the improper layout of work areas, and certain work tasks can make FBHs use unnatural standing positions, which tend to cause MSDs (Andrew, 2017). Poor workspace layout and poor design of tools and machinery can result in adopting stressful working postures

and produce excessive destructive forces during the repetitive pushing and pulling of baggage trailers (Kuhl & Van den Broek, 2020).

According to Lunde et al. (2014) found that when FBHs position various parts of their bodies at the extremes of their range of movement, then overstretching and torsional compression of tendons and nerves occur. The longer a fixed or awkward body position is maintained, the more likely are FBHs prone to developing MSDs (Andrew, 2017). For example, working with the torso bent forward, backward or twisted can place too much stress on the low back. Other examples of stressful body positions include reaching above the shoulder level, reaching behind the body, rotating the arms, bending the wrist forward, backward or side to side, and reaching forward too far out in front of the body. The contracted muscles squeeze the blood vessels, which restricts the flow of blood to the working muscles of the hand. This is where the blood is needed the most, because of the intense muscular effort. As a result, the neck/shoulder muscles become overtired, even though there is little or no movement. At the same time, the reduced blood supply to the rest of the arm accelerates fatigue in the muscles that are moving, making them more prone to injury (CCOHS, 2014).

Musculoskeletal disorders among manual baggage handlers (MBHs) often result from a lack of automation and repetitive movement that leads to a substantial number of intense injuries, due to overexertion (Tafazzo et al., 2016). However, the intensity, duration, and frequency of risk factors play a major role in the prevalence of MSDs in FBHs (Dell, 2016). The increased intensity of loading and unloading of baggage has a negative effect on posture and increases the risk of MSDs (Wahlström & Trask, 2018). The results of a study at a Swedish airport on

FBHs indicated that 67% reported lower back pain (LBP) and 55% had shoulder pain (Bergsten, Mathiassen & Vingard, 2015).

Repetitive movements are especially hazardous, when they involve the same joints and muscle groups over-and-over, and when doing the same motion too often, too quickly and for too long (CCOHS, 2014). The work tasks of FBHs require repetitive movements continuously that involve other risk factors for MSDs, such as adopting a fixed body position and developing excessive forces to perform the tasks (Kuhl & Van den Broek, 2020). For example, when someone is reaching for bottles, grasping bottles, moving bottles to a box, and placing bottles in a box, these are all examples of repetitive movements that can cause MSDs.

Baggage handling work tasks and cycles are repetitive and frequently controlled by hourly or daily production targets and work processes (Bulduk, Bulduk & Güler, 2017). High task repetition, when combined with other risk factors, such as high force and/or awkward postures, can contribute to MSDs (Bruce, 2020). A baggage-handling job is considered highly repetitive, if the cycle time is 30 seconds or less (Da Costa, Vieira & Van Rijn, 2010). Baggage-handling work tasks that require high force place abnormal loads on the human body (Bruce, 2020). Consequently, extra muscular effort increases in response to the high force requirements, thereby, increasing the associated fatigue that can lead to MSDs (Gallagher, 2013).

According to Gallagher (2013) found that joints of the body are most efficient when they operate closest to the joint mid-range of motion, however, repetitive or sustained awkward postures, during loading and unloading of baggage inside the conveyor can lead to MSDs, due

to awkward postures that place excessive loads on joints, and overload the muscles and tendons around the affected joint (Bruce, 2020). The risk of MSDs are increased when joints are working repetitively outside the joint mid-range of motion or when performing sustained work over prolonged periods without adequate recovery time (Bruce, 2020).

The more force that FBHs generate to perform their work translates into more muscular effort and, consequently, a longer time is needed to recover between tasks (CCOHS, 2014). Furthermore, contracted muscles compress the blood vessels, which restricts the flow of blood to the working muscles and the limbs (Kuhl & Van den Broek, 2020). Engaging in strenuous repetitive work can lead to insufficient time for recovery and, the more forceful movements, produce fatigue much faster and cause MSDs in FBHs (CCOHS, 2014).

The amount of force used to do a job depends on many factors, such as the weight of the objects and their position in relation to the body. It requires more force to lift and carry a box with the arms outstretched and held away from the body than with the arms held close to the body. For example, lifting the same object in a "pinch" position using your forefinger or middle finger and thumb in to grasp an object rather than in a "hook" position using your hole hand and thumb in to grasp an object can cause MSDs (CCOHS, 2014). The object shape also plays an important role and sometimes does not allow for the best position of the wrist, elbow, and shoulder that substantially increases the force required (Kuhl & Van den Broek, 2020). For example, a worn screwdriver, a pliers with worn jaws or a blunt scissor can increase the operating force by as much as tenfold and, thereby, increase the risk of developing MCDs (CCOHS, 2014).

The FBHs temperature of the working environment temperature depends on the daily weather conditions. Therefore, if it gets very cold, the hands and fingers become numb, which makes it difficult to hold or carry baggage, and can lead to awkward postures and movements being adopted that can cause MSDs (CCOHS, 2014). Due to very hot temperatures and very humid conditions, FBHs reach fatigue more quickly and, thereby, may become more susceptible to MSDs (Kuhl & Van den Broek, 2020). Therefore, the temperature of the workplace affects the body's muscles, where in excessive heat increases overall fatigue and produces sweat, which makes it hard to hold tools, therefore, requiring more force (CCOHS, 2014). Alternatively, excessive cold can make the hands feel numb, making them hard to grip and, thereby, require more force to perform a task (CCOHS, 2014). Every movement and position involving more effort is more likely to develop work-related neck and upper limb disorders (Kuhl & Van den Broek, 2020).

Constant vibration adversely affects tendons, muscles, joints, and nerves (Kuhl & Van den Broek, 2020). Excessive vibration and the monotonous action of the machines used to load and unload baggage can cause damage to nerves and blood vessels, as well as other soft tissues (Kuhl & Van den Broek, 2020). Flight baggage handlers are at risk of being expose to either whole-body vibration or localized vibration that can cause them to lose feeling in their hands and arms and, thereby cause MSDs (CCOHS, 2014). Vibrations to the hand and arm cause tingling and numbness or loss of sensibility, thereby, requiring a higher clamping force and awkward body position, because vibrating hand tools are harder to control (CCOHS, 2014).

Increased work pressures in FBHs determine the ability to do more work, and that depends on the amount of time available for rest and recovery of the body between cycles of a particular

baggage handlers' task (CCOHS, 2014). The faster baggage handlers work, the less time is available for them to rest and recover, and the higher the risk for MSDs (Berstern, 2017).

The population demographics are changing, especially in developed countries, with increasing proportions of senior workers currently remaining in the workforce (Dell, 2016). Senior workers may have particular difficulties in coping with physically demanding occupations, while simultaneously trying to maintain good health (Lunde et al., 2014).

According to Bern, Brauer, Møller & Koblauch et al. (2013), the self-reported musculoskeletal symptoms reported during the previous 12 months in the neck/upper back, lower back, shoulders, elbows, wrists, hips, and knees were significantly higher in FBHs than in the reference group. Adjustment for age, body mass index, smoking, and leisure-time physical activity showed no change or impact on MSDs in FBHs (Bern, Brauer, Møller & Koblauch et al., 2013).

Previous studies showed that the risk exposure scores for Work Related Musculoskeletal Disorders among FBHs were high for the neck and back (static), and very high for the back (moving), the shoulder/arm, and the wrist/hand (Bulduk, Bulduk & Güler, 2017). According to Dell (2007), 71% of FBHs experienced back pain more than once, 17% reported having back pain daily, and 12% reported having back pain weekly and, therefore, this showed that in a month, there was a high prevalence of MSDs that prevented FBHs from completing their daily work performance. In an effort to reduce the pain among FBHs it may, therefore, be justified to consider a reduction in biomechanical exposure during baggage handling, combined with

due attention to the predisposing psychosocial factors that were also present (Da Costa, Vieira & Van Rijn, 2010).

The average job satisfaction levels of the majority of FBHs were either low or moderate (Bulduk & Güler, 2017). In addition, low and moderate job satisfaction was significantly associated with higher WRMSDs among FBHs (Dell, 2007).

In general, when a FBH is asked to perform work (flight baggage handling) that is outside his/her body's capabilities and limitations, then the individual tends to put his/her musculoskeletal system at risk of injury (Bruce, 2020). In these situations, an objective evaluation of the design of the workstation indicated that the recovery system of FBHs was not able to keep up with the fatigue caused by performing strenuous baggage handling work (Bruce, 2020).

There are three primary ergonomic risk factors in the work environment that influence the prevalence of MSDs in FBHs (Da Costa, Vieira & Van Rijn, 2010). Exposure to these workplace risk factors put FBHs at a higher risk of developing MSDs. Understandably, high task repetition, forceful exertions and repetitive/sustained awkward postures place tremendous fatigue on the worker's body beyond their ability to recover, leading to musculoskeletal imbalances and, eventually, MSDs (Bruce, 2020).

2.3. Risk Factors Associated with Musculoskeletal Disorders in Flight Baggage Handlers

2.3.1. Age

The influence of age on WRMSDs is a common problem (NIOSH, 2016). When one ages, changes occur to the musculoskeletal tissue, such as increased bone fragility, loss of cartilage resilience, reduced ligament elasticity, loss of muscular strength, and fat redistribution (Dell, 2007). This decreases the ability of the tissues to carry out their normal functions efficiently, and results in a loss of mobility that negatively affects physical independence (Roman, 2012). Increasing age also adversely affects physical working capacity, for example, a 25-year-old worker will generally have a greater work capacity than a 50-year-old worker, if all else is equal (NIOSH, 2016). In the later years, when one gets older, it is easier to fatigue, especially during excessive work (Dell, Splittstoesser & Wahlström, 2016). Consequently, there is a higher prevalence of MSDs among older than younger FBHs (Okunribido & Wynn, 2012).

Physical work capacity, including aerobic capacity and muscular strength, will, on average, decrease with age (Dell, 2015). Senior workers (>50 years) may be particularly prone to developing insufficient work productivity (NIOSH, 2016). This could be a contributing factor to age-related differences in workability in physically demanding occupations, and to the increasing prevalence of MSDs with aging (NIOSH, 2016). While some studies have shown positive training effects from occupations with high physical demands (Dell, 2007), other studies on seniors with a history of manual labour have associated a longer lifetime of physically demanding work with higher rates of disability, lowered physical function, and a

reduction in muscular strength (Lunde et al., 2014). There was no significant relationship, however, between age and MSDs among present and former FBHs (Dell, 2007).

2.3.2. Gender

Isabel, Michell and Jorge (2002) reported that there was a higher incidence of WRMSDs in workers doing highly repetitive movements, and baggage-handling duty is more strenuous than most jobs. Most of the MSDs were related to manual materials handling, and gender had a secondary influence on MSDs (Isabel, Michell & Jorge, 2002). Females were reported to be at higher risk of MSDs during manual baggage handling than males (Dell, 2015). Another study showed that mostly females took sick leave, due to injuries related to their work (Hill & Buxton, 2012). The prevalence of MSDs among female FBHs was associated with their job tasks, including manual materials handling, for example, frequently pushing or pulling heavy carts and lifting or carrying heavy objects, and uncomfortable work postures (Lee, Wilbur & Conrad et al., 2006). Therefore, female FBHs are more at risk of having MSDs, due to not being strong enough as their male counterparts.

2.3.3. Psychosocial factors

Psychosocial factors refer to work-related stress, for example, the FBH's organisation of work and management practices, and workers' skills and expectations (Bruce, 2020). Psychosocial factors at work relate to interactions between and among the work environment, job content, organisational conditions, and worker's capacities, needs, culture, and personal extra-job considerations that may influence health, work performance, and job satisfaction (Bulduk,

Bulduk & Güler, 2017). According to the Joint ILO/WHO Committee (2003), the 'stressful psychosocial factors in the working environment are many and varied.

These include physical aspects, some aspects of the organisation and system of work, and the quality of human relations in the enterprise (Cox, 2000). Moreover, these factors interact and affect the psychological climate in the enterprise, and the physical and mental health of workers (Bulduk, Bulduk & Güler, 2017). Previous studies showed that ten types of characteristics gave rise to work-related stress, with some of the characteristics also relating to the organisation of work (Cox, 2000).

Some studies have indicated different results for men and women regarding the relationship between psychosocial factors and WRMSDs (Paulo, 2017). In previous studies, the results showed that the percentage of FBHs who reported that their job involved working to tight deadlines, for at least a quarter of the time, also reported increased MSDs, specifically from 59% in 2000, to 61.9% in 2005, and 62.1% in 2010 that adversely impacted their life (van den Heuvel, 2017). Moreover, once FBHs had an injury, psychosocial factors, such as depression and maladaptive pain responses, were pivotal in the transition from acute to chronic pain, and in the development of disability (Paulo, 2017).

Some of the characteristics that cause work-related stress include low morale (Cox, 2000). When morale is low, workers often feel powerless (Concordia, 2018). This in turn makes them complacent, and productivity suffers (Cox, 2000). The work of an FHBs is marked by the service aspect of responsibilities, and these individuals must respond to the demands and

timelines of others with little control over events (Concordia, 2018). Common to these types of jobs are feelings of too little authority, unfair labour practices, and inadequate job descriptions (Concordia, 2018).

Other factors that cause work-related stress are management style, i.e., when a workplace has poor communication, employees are not included in the decision-making processes, and workers do not feel supported by their co-workers and employers (Concordia, 2018). In addition, a lack of family-friendly policies can lead to increased stress due to the effects on work-life balance (Concordia, 2018).

Job responsibilities also play a role in causing work-related stress, and this is based on how tasks are assigned and carried out, which is a big contributor to workplace stress (Concordia, 2018). This includes heavy workload, infrequent breaks, long hours and shifts, unnecessary routine tasks, and ignoring workers' skills (Concordia, 2018). When job expectations are uncertain or conflicting, employees then feel that they have too much responsibility and too many "hats to wear".

Career concerns can cause one to have workplace stress, such as job insecurity or a lack of advancement opportunities (Concordia, 2018). Rapid changes in the workplace of FBHs, with little or no learning curve allowed, were identified by the Centre for Disease Control and Prevention as problematic (Concordia, 2018).

According to Eurostat (2010), these disorders account for almost 60% of work-related health problems and are, therefore, the most common occupational disorder in the European Union (EU). Stress during manual baggage handling is associated with job demands and job stress (Dell, 2007). Some research shows that occupational psychosocial stress in FBHs may be related more to the total job and organizational structure (Norte da Silva, Bueno da Silva & Gontijo, 2017). In contrast, other researchers reported that the job level was a better indicator of psychosocial stress (Jasobanta, Jaspal & Vijay, 2011). Factors that may influence psychosocial stress in FBHs include rigid work procedures, lack of social support, monotony and insecurity, as well as dissatisfaction with job positions (Hauke, 2011).

Factors that influence psychosocial stress include time pressure, work pace, rest breaks, workload or surges of work, and job control that include perceived lack of participation in decision-making, and the level of influence on work and work outcomes (CCOHS, 2017). Moreover, job satisfaction includes task variety and variability versus monotony, opportunities for development or challenges versus poor skill utilization, and, support, which include social support and emotional support from the employer, co-workers, and family (CCOHS, 2017).

Many psychosocial factors tend to affect one's physical health or musculoskeletal systems, such as stress, hostility, depression, hopelessness, and lack of job control (Jasobanta et al., 2011). Psychosocial stress arises from the poor organization and management of work, which may be due to a lack of social support, psychological aggression, conflicting demands, and an imbalance in the work-family relationship (Dell, 2007). These factors tend to make workers feel dissatisfied, stressed and de-motivated and, therefore, adversely affect their work performance (Da Silva et al., 2017). In addition to the physically strenuous tasks involved in

airline baggage handling, there was also dissatisfaction with the psychosocial factors, such as personal relations, leadership, support, influence, and the organization of work (Roquelaure, 2011).

Based on previous studies, shoulder pain that interfered with work demonstrated a particularly strong association with social support from colleagues, which was in agreement with the conclusions of the study (Rijn, 2010). Low back complaints and limitations in physical activity were also associated with a lack of social support from colleagues and supervisors (Dell, 2007). One interpretation of these findings is that support from colleagues may enable the worker, despite the presence of pain, to plan and efficiently perform tasks with reduced physical effort. In contrast, a lack of support or influence may give rise to pressure and stress and, thereby, contribute to elevated muscle tension, blood and metabolic disturbances, and, subsequently, enhanced risk of developing or aggravating pain (Rijn, 2010). Furthermore, a lack of social support was associated with restricted activity and worker absenteeism, as well as a lower probability of returning to work (Bergsten, Mathiassen & Vingard, 2015).

The stressful psychosocial work conditions in flight baggage handling are critical causes of MSDs (Bergsten, Mathiassen & Vingard, 2015). Other psychosocial factors in the work environment included work organization, job content, interpersonal relations, and leadership, which were all associated with stress (Bergsten, Mathiassen & Vingard, 2015). This indicated that stress could cause MSDs in FBHs, due to psychosocial problems (Bergsten, Mathiassen & Vingard, 2015). According to Bergsten, Mathiassen & Vingard (2015), the FBHs union claimed a high prevalence of lower back and shoulder pain, due to an unsatisfactory psychosocial work environment.

2.3.4. Physical and Physiological Factors

Numerous physical risk factors such as high force, awkward posture, long duration and high frequency **influence** MSDs in FBHs (Rijn, 2010). The physical working capacity loads determine the severity of injury or MSDs, which become prominent when combined with physical risk factors, such as doing heavy-duty work, especially after working for a prolonged period of time (Bergsten, Mathiassen & Vingard, 2015). In addition, other factors that cause one to have work-related stress are traumatic events (Cox, 2000). FHBs jobs are more dangerous, as they can lead to long-term MSDs. The work environment is also an important cause of workplace stress emotionally (Concordia, 2018; Cho ,T.S., Jeon, W.J., Lee, J.G. et al (2014). However, a poor work environment can also create physical stress as well (Cox, 2000). Whether this is related to noise, a lack of privacy, poor temperature control or inadequate facilities, is highly questionable, nevertheless, the work setting is critical in lowering workplace stress (Concordia, 2018).

The influence of physical and physiological factors indicated that almost 40 million workers in Europe suffer from MSDs of the limbs and the back (Eurostat, 2010). In general, all workers doing hard or heavy jobs experience MSDs that will negatively affect the economy in the long term, due to the high demand for sick leave and the long process of rehabilitative treatment (Lunde, Koch & Knardahl et al., 2014).

When comparing the mechanical load on the low back and shoulders during pushing and pulling a two-wheeled container with the same load during lifting and carrying, then pulling is more prone to injury by causing a lot of low back and shoulder pain (Schibye, 2001). According to Harcombe (2010) 58% of FBHs reported MSDs, due to baggage handling.

The peak torque generated during the pull/push compression of the lower back region at lumber spine L4 and lumber spine L5 is from 605 to 1445 N (Schibye, 2001). Furthermore, the extension torque at L4/L5, produced by the push/pull force, is counteracted by the forward learning of the upper body (Schibye, 2001). The forces involved in pushing and pulling are very high and common in many workplaces that involve heavy lifting, although some workplaces have tried to minimize manual baggage handling by introducing conveyor belts and machines (Dell, 2007). This emphasises the need for more knowledge on the internal mechanical load of the body during these physical activities (NIOSH, 2012).

There are Individual-related risk factors that involve FBHs multi-dimensional tasks that are associated with MSDs (Jonker, 2009). Poor work practices are one of the risk factors experienced by FBHs, which include poor body mechanics and poor lifting techniques that contribute to MSDs (NIOSH, 2012). These poor practices create unnecessary stress on the body that increased fatigue and decreased the body's ability to recover properly (Bruce, 2020).

Poor health habits were related to baggage handlers\ who smoked, drank excessively, were obese, and put themselves at risk for developing not only MSDs, but also other chronic diseases that often shortened their lifespan (NIOSH, 2012). When it comes to inadequate rest and recovery as physiological risk factors, MSDs developed when fatigue exceeded the FBH's recovery system, causing musculoskeletal imbalances (Jonker, 2009). Baggage handlers who did not get adequate rest and recovery put themselves at higher risk of injury (Bruce, 2020).

Poor nutrition, a lack of physical fitness, and poor hydration are risk factors for MSDs (Jonker, 2009). FBHs who do not take care of their bodies put themselves at higher risk for developing musculoskeletal and chronic health problems (NIOSH, 2012). Poor nutrition and dehydration also make it difficult for the muscles to recover quickly, and make the body weaker to perform strenuous work (Bruce, 2020). In addition, a lack of fitness, due to muscle imbalances, combined with poor strength and muscular endurance, put FBHs at risk of sustaining MSDs (NIOSH, 2012).

CHAPTER THREE: RESEARCH METHODS

3.1. Introduction

This chapter outlines the quantitative, cross-sectional, descriptive and correlational design of the study. The data collection instruments and questionnaires are described, as well as the techniques used to collect the data and the methods used to analyse the data. The analysis carried out was done in two parts, namely, descriptive analysis (data presentation) and inferential analysis (hypothesis testing).

3.2. Research Design

The study used a quantitative, cross-sectional observational study design.

3.3. Study Population and Sample Size

A total population of 134 FBHs are employed at all the airports by the Airports Company of SA (ACSA). After screening for eligibility, a total of 100 female and male FBHs at the an International Airport in South Africa was conveniently sampled. The sample size calculated using Slovin's formula to establish an acceptable power for the study:

$$n = \frac{N}{1+Ne2}$$

$$n = \frac{134}{1+ (134\ x\ 0.05^{2})}$$

n = 100

Key:

N = total population (100)

n = number of participants (100)

e = margin of error (0.05)

3.3.1 Inclusion Criteria

The participants were included in the study, if they were FBHs, male, female, who were permanently employed for more than 12 months by ACSA, and aged 18 years to 65 years older.

3.3.2. Exclusion Criteria

Participants were excluded, if they had any acute illness in such a manner that they were unable to perform the tasks of a FBH due to the covid19 risk of contamination.

3.4. Research Instruments

3.4.1. Self-Administered Sociodemographic and Injury Questionnaire

Self-administrated questionnaire was used to obtain the sociaodemographic data of the participants. Information on age, gender, ethnicity, marital status, and smoking status were self reported. A previously validated questionnaire, namely, the Dell's Survey of Baggage Handlers was used to collect data on MSDs (Dell, 1998). Data on the manual baggage-handling location, the manual baggage-handling task that was likely to cause injury, and the personal injury history of the FBHs were collected with the Dell questionnaire.

The previously validated Nordic MSDs questionnaire was used to identify the involved limb(s) presenting with MSDs (Crawford, 2007). The prevalence of MSDs in the past 12 months in FBHs was also recorded with the Nordic MSDs questionnaire**,** as well as the pain intensity that was subjectively reported on a scale ranging from "no pain" to "very, very high (almost maximal) pain", with the specification of anatomical site.

The psychosocial factors were assessed based on two domains using the previously validated Copenhagen Psychosocial Questionnaire (COPSOQ) (Bergsten, 2017). The two psychosocial domains involved work organization and job content, which included five factors, such as (1) the influence at work, (2) the possibilities for development, (3) variation in job function, (4) the meaning of work, and (5) commitment to the workplace. Furthermore, interpersonal relations and leadership were also assessed (that included eight factors, i.e., (1) predictability, (2) recognition, (3) role clarity, (4) role conflicts, (5) quality of leadership, (6) social support from colleagues, (7) support from supervisors, and (8) social community at work). Each of these factors were evaluated using a total of 35 questions.

The questions concerning six of these factors, such as influence at work, variation, commitment to the workplace, social support from colleagues, social support from supervisors, and social community at work were answered on an four and five–point Likert scale ranging from "always" to "never/hardly ever", whereas the other seven factors (i.e., possibilities for development, meaning of work, predictability, recognition, role clarity, role conflict and quality of leadership) were answered on a five-point Likert scale that ranged from "to a large extent" to "a very small extent". The answers were assigned a value of either 1-4 or 1 to 5 and an overall mean score was calculated according to Petersen et al. (2010). In general, a higher

mean score indicated a more positive work environment, except for role conflict, where the opposite was true. The questionnaires were completed in paper form (hardcopy) at an international airport in South Africa by the flight baggage handling team and submitted for analysis. The mandatory COVID-19 safety protocols were observed during data collection.

3.4.2. Anthropometric Measurements

The antropometric measurements taken in the study followed the guidelies of the International Society for the Advancement of Kinanthropometry (ISAK) Marfell-Jones, 2006).

3.4.2.1. Stature

Stature was measured using a tape measure calibrated in centimetres and measured to the nearest 0.1 cm. A tape measure, calibrated in centimetres, was attached to a wall from the ground and used to measure stature. Participants were asked to remove their shoes, before taking the measurements. Participants were asked to stand with their back against the wall and look directly forward. The calves, buttocks, upper back, and the back of the head were all in contact with the wall when the measurement was taken. Participants were positioned directly underneath the headboard, and the headboard was lowered until it rested gently on top of the participants 'heads, and the measurement was recorded upon a maximal inhalation.

3.4.2.2. Body mass

Body mass was measured in light clothing, without shoes, using a digital diagnostic scale (SBF 14 electronic weighing scale) calibrated to the nearest 0.1 kg. The scale was zeroed, before the participants stepped onto it. Participants were asked to remove any 'heavy' items from their pockets (keys, wallets, etc.), and to remove any heavy items of clothing or apparel (jackets,

shoes, woollen jerseys, etc.). When measuring body mass participants were asked to look straight ahead and to stand still on the scale.

3.4.2.3. BMI

Body mass index (BMI) was derived by dividing the body mass (kg) by the stature (m^2) and expressed in kilograms per metre squared ($kg•m^{-2}$). The following categories were used to interpret BMI according to the participants BMI results: underweight < 18.5 $kg•m^{-2}$, normal weight = 18.50 - 24.99 $kg•m^{-2}$, overweight = 25.00 - 29.99 $kg•m^{-2}$ and obese ≥ 30.0 $kg•m^{-2}$.

3.5. Reliability and Validity

The Standardised Nordic questionnaire was previously validated for measuring the prevalence and associated risk factors of MSDs in FBHs (Crawford, 2007; Kuorinka, I, Jonsson, B, Kilbom, A, Vinterberg, H., & Rensen, F.B., 1987). Dell's Survey of the baggage handlers questionnaire was also previously validated for measuring MSDs in FBHs (Dell, 2015; Yang, C, Wang, J, Zhang, W. et al., 2017). The validity of the questionnaire was reported by calculating Cohen's Kappa concerning sensitivity, specificity, and predictive values using and the formula for Cohen's kappa is calculated as: $k = (p_o - p_e) / (1 - p_e)$, where: p_o: Relative observed agreement among raters and p_e: Hypothetical probability of chance agreement from 0(no agreement) to 1(perfect agreement) (Descatha, Roquelaure, Chastang & Ha et al., 2010; Zach, 2021). Dell's Survey of the baggage handlers questionnaire was also previously validated for measuring MSDs in FBHs (Dell, 2015).

With regard to the Dell questionnaire, from a list of five baggage handler workplaces, participants were asked to identify which ones were considered most and least likely to cause back injuries. And from a list of twelve manual handling tasks routinely carried out by baggage

handlers, to identify which ones they considered to be most likely to cause baggage handler back injuries the main areas researched were what FBHs viewed as high-risk tasks that my lead to injury, and the need for improved training techniques on lifting and back care (Solomon, 2004).

The Copenhagen psychosocial questionnaire (COPSOQ) was previously validated for the assessment of the psychosocial factors in the work environment (Kristensen, 2005). The COPSOQ was valid and reliable tool for workplace surveys, analytic research, interventions, and international comparisons. The questionnaire was comprehensive and ~~to~~ included most of the relevant dimensions according to several important theories on psychosocial factors at work. The three dimensions covered by the questionnaire were: (a) facilitated communication between FBHs, (b) the work environment, and (c) workplaces such as by the baggage room and inside the conveyor. The questionnaire assessed the psychosocial factors at work, stress, and the well-being of employees, as well as some personal factors.

The physical measurements were conducted consistently by the same tester to control for inter-tester variability. Each measurement instrument was calibrated for accuracy before use. In addition, before data collection, a pilot test with 10 uninvolved FBHs was undertaken to ascertain the logistical and technical procedures for data collection, and to confirm the reliability of the measurement techniques and tester reliability.

3.6. Data Collection Procedures

With the permission of the management at ACSA, the participants were approached by the researcher and given information about the study. Arrangements made with the manager of the

ground flight baggage handling staff for private space to collect the data. The data was collected primarily through questionnaires and administered by the researcher.

The researcher also took the anthropometric measurements privately for each participant. The participants were called in privately to participate in the testing and to complete the questionnaires. Repeated visits were required to cover the different work shifts to ensure that all potential participants were informed and involved in the study.

3.7. Statistical Analysis

A datasheet was prepared in Microsoft Excel to collate the data collected in the questionnaires. A coding system was used for the questionnaires, for example, the participants' marital status was rated on a four-point scale, with divorced = 4, widowed = 3, married = 2, and single = 1, which simplified the process of data analysis considerably. Sociodemographic characteristics were scored using a 2-point numeric code, for example, gender was scored as male = 1 and female = 2, while for the Dell questionnaire, for example, manual handling locations most likely to cause injury were coded as follows: 1 = inside the baggage room, 2 = inside an aircraft baggage compartment, 3 = inside an aircraft bulk-hold, and 4 = outside an aircraft, on the tarmac. Thereafter, the data was transferred to SPSS software to calculate the proportion of respondents answering for each category of each question (Burns, 2000). The means and standard deviations for ranked questions were also calculated.

All statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS), version 25.0 for Windows (SPSS Inc., Chicago, IL, USA). Data was analysed using a combination of descriptive and inferential statistics. Descriptive statistics (i.e., frequencies,

percentages, means and standard deviations) were used to summarise the descriptive data. The independent samples t-test was used to compare the differences between males and females. The associations between sociodemographic, anthropometric, and psychosocial risk factors and MSDs were analysed using the Chi-square test. A p-value of less than 0.05 indicated statistical significance.

3.8. Ethics Considerations

Ethics clearance (Ethics Reference Number: BM19/5/2) was obtained from the Biomedical Research Ethics Committee (BMREC) at the University of the Western Cape. Permission to conduct the research was obtained from the management at ACSA. An information letter (Appendix A) that included the description of the study and the risks and benefits, was issued to the participants. The participants were asked to sign a consent form (Appendix B) to indicate their willingness to participate voluntarily in the study. Participants were allowed to withdraw from the study at any stage without any negative consequences. Data collected from the participants was kept confidential and stored in the university research repository, under the control of the supervisor, for at least five years. The research data will be used for the study purposes only, and should the results be published in an academic journal or presented at a conference, the details of the participants will remain confidential and not be disclosed.

CHAPTER FOUR: RESULTS

4.1. Introduction

The results of the study are outlined in this chapter. The study assessed the prevalence and associated risk factors of musculoskeletal disorders in flight baggage handlers at an international airport in South Africa. Other variables which included the sociodemographs and the psychosocial factors of the participants were assessed. The descriptive data is based on a frequency distribution table showing the frequencies of each variable and their corresponding percentages.

4.2. Sociodemographic Characteristics of the participants

Table 4.1 illustrates the sociodemographic characteristics and the medical history of the participants. The mean age of study participants was 28±4.83 years. Most of the study participants were male (96.0%), predominantly of the black ethnic group (65.0%), and single (78.0%). Concerning the chronic disease and medical history of participants, the overwhelming majority (94.0%) had no chronic or acute diseases and were not on any type of medication.

Table 4.1: Sociodemographic characteristics and medical history of flight baggage handlers (n = 100).

Characteristic	Frequency	Percentage
Gender		
Male	96	96.0
Female	4	4.0
Ethnicity		
Black	65	65.0
Mixed ethnicity	35	35.0
Marital status		

Single	78	78.0
Married	20	20.0
Widowed	1	1.0
Divorced	1	1.0
Chronic disease		
Yes	6	6.0
No	94	94.0
Specific chronic disease		
Asthma	2	2.0
Hypertension	3	3.0
Hypertension and diabetes	1	1.0
On medication		
Yes	4	4.0
No	2	2.0
Type of medication		
Asthma pump	2	2.0
High blood pressure pills	2	2.0

The mean height, weight, and body mass index of the participants were 171.0±10.09 cm, 71.7±15.62 kg and 24.4±5.18 $kg \cdot m^{-2}$, respectively (Table 4.2). The mean weekly hours worked by the participants was 47.0±4.56 hours.

Table 4.2: Anthropometric characteristics of flight baggage handlers and weekly hours worked.

	Number	Minimum	Maximum	Mean	SD
Age (years)	100	22.0	38.0	28.0	4.83
Height (cm)	100	145.0	199.0	171.6	10.09
Weight (kg)	100	48.2	117.2	71.7	15.62
Body Mass Index ($kg \cdot m^{-2}$)	100	16.5	36.8	24.4	5.18

4.3. Likelihood of Injury by Baggage Handling Location

The results in Figure 4.1 show the distribution of injuries based on the worksite. The majority of the participants indicated the baggage room as the most likely location to cause injury

(79.0%), followed by the aircraft baggage compartment (19.0%), then the tarmac (16.0%), and lastly the aircraft bulk-hold (13.0%).

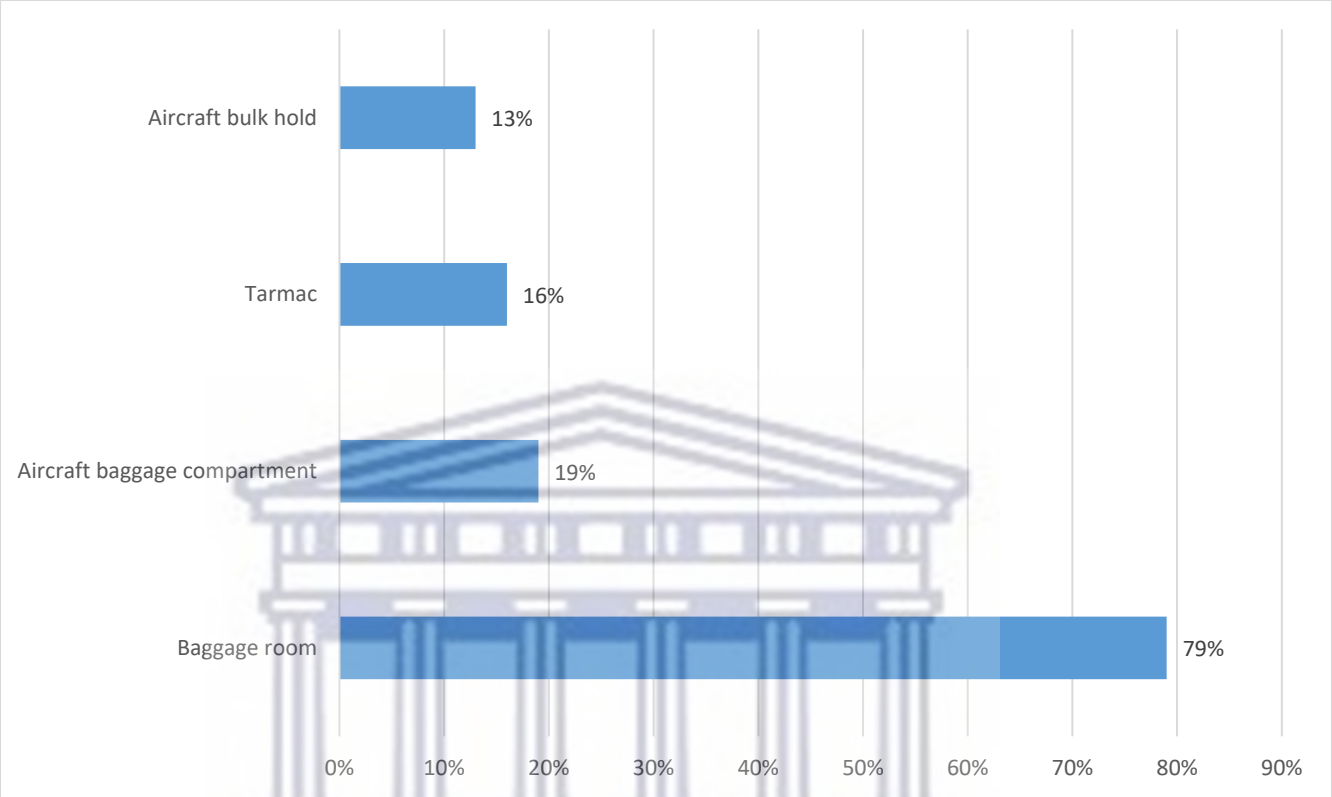

Figure 4.1: Manual baggage handling location most likely to cause injury.

4.4. Likelihood of Injury by Baggage Handling Task

In Figure 4.2, the baggage-handling task identified by most participants as likely to result in injury was pushing and pulling of loaded carts (57%), followed by lifting baggage on-and-off the conveyors (50%), then baggage loading (48%) and, to a lesser extent, baggage stacking in the bulk-hold (15%).

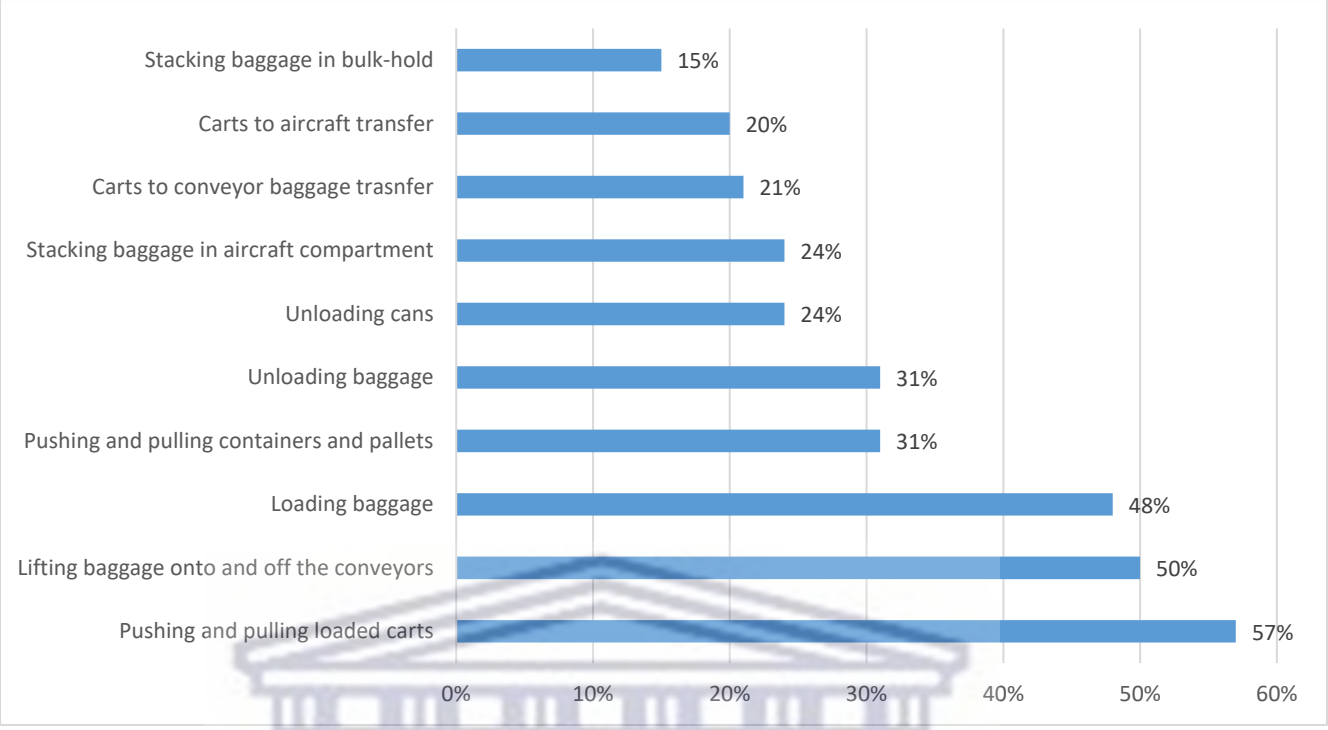

Figure 4.2: Manual handling tasks most likely to cause injury.

4.5. Injury History of Flight Baggage Handlers

The majority of participants sustained an acute injury, while performing their baggage handling duties (78%), whereas 32% experienced a recurrence of the injury, and 43% of FBHs experienced reduced functional ability from the injury.

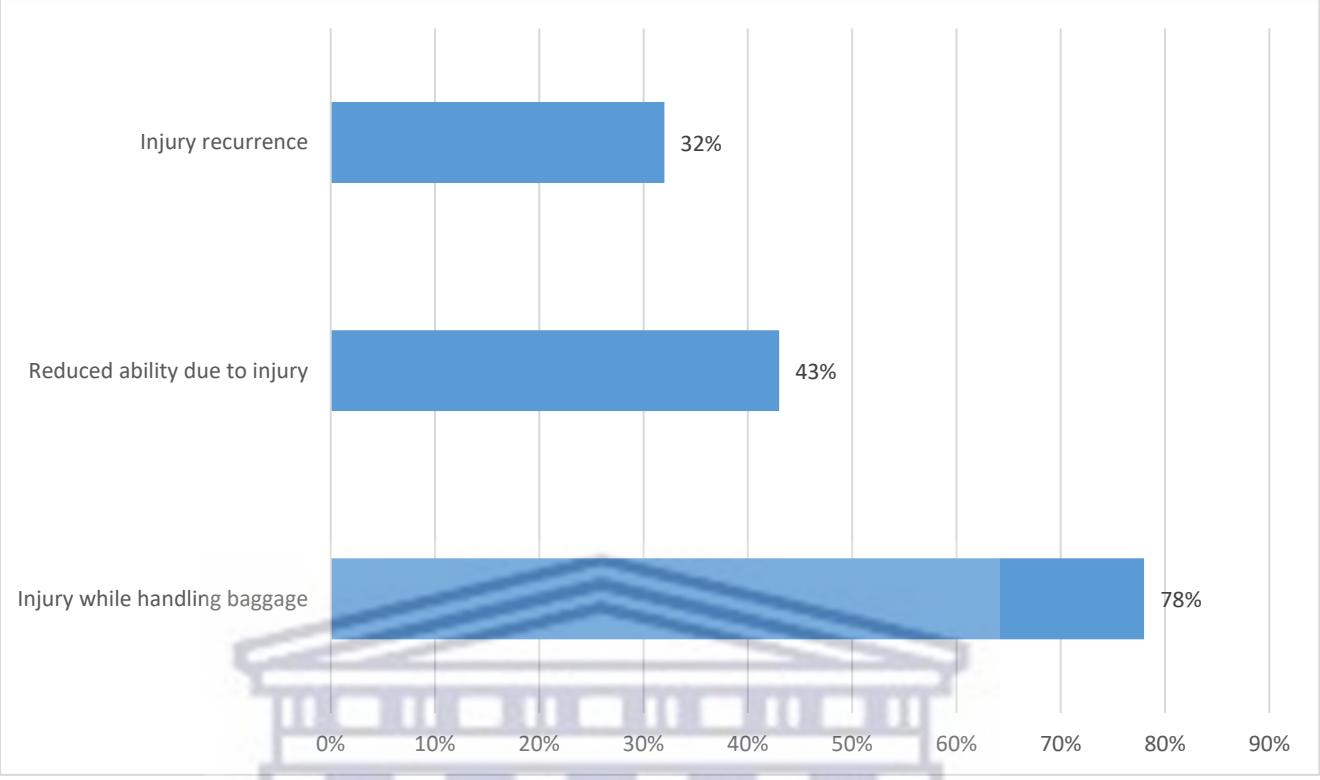

Figure 4.3: Flight baggage handlers personal injury experiences.

4.6. Anatomical Site of Pain of Musculoskeletal Disorders in Flight Baggage Handlers

Musculoskeletal disorders over the previous 12-month period were identified by anatomical area/site on the body (Figure 4.4). The anatomical areas/body parts of interest in the study were the neck, shoulders, elbows, wrists/hands, upper back, lower back, hips, knees and ankles. The results showed that FBHs were more likely to be injured in the lower back (36%) and upper back (22%), followed by the left shoulder (21%) then the right shoulder (19%). The results also showed a higher prevalence of MSDs experienced in the left wrist (20%) than right wrist (13%), while left elbow injuries were also identified in 12%, followed by right knee injuries in 11%, and hip injuries in 10%.

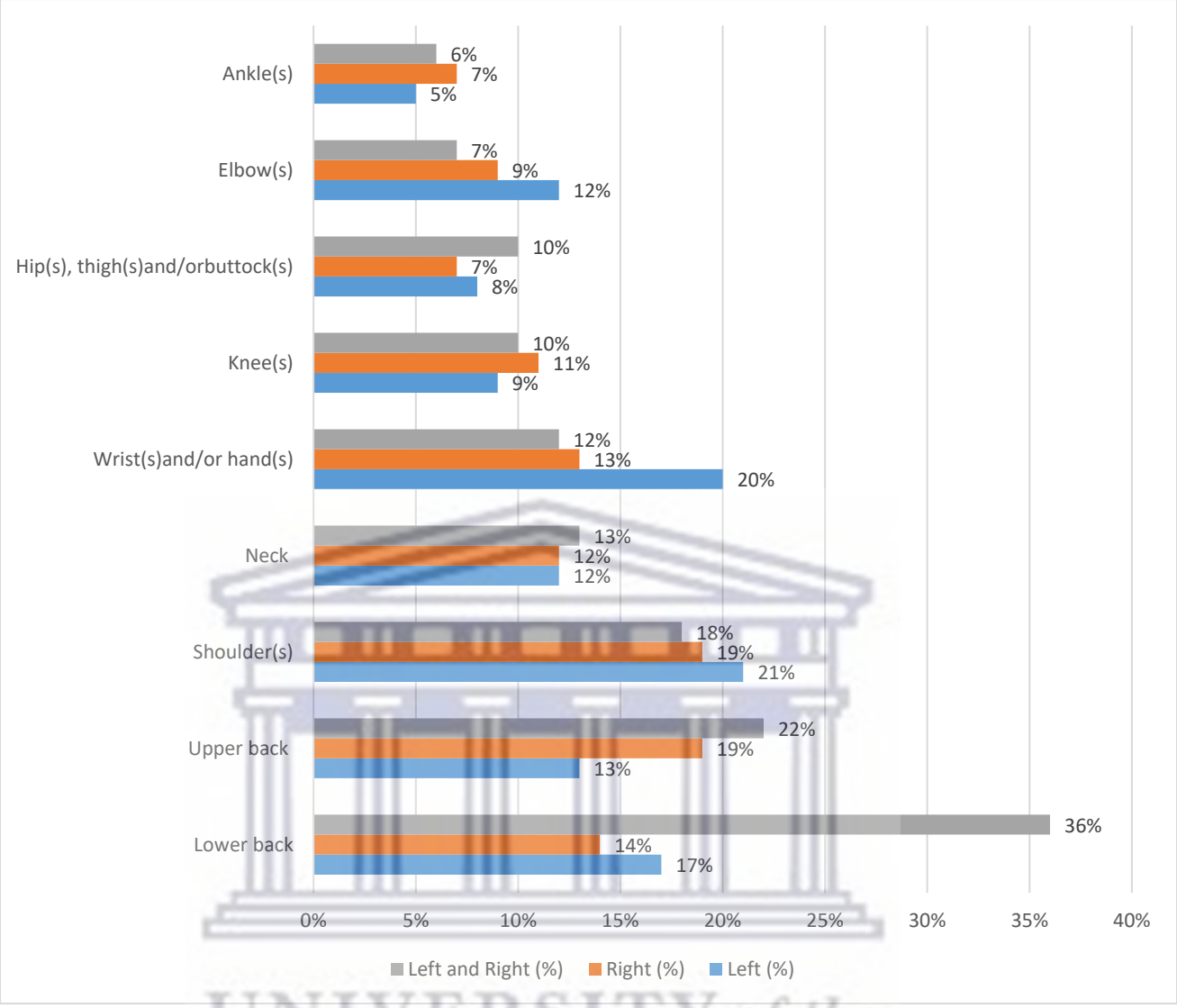

Figure 4.4: Anatomical site of pain of musculoskeletal disorders in the previous twelve months.

4.7. Prevalence of Injury and Incapacitation in Flight Baggage Handlers

The results on the prevalence of MSDs and incapacitation is presented in Figure 4.5. The results showed that the prevalence of MSDs ranged from the highest in the lower back (67%), shoulders (58%), upper back (54%), wrist/ hand (45%) to the lowest in the ankles (18%).

By investigating further, whether the severity of injury contributed to the inability to perform normal daily duties, the results showed that incapacitation was highest in those who experienced lower back injury (46%), followed by upper back injury (36%), then shoulder injury (24%), wrist/hand injury (20%), and lowest in those with an ankle injury (10%).

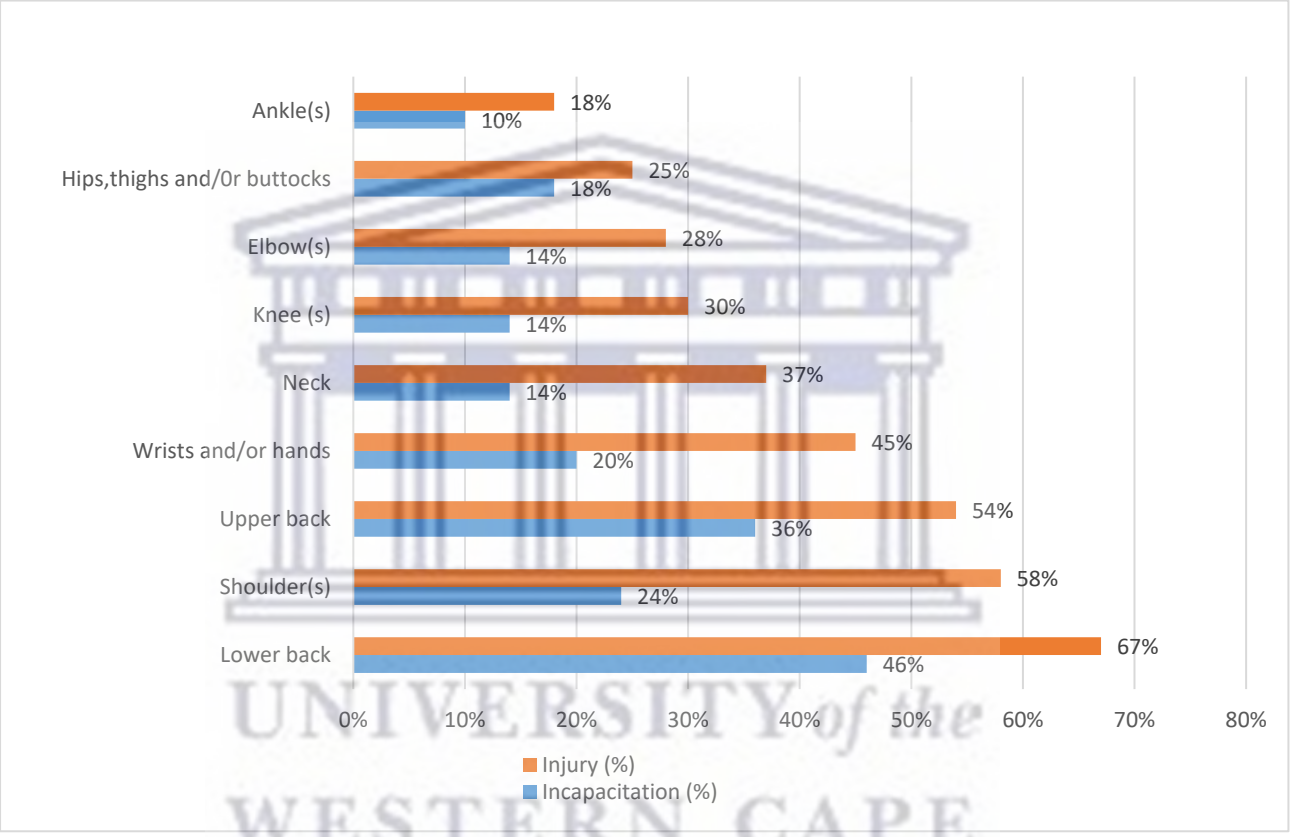

Figure 4.5: Injury and incapacitation in flight baggage handlers in the previous twelve months.

4.8. Psychosocial Factors in the Work Environment of Flight Baggage Handlers

Slightly more than a quarter of the participants (27%) sometimes fell behind in their work, because of psychosocial stress in the work environment, while 4% often fell behind,1% always fell behind, and 8% seldom fell behind-(Table 4.3). With respect to having enough time for their work, 51% always had enough time, while 11% often had enough time, 23% sometimes

had enough time, and 3% seldom had enough time, due to the level of psychosocial stress at work, while 12% never had enough time for their work tasks.

Just over half of the participants felt that it was sometimes necessary to keep working at a faster pace (52%), whereas 19% of the participants felt that it was always necessary to keep working at a high pace. The results also showed that 10% of the participants felt that it was often necessary to keep working at a high pace, whereas 2% felt that it was seldom necessary to keep working at a high pace, and 17% felt that it was never necessary to work at a faster pace.

The results showed that 48% felt that they sometimes worked at a high pace, while 17% felt that they always worked at a high pace. The results also showed that 12% often worked at a high pace, and 7% felt that they seldom worked at a high pace.

The results showed that the level of psychosocial stress, due to the work, sometimes (41%) put FBHs in emotionally disturbing situations, whereas 9% felt that the work always put them in emotionally disturbing situations. In addition, 7% felt that the work often put them in emotionally disturbing situations and 10% felt that the work seldom put them in emotionally disturbing situations.

Moreover, the results showed that 25% of FBHs sometimes had to relate to other people's personal problems, as part of your work, which could cause a lot of psychosocial stress and lead to MSDs, whereas 13% felt that, they always had to relate to other people's personal problems as part of their work.

The results showed that 27% of FBHs felt that they always had a large degree of influence concerning their work, whereas 14% felt that they sometimes had a large degree of influence concerning their work. Moreover, 33% felt that they never had a large degree of influence concerning their work. Moreover, 21% felt that they sometimes could influence the amount of work assigned to them. In contrast, 17% felt that they could never influence the amount of work assigned to them.

Table 4.3: Frequency distribution of the impact of psychosocial factors in the work environment of flight baggage handlers.

Question	Frequency				
	Always (%)	Often (%)	Sometimes (%)	Seldom (%)	Never (%)
Do you fall behind with your work?	1.0	4.0	27.0	8.0	60.0
Do you have enough time for your work tasks?	51.0	11.0	23.0	3.0	12.0
Is it necessary to keep working at a high pace?	19.0	10.0	52.0	2.0	17.0
Do you work at a high pace throughout?	17.0	12.0	48.0	7.0	16.0
Does your work put you in emotionally disturbing situations?	9.0	7.0	41.0	10.0	33.0
Do you have to relate to other people's personal problems, as part of your work?	13.0	5.0	25.0	7.0	50.0
Do you have a large degree of influence concerning your work?	27.0	18.0	14.0	8.0	33.0
Can you influence the amount of work assigned to you?	46.0	8.0	21.0	8.0	17.0

In Table 4.4, the results showed that 57% of FBHs felt that they had a very large possibility of learning new things through their work, whereas 19% felt that they had a moderate possibility of learning new things through their work. According to the results, 47% of FBHs felt that their work required them to take the initiative to a very large extent, whereas 26% felt that their work required them to take initiative to a moderate extent.

Moreover, the results showed that 65% felt that their work was meaningful to a very large extent, and 17% felt that their work was meaningful to a large extent. In contrast, however, 6% did not find their work meaningful, which contributed to their psychosocial levels of stress and led to MSDs. The majority (73%) of FBHs felt that their work was important to a very large extent, whereas 7% felt that it was important to a very small extent. This showed that the majority of FBHs appreciated and valued their work.

The results showed that 59% of FBHs felt that their place of work was of great importance to them to a very large extent, and 15% felt likewise to a large extent, while 15% felt likewise to a moderate extent, and 6% felt likewise to a very small extent. In addition, 43% of FBHs mentioned that they would recommend a good friend to apply for a position at their workplace to a very large extent, whereas 31% felt that they would recommend a friend to apply for a position at their workplace to a very small extent.

The results showed that 36% of FBHs felt to a very large extent that, at their place of work, they were informed well in advance concerning, for example, important decisions, changes and plans for the future. However, 22% of FBHs felt to a very small extent that they were informed well in advance regarding, for example, important decisions, changes and plans for the future, which contributed to the increase in their levels of stress and MSDs.

According to the results, 45% of FHBs felt that they received all the information they needed in order to do their work well, whereas 20% felt to a moderate extent that they received all the information they needed in order to do their work well, and 15% felt to a very small extent that they received all the information they needed in order to do their work well, which caused psychosocial stress and led to MSDs. Moreover, 34% of FBHs felt to a very large extent that

their work was recognized and appreciated by management, whereas 26% felt likewise to a moderate extent, and 16% felt to a very small extent that their work was recognized and appreciated by management, which caused psychosocial stress and led to MSDs.

The results showed that 28% of FBHs felt to a very large extent that they were fairly treated at their workplace, whereas 27% of FBHs felt to a moderate extent that they were fairly treated at their workplace, which caused psychosocial stress and led to MSDs. The results showed that the majority (50%) of FBHs felt to a very large extent that their work had clear objectives, whereas 18% felt to a moderate extent that their work had clear objectives that caused stress and led to MSDs.

According to the results, 80% of FBHs felt to a very large extent that they knew exactly what was expected of them at work, whereas 5% felt to a moderate extent that they knew what was expected of them at their work and, as a result, it caused stress and affected their physical wellbeing. The results showed that 48% of FBHs felt to a very large extent that their immediate superior gave a high priority to job satisfaction, and 20% felt likewise to a moderate extent, which caused psychosocial stress and led to MSDs.

Moreover, the results showed that 53% of FBHs felt to a very large extent that their immediate superior was good at work planning, whereas 10% felt to a very small extent that their immediate superior was good at work planning, which caused psychosocial stress and led to MSDs.

The results showed that the majority of FBHs felt to a very large extent (43%) that their immediate superiors were willing to listen to their problems at work, whereas a minority felt to a moderate extent (20%) that their immediate superiors were willing to listen to their problems at work. Furthermore, 14% of the FBHs felt that their immediate superiors was never willing to listen to their problems at work, and that led to stress and increase the chances of having MSDs.

Table 4.4: Extent of psychosocial factors in the work environment of flight baggage handlers.

Question	Extent				
	Very Large (%)	Large (%)	Moderate (%)	Small (%)	Very Small (%)
Do you have the possibility of learning new things through your work?	57.0	14.0	19.0	3.0	7.0
Does your work require you to take initiative?	47.0	14.0	26.0	7.0	6.0
Is your work meaningful?	65.0	17.0	7.0	2.0	6.0
Do you feel that the work you do is important?	73.0	11.0	8.0	1.0	7.0
Do you feel that your place of work is of great importance to you?	59.0	15.0	15.0	5.0	6.0
Would you recommend a good friend to apply for a position at your workplace?	43.0	10.0	10.0	6.0	31.0
At your place of work, are you informed well in advance concerning, for example, important decisions, changes or plans for the future?	36.0	18.0	17.0	7.0	22.0
Do you receive all the information you need in order to do your work well?	45.0	17.0	20.0	3.0	15.0
Is your work recognized and appreciated by the management?	34.0	18.0	26.0	6.0	16.0
Are you treated fairly at your workplace?	28.0	19.0	27.0	11.0	15.0
Does your work have clear objectives?	50.0	20.0	18.0	5.0	7.0
Do you know exactly what is expected of you at work?	80.0	9.0	5.0	5.0	1.0
To what extent would you say that your immediate superior gives high priority to job satisfaction?	48.0	22.0	20.0	2.0	8.0

To what extent would you say that your immediate superior is good at work planning?	53.0	20.0	12.0	5.0	10.0
How often is your nearest superior willing to listen to your problems at work?	43.0	19.0	20.0	4.0	14.0

4.9. Job Satisfaction in Flight Baggage Handlers

Figure 4.6 shows the distribution of FBHs with respect to their job satisfaction. The majority of them were satisfied (54%), and 22% were very satisfied with their jobs. This gave a total of 76% who were satisfied with their work. The remainder were either dissatisfied (20%) or very dissatisfied (4%) with their jobs.

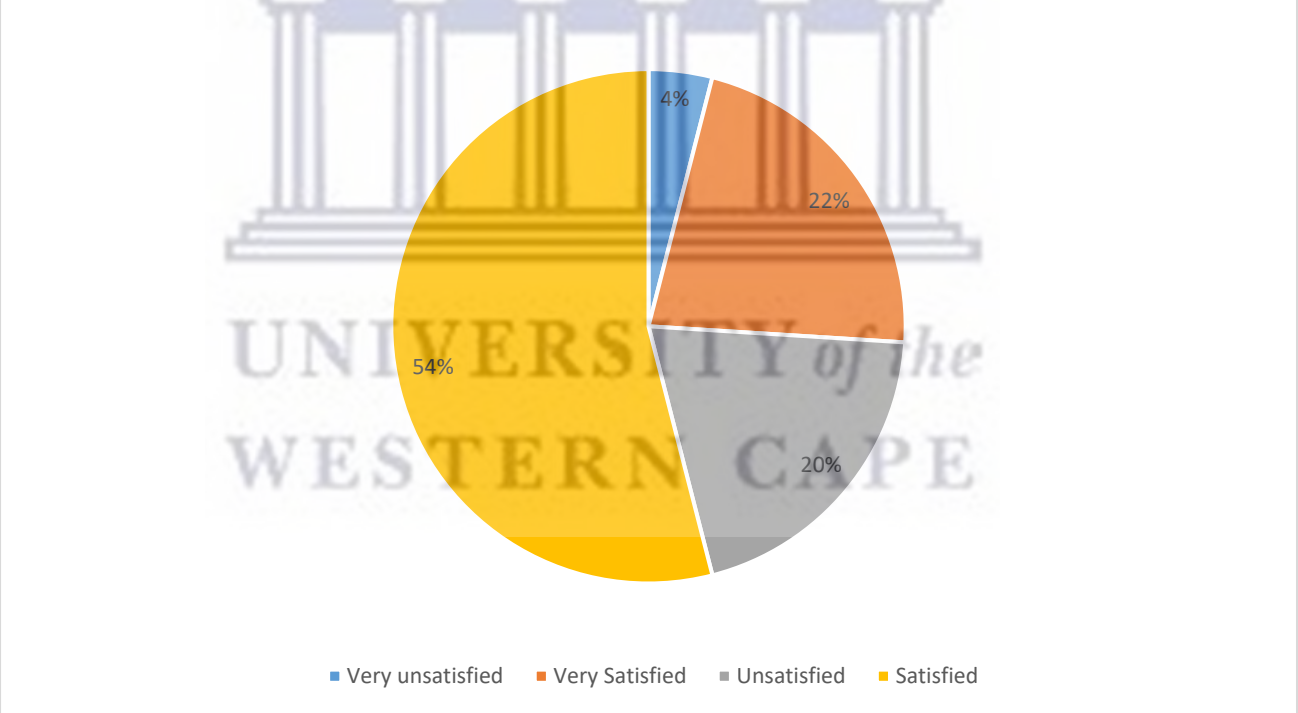

Figure 4.6: Job satisfaction among flight baggage handlers.

4.10. Impact of the Work Demands on the Private Lives of Flight Baggage Handlers

In Figure 4.7, the results showed that the majority (32%) of FBHs felt that their work certainly drained their energy levels, while 25% agreed that it did so to some extent, whereas 22% felt that it did so to a very little extent, whereas 21% felt that their work did not drain their energy levels at all.

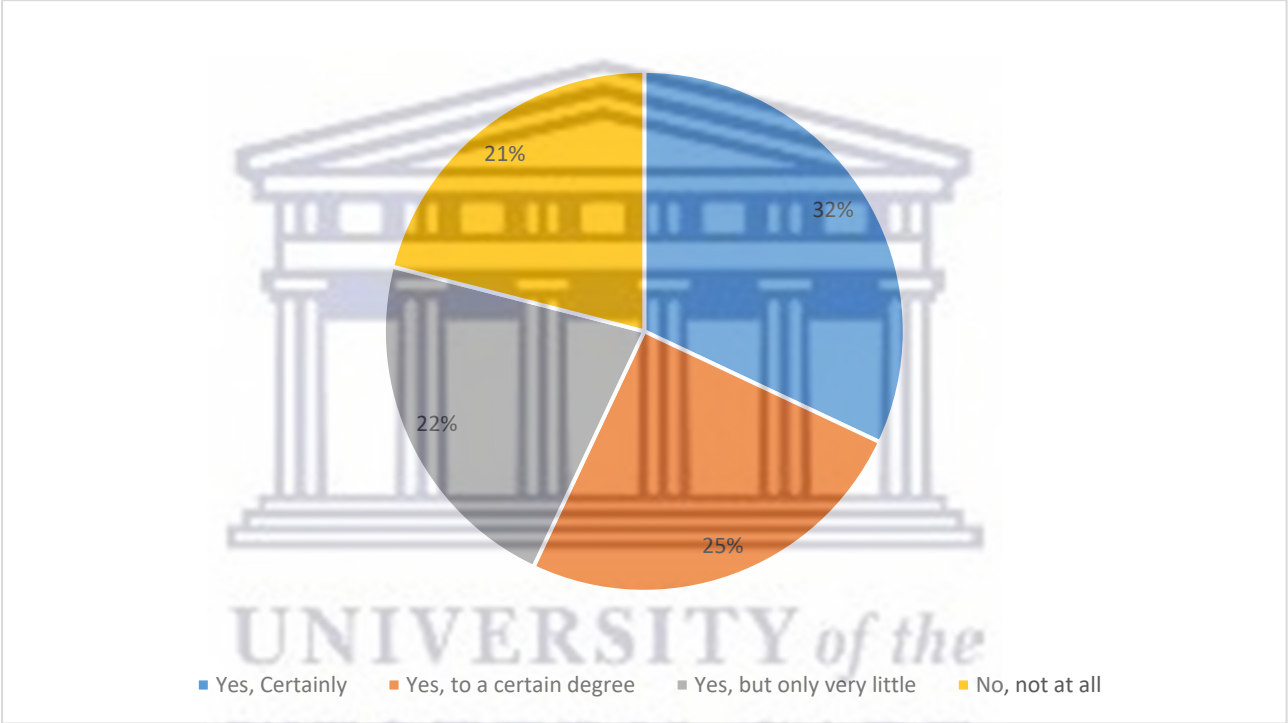

Figure 4.7: Negative effects of excessive workloads on the energy levels of flight baggage handlers.

A total of 19% of FBHs complained that their excessive workload had a negative effect on their private lives, while 28% felt to a certain degree that their excessive workload had a negative effect on their private lives, whereas 25% felt to a very little degree that their excessive workload had a negative effect on their private lives (Figure 4.8).

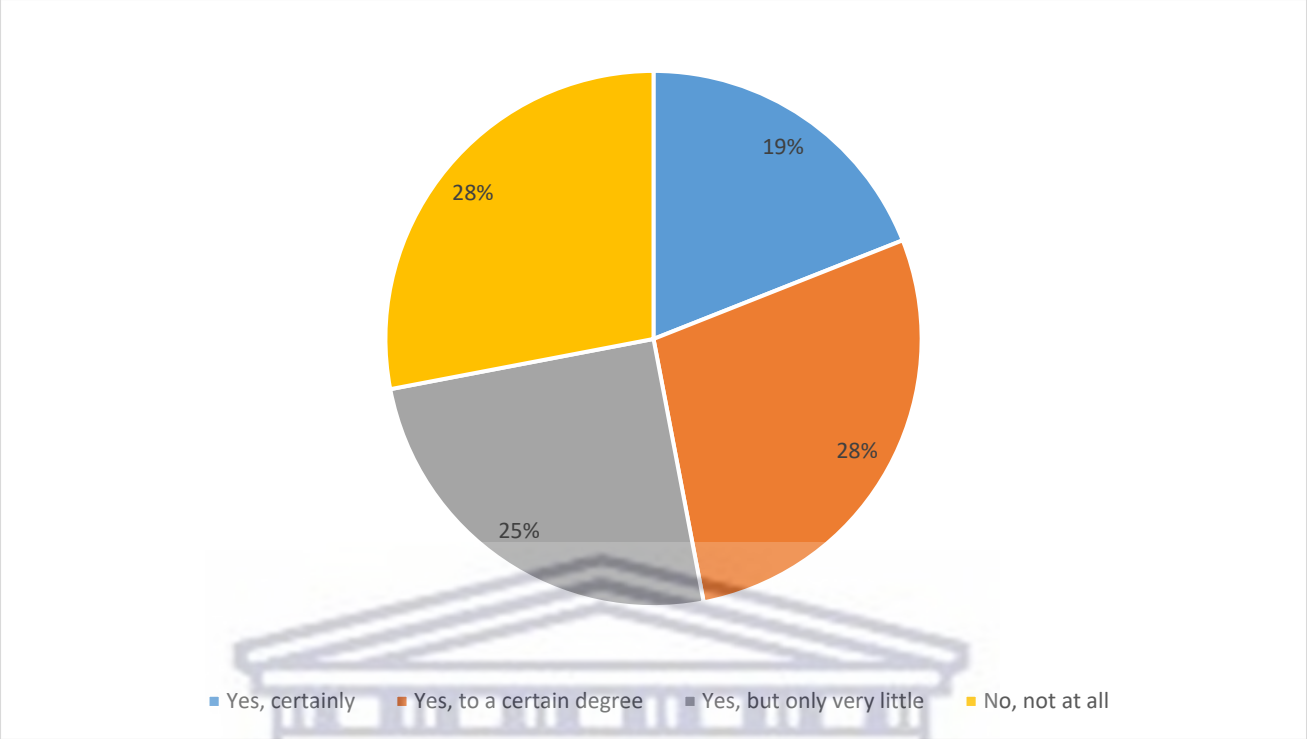

Figure 4.8: Negative effects of excessive workloads on the private lives of flight baggage handlers.

In Figure 4.9, the results showed that the majority (29%) of FBHs felt to a large extent and to a very large extent (21%) that the work was fairly distributed. A minority (19%) felt that the work was somewhat fairly distributed, while 17% felt to a small extent that the work was fairly distributed, which caused some of them to be stressed, due to work that they still needed to do within a short period of time.

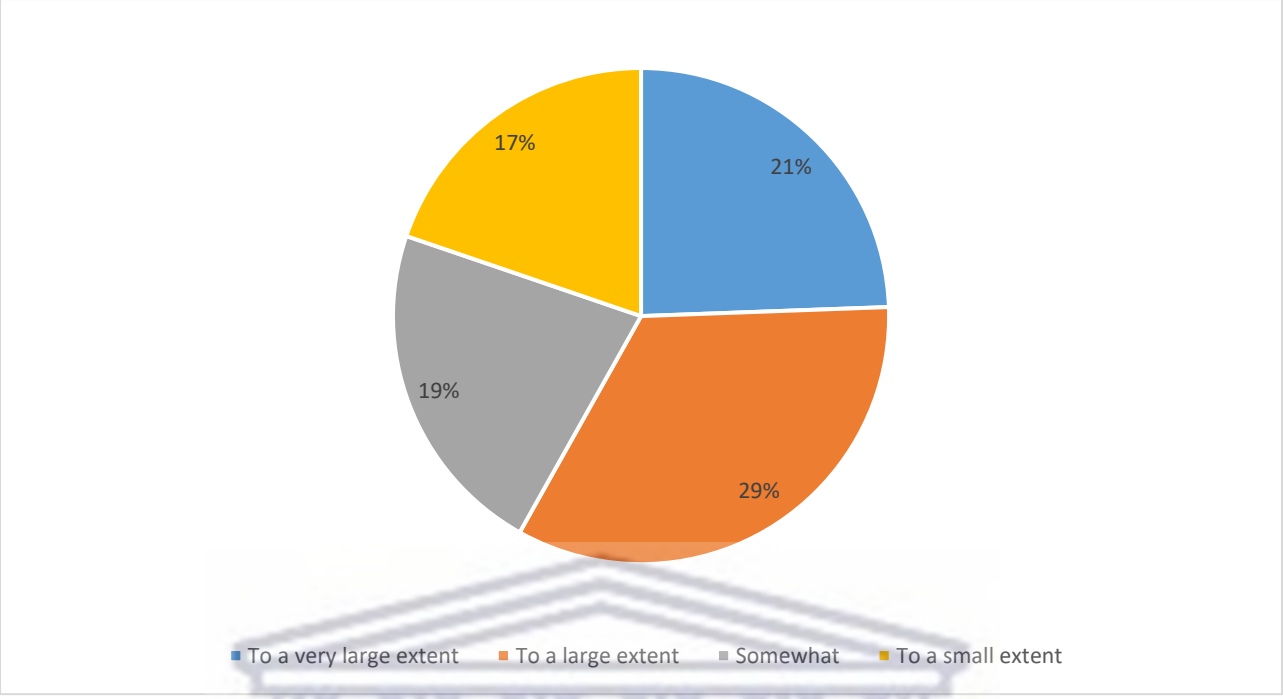

Figure 4.9: Fairness of work distribution among flight baggage handlers.

4.11. Emotional Exhaustion and Fatigue in Flight Baggage Handlers

This aspect of the results relates to the frequency of FBHs being worn out during their working time (Figure 4.10). The majority of FBHs felt worn out some of the time (48%), 19% felt worn out for a large part of the time, while 11% felt worn out all of the time, and 22% never felt worn out.

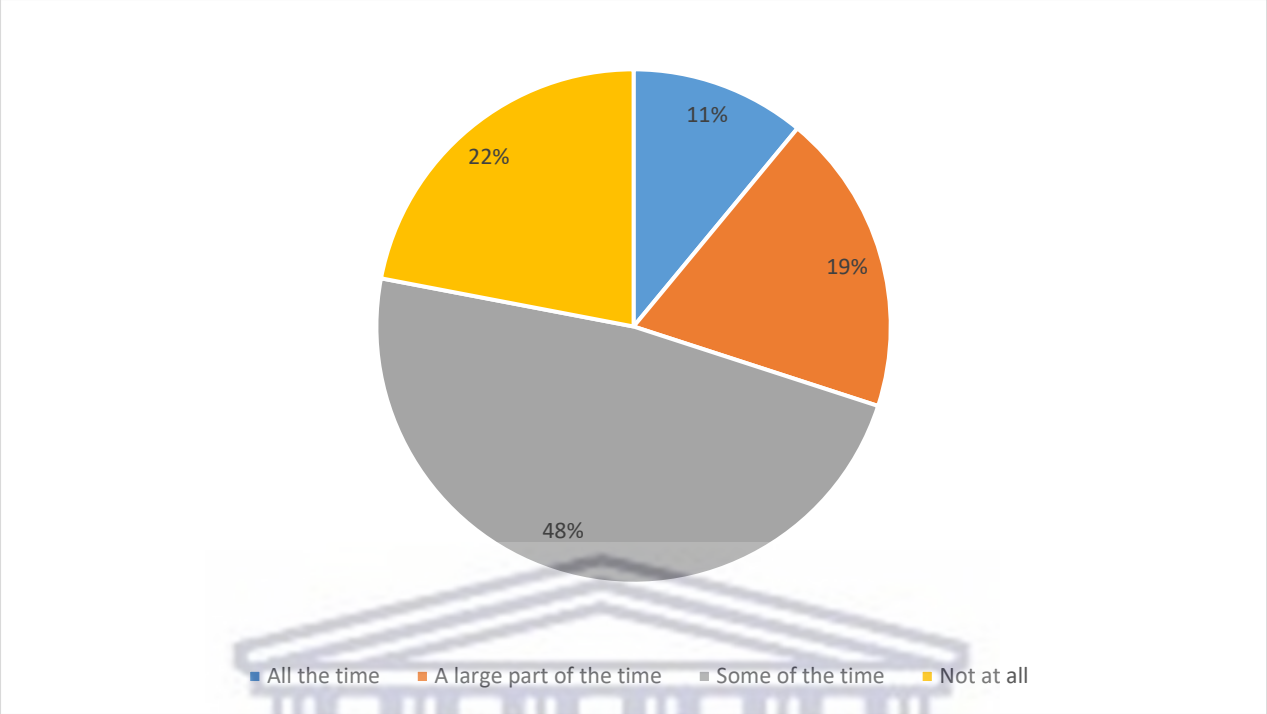

Figure 4.10. Frequency to which flight baggage handlers felt worn out at work.

The majority of participants felt emotionally exhausted some of the time (45%) while 22% felt emotionally exhausted part of the time (Figure 4.11). The results showed that 7% felt emotionally exhausted all the time, while 26% did not feel emotionally exhausted at all.

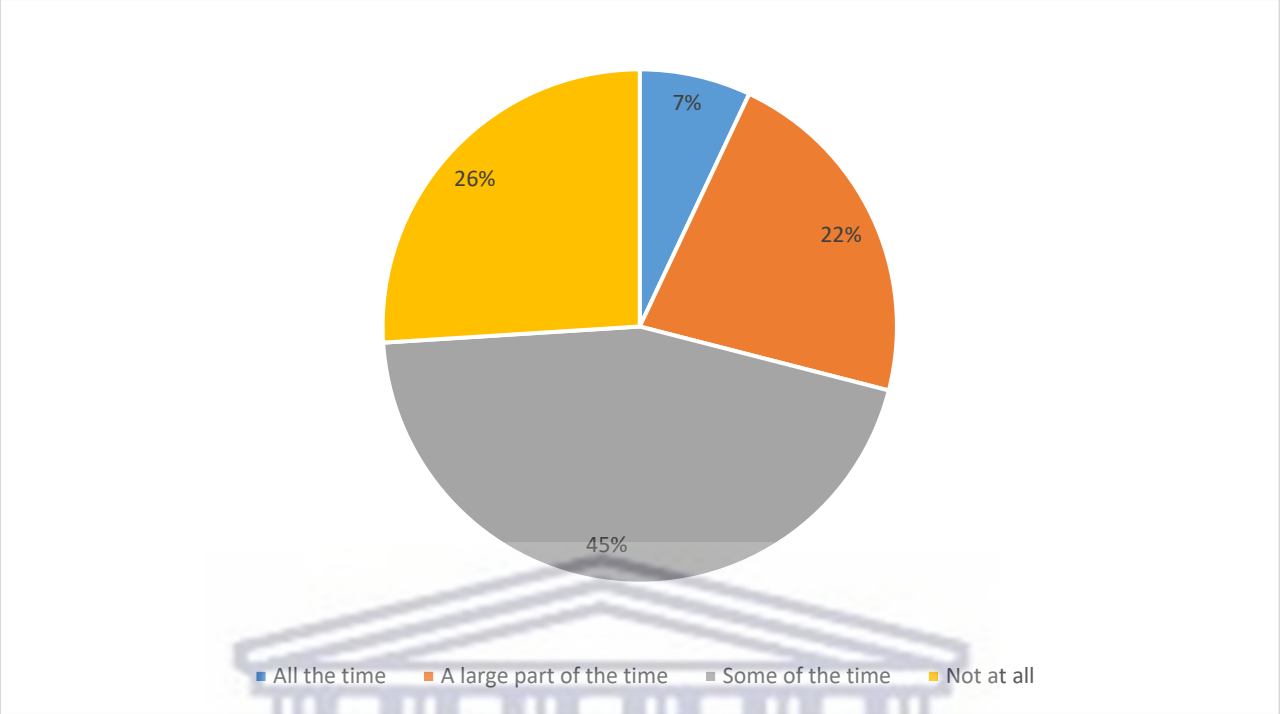

Figure 4.11: Frequency with which flight baggage handlers felt emotionally exhausted at work.

4.12. Extent to which Flight Baggage Handlers Experienced Abusive Treatment at Work

Abusive treatment is classified into bullying, actual physical violence, sexual abuse, and threats of violence in the workplace (Figure 4.12). The prevalence of daily abusive treatment was 2% for bullying, 2% for physical violence, and 2% for sexual abuse, while it was 3% for threats of actual violence. The results showed that the weekly abusive treatment was 0% for bullying, 2% for physical violence, and 3% for sexual abuse, while it was 2% for threats of actual violence. Concerning monthly abusive treatment, there was 1% for bullying, 3% for physical violence, and 4% for sexual abuse, while it was 2% for threats of actual violence. Flight baggage handlers 'results showed that abusive treatment was 7% for bullying, 6% for physical violence, and 7% for sexual abuse, while it was 13% for threats of actual violence. The high level of abusive

treatment at work that occurred daily, weekly, and monthly in FBHs most likely affected their mental health and led to either short- or long-term stress, and resulted in MSDs.

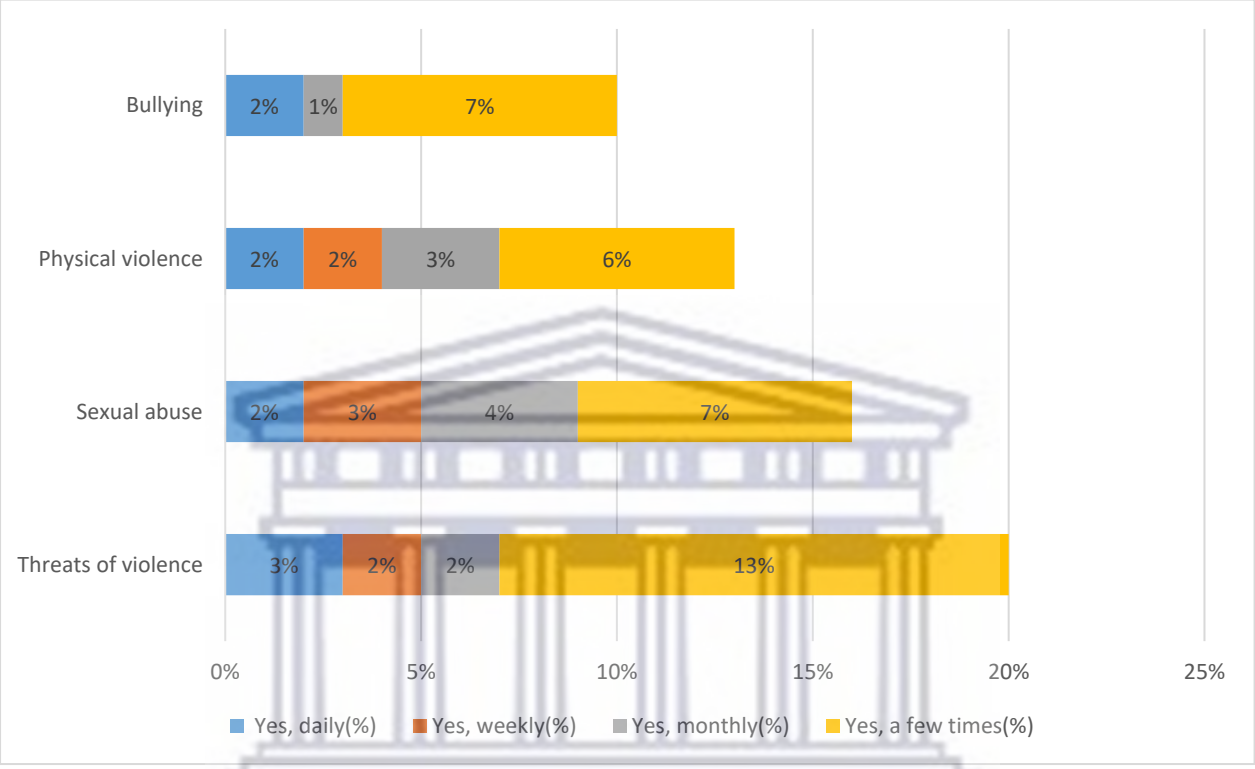

Figure 4.12: Extent to which flight baggage handlers experienced abusive treatment in the workplace in the previous twelve months.

4.13. Relationship Between Sociodemographic Characteristics and Musculoskeletal Disorders

With respect to ethnicity, the results showed that Blacks were significantly more likely to feel pain in the neck (OR = 2.7; CI: 1.10-6.88; p = 0.032), shoulders (OR = 3.1; CI: 1.34-7.38; p = 0.007) and elbows (OR = 4.5; CI: 1.43-14.42; p = 0.007) compared to other anatomical locations, and compared to persons of mixed ethnicity.

Table 4.5: Relationship between ethnicity and musculoskeletal disorders in flight baggage handlers.

MSD location	MSD Frequency		Chi sq	p-value	OR	95% CI	
	Black ($\bar{X}$±SD)	Mixed ethnicity ($\bar{X}$±SD)				LCL	UCL
Neck	29 (37.2)	8 (36.4)	4.62	0.032	2.7	1.10	6.88
Shoulder	48 (61.5)	10 (45.5)	7.16	0.007	3.1	1.34	7.38
Elbow	23 (29.5)	5 (22.7)	7.34	0.007	4.5	1.43	14.42
Wrist	39 (50.0)	6 (27.3)	2.50	0.114	2.0	0.84	4.63
Upper back	45 (57.7)	9 (40.9)	2.69	0.101	2.0	0.87	4.60
Lower back	53 (67.9)	14 (63.6)	1.29	0.256	0.6	0.24	1.47
Waist	22 (28.2)	3 (13.6)	0.72	0.397	1.5	0.57	4.13
Knee	21 (26.9)	9 (40.9)	0.47	0.493	0.7	0.30	1.78
Ankle	15 (19.2)	3 (13.6)	1.58	0.209	2.1	0.64	7.05

The results displayed in Table 4.6 showed that marital status had no significant association with MSDs.

Table 4.6: Association between marital status and musculoskeletal disorders.

MSD location	MSD Frequency		Chi sq	p-value	OR	95% CI	
	Single ($\bar{X}$±SD)	Married ($\bar{X}$±SD)				LCL	UCL
Neck	29 (37.2)	8 (36.4)	0.01	0.144	1.0	0.39	2.77
Shoulder	48 (61.5)	10 (45.5)	1.82	0.177	1.9	0.74	4.99
Elbow	23 (29.5)	5 (22.7)	0.39	0.533	1.4	0.47	4.31
Wrist	39 (50.0)	6 (27.3)	3.58	0.058	2.7	0.94	7.53
Upper back	45 (57.7)	9 (40.9)	1.94	0.163	1.9	0.75	5.15
Lower back	53 (67.9)	14 (63.6)	0.14	0.704	1.2	0.45	3.26
Waist	22 (28.2)	3 (13.6)	1.94	0.163	2.5	0.67	9.26
Knee	21 (26.9)	9 (40.9)	1.60	0.206	0.5	0.20	1.43
Ankle	15 (19.2)	3 (13.6)	0.36	0.546	1.5	0.39	5.77

4.14. Relationship Between Working Hours and Musculoskeletal Disorders

Looking at the association between the working hours and MSDs in FBHs, the results showed that there was no significant relationship.

Table 4.7: Relationship between working hours and musculoskeletal disorders.

MSD location	Working Time (Hours)		t	p-value	Mean Difference	95% CI	
	Single ($\bar{X}$±SD)	Married ($\bar{X}$±SD)				LCL	UCL
Neck	48.1 (5.67)	46.4 (3.67)	1.77	.081	1.6	-0.20	3.50
Shoulder	47.0 (3.95)	47.0 (5.34)	-0.01	.992	0.0	-1.85	1.83
Elbow	48.2 (4.14)	46.6 (4.66)	1.62	.109	1.6	-0.37	3.63
Wrist	47.9 (5.53)	46.4 (3.48)	1.66	.100	1.5	-0.29	3.31
Upper back	47.2 (4,84)	46.9 (4.24)	0.31	.754	0.3	-1.53	2.11
Lower back	47.0 (4.97)	47.1 (3.65)	-0.02	.987	0.0	-1.95	1.92
Waist	47.4 (5.88)	46.9 (4.06)	0.49	.625	0.5	-1.58	2.61
Knee	48.2 (5.77)	46.5 (3.86)	1.73	.087	1.7	-0.25	3.65
Ankle	46.9 (4.97)	47.1 (4.49)	-0.17	.862	-0.2	-2.57	2.16

4.15. Relationship between Body Mass Index and Musculoskeletal Disorders

Looking at the association between the BMI and MSDs in FBHs, the results showed that there was no significant relationship.

Table 4.8: Relationship between body mass index and musculoskeletal disorders.

MSD location	Mean BMI ($kg \cdot m^{-2}$)		t	p-value	95% CI		
	Single ($\bar{X}$±SD)	Married ($\bar{X}$±SD)			Mean Difference	LCL	UCL
Neck	24.4 (5.68)	24.4 (4.91)	0.04	0.971	0.1	-2.10	2.18
Shoulder	24.2 (5.13)	24.8 (5.29)	-0.54	0.591	-0.6	-2.66	1.52
Elbow	23.2 (4.93)	24.9 (5.23)	-1.43	0.156	-1.6	-3.92	0.64
Wrist	25.4 (5.93)	23.6 (4.36)	1.73	0.087	1.8	-0.27	3.82
Upper back	24.5 (5.54)	24.3 (4.78)	0.14	0.885	0.2	-1.92	2.22
Lower back	24.4 (5.33)	24.4 (4.94)	0.04	0.972	0.0	-2.16	2.24
Waist	25.0 (5.67)	24.2 (5.03)	0.66	0.513	0.8	-1.59	3.17
Knee	24.7 (5.94)	24.3 (4.86)	0.40	0.691	0.5	-1.80	2.70
Ankle	23.9 (5.28)	24.5 (5.18)	-0.43	0.666	-0.6	-3.27	2.10

4.16. Relationship Between Age and Musculoskeletal Disorders

The results showed that there was no significant relationship between age and MSDs in FBHs.

Table 4.9: Relationship between age and musculoskeletal disorders.

MSD location	Mean Age (SD) (years)		t	p-value	95% CI		
	Single ($\bar{X}$±SD)	Married ($\bar{X}$±SD)			Mean Difference	LCL	UCL
Neck	29.9 (6.50)	30.7 (8.24)	-.46	.645	-.7	-3.88	2.41
Shoulder	29.9 (6.27)	31.1 (9.20)	-.77	.443	-1.2	-4.26	1.88
Elbow	29.7 (6.70)	30.6 (7.97)	-.54	.588	-.9	-4.30	2.45
Wrist	28.4 (4.83)	32.0 (9.02)	-2.44	.017	-3.6	-6.61	-0.68
Upper back	29.7 (6.53)	31.2 (8.73)	-.96	.339	-1.5	-4.50	1.56
Lower back	29.7 (7.14)	31.7 (8.47)	-1.19	.238	-1.9	-5.13	1.29
Waist	29.0 (5.50)	30.9 (8.18)	-1.08	.284	-1.9	-5.38	1.59
Knee	30.9 (6.75)	30.1 (8.00)	.47	.637	.8	-2.52	4.10
Ankle	29.5 (7.21)	30.6 (7.73)	-.54	.591	-1.1	-5.02	2.88

CHAPTER FIVE: DISCUSSION

5.1. Introduction

This section discusses the prevalence and the risk factors associated with MSDs in FBHs, as well as the psychosocial factors in the work environment, the relationship between the sociodemographic variables and MSDs, and the relationship between psychosocial factors and MSDs.

5.2. Prevalence of Musculoskeletal Disorders in Flight Baggage Handlers

The prevalence of MSDs in FBHs was significantly higher in the lower back 67%, shoulders 58%, upper back 54%, wrist/hands 45%, neck 37%, knees 30%, elbows 28% and hips 25% compared to other less heavy-duty jobs, which resulted in an inability to perform daily duties. This prevalence is similar to the results reported by Bern et al. (2013) who found that self-reported MSDs symptoms in the neck and upper back, lower back, shoulders, elbows, wrists, hips and knees were significantly higher in FBHs than in other unskilled occupations with less heavy work.

The findings of this study showed that FBHs were more likely to sustain injury in the lower back (36%) and upper back (22%), which was due to the repetitive movement and heavy lifting of the baggage. Similarly, Eva et al. (2015) found that the prevalence of injury to the lower back was 70%, while shoulder pain was 60% higher than in the general population,especially in and the workers performing manual handling, such as scaffolders, ambulance workers and industrial workers.

A previous study also showed that 93% of FBHs experienced spinal column (lower back) pain, 1% knee pain, 16% neck pain, 7% shoulder pain, and 16% ankle. Flight baggage handlers experienced ankles, spinal column and knee injuries due to prolonged debilitating factors, such as the awkward working postures in aircraft compartments, especially in narrow body aircraft (Tafazzol et al., 2016).

Heavy lifting in awkward positions implies chronic excessive biomechanical loads on all body parts. Short-term exposure to baggage handling was associated with acute pain in most of the anatomical regions (Bern et al., 2013). Therefore, the long-lasting exposure to daily heavy lifting in awkward positions was reported to cause chronic or long-lasting adverse effects on musculoskeletal health in several body regions (Tafazzol et al., 2016).

The study indicated that incapacitation was highest in FBHs who experienced lower back injury (46%), followed by upper back injury (36%). Similarly, Salomon (2004) found that lower back pain interfered with work (30%) more often than shoulder pain (28%). This showed that a typical solution to ergonomic problems of baggage handlers, such as wearing back support belts, was not effective in reducing the back injury rate in FBHs. Furthermore, due to the long- or short-term inability to perform daily duties, this led to more unplanned leave, such as sick leave, as well as medical procedures, and damage to the luggage.

The current study found that 79.0% of FBHs were more likely to sustain injury inside the baggage room, followed by 19.0% aircraft baggage compartment, causing MSDs. This prevalence of MSDs in FBHs was similar to the previous results reported by Dell (2015), where

86% of the FBHs felt that stacking baggage inside the narrow body aircraft compartment was most likely to cause back injury, as it placed limitations on FBHs working postures and increased the risk of injury.

5.3. Physical Workload and Musculoskeletal Disorders in Flight Baggage Handlers

The baggage-handling task identified by most FBHs that resulted in injury was pushing and pulling of loaded carts (57%), followed by lifting baggage off-and-onto the conveyors (50%), and then baggage loading (48%). However, these tasks tended to cause long-lasting and/or short-term MSDs in FBHs. This was similar to the results reported by Bergsten et al. (2015) who found that the baggage handlers spent a lot of time pushing/pulling baggage carts and loading/unloading baggage to the conveyors, which is assumed to involve heavy lifting. Furthermore, the awkward postures and movements, which were repetitive and prolonged were common causes of MSDs.

According to Dell (2015), pushing, pulling and stacking baggage inside the aircraft compartments were considered the tasks most likely to cause injury. However, a reduction in the weight of baggage handled by FBHs may be an effective method to reduce that exposure (Dell, 2015). The majority of FBHs sustained an injury while performing their baggage handling duties (78%), and 43% experienced reduced functional ability from the injuries while 32% experienced a recurrence of the injury. This generally will cause-long-lasting chronic pain and lead to possible medical disability, such as osteoarthritis and MSDs in FBHs, even after they had retired from the job. It also had an impact on daily work-ability because there will be more sick leave taken, due to the constant pain. Dell (2015) found that there was 25% in FBHs sick leave rates.

5.4. Ethnicity and Musculoskeletal Disorders in Flight Baggage Handlers

The present study demonstrated that Blacks were more likely to feel the pain in the neck (OR = 2.7; CI: 1.10-6.88), shoulders (OR = 3.1; CI: 1.34-7.38) and elbows (OR = 4.5; CI: 1.43-14.42) compared to persons of mixed ethnicity. This indicated that there was a high prevalence of MSDs in black FBHs than mixed ethnicity, because they were more prone to adopting awkward postures and performing involuntary movements, and low socio-economic status of not being exposed to the preventative exercise strategies, and they also lacked the proper education. Therefore, these various participating factors resulted in a long-term injuries and limited mobility.

5.5. Psychosocial factors and Musculoskeletal Disorders in Flight Baggage Handlers

In addition to the physically strenuous tasks involved in airline baggage handling, the study found that there was a dissatisfaction in FBHs associated with psychosocial factors, i.e., personal relations, leadership, support, influence and the organization of work. Similarly, a previous study found that limited social support was associated with low back and shoulder pain that interfered with daily work (Eva et al., 2015). The results showed that the level of psychosocial stress (41%) was due to the work that sometimes put FBHs in emotionally disturbing situations.

The majority of FBHs felt that their work certainly drained their energy levels and they also felt worn out some of the time and emotionally exhausted some of the time (45%). Similarly, Wahlström (2004) found an association between specified factors at work and long-term work absence, due to psychiatric problems. The work-related psychosocial predictors of work

absence correlated with long-term sickness caused by being emotionally exhausted. These associations between job stress and MSDs reported in the present study are in agreement with those reported in recent studies, and it will have a negative impact on the company, as they will results in staff shortages, and also put more stain on others (Bergsten, 2015; Solomon, 2004).

The findings in the current study showed that there were FBHs who experienced repetitive abusive treatment at work daily that caused psychosocial stress and led to MSDs. This will have a negative impact of their productivity, when on duty, due to them not being comfortable, and developing a fear of experiencing abusive treatment continuously. It also increased the stress levels that can lead to severe anxiety and depression, were FBHs end up being on certain medication to control their stress.

5.6. Strengths and Limitations of the Study

This was the first study in South Africa to look at the prevalence and associated risk factor of MSDs in FBHs. This study provides valuable research in a scarcely studied area, especially in South Africa and in the Western Cape.

A limitation was that the study used convenient sampling that negatively affected the external validity. In addition, the relatively small sample size of 100 FBHs negatively affected the power of the study. However, this was unavoidable, as an international airport in South Africa had limited numbers of FBHs that was further compromised, due to concerns of FBHs experiencing work disruption when participating in the research that was considered time-consuming.

In FBHs with diabetes, hypertension and asthma, who were medically diagnosed, the present study did not monitor these conditions or assess how they were controlled or how they affected the working environment. The present study had only four (4) female participants out of 100 FBHs, therefore gender balance was lacking in the study.

5.7. Conclusion

Flight baggage handlers had a high prevalence of MSDs, and the area that was most likely to be injured was the lower back, due to continuously being in awkward postures, while on duty. Also, the baggage room and narrow aircraft compartment were more likely to cause high rates of lower back and neck pain, due to the awkward postures at work. Furthermore, pushing, pulling and stacking baggage inside aircraft compartments were considered the tasks most likely to cause injury. This meant that increased baggage-handling duty might cause chronic or long-lasting MSDs that may lead to unplanned leave and prolonged sick leave, as well as early retirement and, in some cases, even retrenchment. The high prevalence of MSDs in FBHs was significantly associated with certain psychosocial factors.

The risk of MSDs in FBHs increased significantly with increases in psychosocial stress levels at work. Flight baggage handlers were exposed to MSDs, often due to the dissatisfaction at work, which highest when there was a lack quality leadership and support at work. This showed that there was an association between MSDs and psychosocial factors related to work organization, job content, interpersonal relations and leadership.

5.8. Recommendations

There is a need to address injury prevention and rehabilitation, because of the physical nature of the work of FBHs. Addressing job strain could provide significant benefits for those with

neck and wrist/hand pain, while the effect of somatisation and the promotion of good mental health may provide smaller, but significant benefits. There is also a need to understand organizational readiness for change and the impact that it will have on implementation and intervention success associated with MSDs in FBHs.

Another recommendation would be for rotational work among FBHs that will also help to give specific joints and muscles time to relax and rest, while also avoiding the repetition of movement that tended to lead into injuries. It is still important for FBHs to use lower back support belts for stability prevention, while engaging in stretching before, during and after work might help to reduce the chances of sustaining MSDs.

Moreover, looking at the prevalence of MSDs in FBHs, due to psychosocial factors, it is very important to have certain projects running annually or every few months that include mental awareness programmes/wellness days. The wellness days can be used to educate FBHs about their mental health and how to deal with conflict at work, as well as any work-related problems, in order to avoid long-term stress or depression that could lead to MSDs.

Wellness days may also include FBHs getting to know their health, such as CVD risk factor screening, as well as performing warm-up exercises/stretches to prevent injury at work. In order to pursue this research further, future research should include information on the onset and estimates of individual differences in the amount and frequency of heavy lifting.

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APPENDICES

Appendix A: Information Sheet

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2409 Fax: 27 21-959 3688

E-mail:dobowers@uwc.ac.za

PARTICIPANT INFORMATION SHEET

Title of the study: The prevalence and associated risk factors of musculoskeletal disorders in flight baggage handlers at an international airport in South Africa.

What is this study about?

This is a research project being conducted by Livhuwani Phylist Ramashiya at the University of the Western Cape. The aim of the study is to determine the prevalence and associated risk factors of common musculoskeletal disorders (MSDs) among flight baggage handlers at an international airport in South Africa.

The Dell's questionnaire for baggage handlers will be used to evaluate musculoskeletal disorders. The Nordic musculoskeletal questionnaire will be used to identify the involved limb(s) presenting with musculoskeletal injury among baggage handlers. The Copenhagen

psychosocial questionnaire will be used to evaluate the psychosocial work environment in relation to MSDs.

What will I be asked to do if I agree to participate?

You will be booked by appointment for physical testing including height, weight, waist and hips circumferences. You will then be informed how you will be tested and what to expect. You will also be familiarized with the tests before the testing starts. You will also be asked to fill in a variety of questionnaires to gather personal information.

Would my participation in this study be kept confidential?

To ensure your anonymity, alpha-numeric codes (A1) will be used in place of your name, and only the researcher will have access to the identification key. To ensure your confidentiality, your personal information regarding the study will be kept in a file and securely stored in a locked filing cabinet in my supervisor's office. If we write a report or an article about this research project, your identity will not be disclosed at any time.

What are the risks of this research?

There may be some risks from participating in this research study. Much like any activity or assessment, there are risks which can be described as both expected and unexpected. Possible expected risks of an emotional and psychological nature may include feeling self-conscious, embarrassed or anxious, due to having fears of possible negative outcomes. Unexpected risks include physical aspects, such as increased heart rate and blood pressure and discomfort during assessments. There are minimal risks involved regarding the questionnaires on musculoskeletal disorders (MSDs) and the physical measurements. The MSDs involve a questionnaire, and the physical testing includes measuring height, weight, waist and hips circumferences that have no risk of injury. However, should any injury occur, there will be a certified (level 3) first aider

available with the needed equipment to provide treatment. All human interactions and talking about self or others carry some amount of risks. We will nevertheless minimise such risks and act promptly to assist you if you experience any discomfort, psychological or otherwise during the process of your participation in this study. Where necessary, an appropriate referral will be made to a suitable professional for further assistance or intervention.

What are the benefits of this research?

The benefits for you include knowing and understanding your own functional movement ability, strengths and weaknesses. Movement deficiencies affect your performance at work. Identifying these movement deficiencies will inform you about what aspects you can improve in order to enhance your performance at work and decrease your risk of injury.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, there will not be any negative consequences.

What if I have questions?

This research is being conducted by Livhuwani Phylist Ramashiya of the Department of Sport, Recreation and Exercise Science at the University of the Western Cape. If you have any questions about the research study itself, please contact:

Livhuwani Phylist Ramashiya

Cell phone: 0783891039

Email: ramashiyalivhu@gmail.com

Head of Department: Dr Marie Young

Address: Department of Sport, Recreation & exercise Science, University of the Western Cape, Private Bag X17, Bellville 7535

Email: myoung@uwc.ac.za

Dean CHS: Prof Anthea Rhoda

Address: Faculty of Community and Health Sciences, University of the Western Cape, Private Bag X17, Bellville 7535

Email: chs-deansoffice@uwc.ac.za

This research has been approved by the University of the Western Cape's Senate Research Committee. (REFERENCE NUMBER: _____)

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Appendix B: Consent Form

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CONSENT FORM

Title of Research Project: The prevalence and associated risk factors of musculoskeletal disorders in flight baggage handlers at an international airport in South Africa.

The study has been described to me in language that I understand. My questions about the study have been answered. I understand what my participation will involve and I agree to participate of my own choice and free will. I understand that my identity will not be disclosed to anyone. I understand that I may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.

Participant's name……...

Participant's signature…….

Date……

Appendix C: Participant Sociodemographic Questionnaire

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PARTICIPANT SOCIODEMOGRAPHIC QUESTIONNAIRE

Title of the study: The prevalence and associated risk factors of musculoskeletal disorders in flight baggage handlers at an international airtport in South Africa.

Participant No. (Alpha-numeric code): _____

1. Demographic information

(Please make a cross (X) in the appropriate box below) or fill in the required information below.

Gender	Male □	Female □			
Date of birth	(yyyy/mm/dd): _____				
Race	Black □	White □	Coloured □	Indian □	Other □
Marital status	Single □	Married □	Widowed □	Divorced □	Separated □

Do you have any chronic diseases? If yes, then specify:_____	Yes □	No □
Are you taking any medication? If yes, then specify:_____	Yes □	No □

How many hours per week do you work?	_____ hours per week
Height (cm)	
Weight (kg)	
BMI ($kg \cdot m^{-2}$)	

2. Dell's Questionnaire for surveying the causes and prevention of musculoskeletal disorders

Manual handling locations most likely to cause injury

(Please cross (X) for the one you feel most likely to cause injury) (Choose only one).

Location	Response (x)
Inside the baggage room.	
Inside an aircraft baggage compartment.	
Inside an aircraft bulk-hold.	
Outside an aircraft, on the tarmac.	

Manual handling task that is most likely to cause injury.

Task	Response (X)
Loading baggage onto carts in the baggage room.	
Unloading baggage in the inbound baggage area.	
Unloading cans in the inbound baggage area.	
Pushing and pulling loaded baggage carts, etc.	
Transferring baggage from carts to a conveyor belt positioned at the aircraft.	
Transferring baggage from carts directly into an aircraft, through the cargo door.	
Stacking baggage inside the compartment of a narrow-bodied aircraft.	
Pushing and pulling containers and pallets inside a wide-bodied aircraft, when inoperative.	
Stacking baggage in the bulk-hold of a wide-bodied aircraft.	
Lifting baggage on and off the conveyors.	

Baggage handler personal injury experience

(Please cross (X) the one you feel most likely to cause injury) (Choose only one).

QUESTION	Yes	No
Have you personally experienced a back injury while handling baggage?		
If yes, has the back injury reduced your ability to handle baggage?		
If yes, has the injury recurred since the first occasion?		

3. Nordic Musculoskeletal Disorders Questionnaire

Have you at any time, during the last 12 months, had trouble (such as ache, pain, discomfort, numbness) in the following areas?

(Please make a cross (X) below indicating either yes or no. Also, make a cross (X) in left or right, or both left and right, if both were involved)

Neck	No □	Yes □	If yes, indicate which side(s) of the neck was/were involved.	Left □	Right □
Shoulder(s)	No □	Yes □	If yes, indicate which shoulder(s) was/were involved.	Left □	Right □
Elbow(s)	No □	Yes □	If yes, indicate which elbow(s) was/were involved.	Left □	Right □
Wrist(s) and/or hand(s)	No □	Yes □	If yes, indicate which hand(s) and/or wrist(s) was/were involved.	Left □	Right □
Upper back	No □	Yes □	If yes, indicate which side(s) of the upper back was/were involved.	Left □	Right □
Lower back	No □	Yes □	If yes, indicate which side(s) of the lower back was/were involved.	Left □	Right □
Hip(s), thigh(s) and/or buttock(s)	No □	Yes □	If yes, indicate which hip(s), thigh(s) and/or buttock(s)was/were involved.	Left □	Right □
Knees	No □	Yes □	If yes, indicate which knee(s) was/were involved.	Left □	Right □
Ankle	No □	Yes □	If yes, indicate which ankle(s) was/were involved.	Left □	Right □

Have you had trouble, during the last 7 days, in the following areas?
(Please make a cross (X) below indicating either yes or no. Also, make a cross (X) for left or right, or both left and right, if both were involved)

Neck	No □	Yes □	If yes, indicate which side(s) of the neck was/were involved.	Left□	Right □
Shoulder(s)	No □	Yes □	If yes, indicate which shoulder(s) was/were involved.	Left □	Right □
Elbow(s)	No □	Yes □	If yes, indicate which elbow(s) was/were involved.	Left □	Right □
Wrist(s) and/or hand(s)	No □	Yes □	If yes, indicate which hand(s) and/or wrist(s) was/were involved.	Left □	Right □
Upper back	No □	Yes □	If yes, indicate which side(s) of the upper back was/were involved.	Left □	Right □
Lower back	No □	Yes □	If yes, indicate which side(s) of the lower back was/were involved.	Left □	Right □
Hip(s), thigh(s) and/or buttock(s)	No □	Yes □	If yes, indicate which hip(s), thigh(s) and/or buttock(s) was/were involved.	Left □	Right □
Knee(s)	No □	Yes □	If yes, indicate which knee(s) was/were involved	Left □	Right □
Ankle(s)	No □	Yes □	If yes, indicate which ankle(s) was/were involved.	Left □	Right □

During the last 12 months, have you been prevented from carrying out normal activities (job, housework, hobbies), because of this trouble?
(Please make a cross (X) below indicating either yes or no. Also, make a cross (X) for left and right, if both were involved)

Neck	No □	Yes □	If yes, indicate which side(s) of the neck was/were involved.	Left □	Right □
Shoulder(s)	No □	Yes □	If yes, indicate which shoulder(s) was/were involved.	Left □	Right □
Elbow(s)	No □	Yes □	If yes, indicate which elbow(s) was/were involved.	Left □	Right □
Wrist(s) and/or hand(s)	No □	Yes □	If yes, indicate which hand(s) and/or wrist(s) was/were involved.	Left □	Right □
Upper back	No □	Yes □	If yes, indicate which side(s) of the upper back was/were involved	Left □	Right □
Lower back	No □	Yes □	If yes, indicate which side(s) of the lower back was/were involved.	Left □	Right □
Hip(s), thigh(s) and/or buttock(s)	No □	Yes □	If yes, indicate which hip(s), thigh(s) and/or buttock(s) was/were involved.	Left □	Right □
Knees(s)	No □	Yes □	If yes, indicate which knee(s) was/were involved.	Left □	Right □
Ankle(s)	No □	Yes □	If yes, indicate which ankle(s) was/were involved	Left □	Right □

4. Copenhagen Psychosocial Questionnaire (COPSOQ)

The following questions are about your psychosocial work environment. Please choose the answer that best fits each of the questions. (Please make a cross (X) below indicating either yes or no. Also, make a cross (X) for left and right, if both were involved

Question	Always	Often	Sometimes	Seldom	Never/hardly never
Do you fall behind with your work?					
Do you have enough time for your work tasks?					
Is it necessary to keep working at a high pace?					
Do you work at a high pace throughout?					
Does your work put you in emotionally disturbing situations?					
Do you have to relate to other people's personal problems, as part of your work?					
Do you have a large degree of influence concerning your work?					
Can you influence the amount of work assigned to you?					

Question	To a very large extent	To a large extent	Some what	To a small extent	To a very small extent
Do you have the possibility of learning new things through your work?					
Does your work require you to take the initiative?					
Is you work meaningful?					
Do you feel that the work you do is important?					
Do you feel that your place of work is of great importance to you?					
Would you recommend a good friend to apply for a position at your workplace?					
At your place of work, are you informed well in advance concerning for example important decisions, changes, or plans for the future?					
Do you receive all the information you need in order to do your work well?					
Is your work recognized and appreciated by management?					
Are you treated fairly at your workplace?					
Does your work have clear objectives?					
Do you know exactly what is expected of you at work?					
To what extent would you say that your immediate superior gives high priority to job satisfaction?					
To what extent would you say that your immediate superior is good at work planning?					
How often is your nearest superior willing to listen to your problems at work?					

Question	Very satisfied	Satisfied	Unsatisfied	Very unsatisfied
Regarding your work in general. How pleased are you with your job as a whole, everything taken into consideration?				

The next two questions are about the way your work affects your private life and family life

Question	Yes, certainly	Yes, to a certain degree	Yes, but only very little	No, not at all
Do you feel that your work drains so much of your energy that it has a negative effect on your private life?				
Do you feel that your work takes so much of your time that it has a negative effect on your life?				

The next four questions are not about your own job, but about *the whole company* where you work

Question	To a very large extent	To a large extent	Somewhat	To a small extent	To a very small extent
Are conflicts resolved in a fair way?					
Is the work distributed fairly?					

The following five questions are about your *own* health and well-being. Please do not try to distinguish between symptoms that are caused by work, and symptoms that are due to other causes. The task is to describe how you feel in general.

The questions are about your health and well-being, during the last twelve months.

Question	Excellent	Very good	Good	Fair	Poor
Are conflicts resolved in a fair way?					

Question	All the time	A large part of the time	Part of the time	Not at all
How often have you felt worn out?				
How often have you been emotionally exhausted?				

Question	Yes, daily	Yes, weekly	Yes, monthly	Yes, a few times	No
During the past 12 months, have you been exposed to undesired sexual attention at your workplace?					
During the past 12 months, have you been exposed to threats of violence at your workplace?					
During the past 12 months, have you been exposed to physical violence at your workplace?					
During the past 12 months, have you been exposed to bullying at your workplace?					

Appendix D: Ethics Clearance Letter

UNIVERSITY of the WESTERN CAPE

OFFICE OF THE DIRECTOR: RESEARCH
RESEARCH AND INNOVATION DIVISION

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28 June 2019

Ms L Ramashiya
SRES
Faculty of Community and Health Sciences

Ethics Reference Number: BM19/5/2

Project Title: Prevalence and associated risk factors of musculoskeletal disorders in flight baggage handlers.

Approval Period: 14 June 2019 – 14 June 2020

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

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

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

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

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

BMREC REGISTRATION NUMBER -130416-050

FROM HOPE TO ACTION THROUGH KNOWLEDGE

Appendix E: Letter of Permission to ACSA

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2409 Fax: 27 21-959 3688

E-mail:dobowers@uwc.ac.za

Letter of Permission to ACSA

Title of the Research Project: Prevalence and associated risk factors of musculoskeletal disorders in flight baggage handlers at an international airport in South Africa.

The Executive Manager

Airports Company South Africa

International Airport in South Africa

Dear Sir

I, Livhuwani Phylist Ramashiya (student number: 3870681) am registered for a MSc Biokinetics 2019, and have been granted permission by the Biomedical Research Ethical Committee, Faculty of Community and Health Sciences, UWC, to conduct the above-mentioned study.

Research Ethics Clearance Number: _____.

I hereby request permission to conduct my research involving all airport baggage handlers, both males and females, at an International Airport in South Africa.

I trust that you will give my request your favourable consideration, and I look forward to a positive response.

Thank you.

Yours faithfully

_____

Livhuwani Phylist Ramashiya

Appendix F: Turn-it-it Report

Turnitin Originality Report

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