The Epidemiology of Musculoskeletal Pain in an Elderly Population within a Selected Elderly Care Facility in KwaZulu-Natal

By

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I, Luke Fitzroy Pendock, do hereby declare that this dissertation is representative of my own work in both conception and execution (except where acknowledgements indicate to the contrary)

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DEDICATION

I dedicate this dissertation to:

My dad and mom, Michael and Charne' Pendock. You have helped and guided me to realise and live my dreams. Your constant love, encouragement and support, both financially and emotionally, have never been taken for granted. You have given me every opportunity to be successful and are the reason behind who I am today. I am eternally grateful to have been blessed with you as my parents. I cannot thank you enough. I love you both dearly.

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ABSTRACT

Aim: The aim of this study was to determine the epidemiology of the elderly presenting with musculoskeletal pain, within a selected elderly care facility in KwaZulu-Natal.

Subjects: Elderly participants, aged 60 years and older, residing in the selected elderly care facility in KwaZulu-Natal.

Methodology: Once the Institutional Research Ethics Committee (IREC) approved the study, and TAFTA had granted permission for the study to be conducted, the researcher administered the questionnaires to the participants who met the inclusion criteria, on the same day that they had read and completed the letter of information and informed consent. The researcher, and the research assistant, remained present to read the questions to any participants unable to read, or who were no longer able to read, and answer any queries or concerns the participants may have had throughout the process. A total of 302 completed informed consent forms and questionnaires were collected, and placed in separate sealed ballot boxes to ensure that questionnaires could not be linked to the participants. This served to maintain confidentiality and anonymity in the study. All completed questionnaires were analysed by only the researcher and the statistician. The number issued to the participant's questionnaire was used on the data sheet to maintain confidentiality.

Results: In total, 302 questionnaires were utilised for statistical analysis. The results showed a significantly high point (79.1%) and lifetime (86.1%) prevalence of musculoskeletal pain in the elderly participants. The most common areas of pain reported by the participants were the lower back (41.1%), the knee (33.1%) and the shoulder (20.1%). The statistically significant risk factors for musculoskeletal pain in the elderly were difficulty sleeping and the amount of hours slept per night (p=0.018); anxiety; stress and depression (p=0.026); concomitant medical conditions (p=0.012); medication used, and past musculoskeletal pain experienced (p<0.001).

Conclusion: This study is consistent with previous studies conducted on the prevalence of musculoskeletal pain in the elderly. Musculoskeletal pain has a negative impact on the activities of daily living in the elderly, making it a public health concern. Focus needs to be placed on satisfactory and effective healthcare, with patient education and rehabilitation to enhance the quality of life and the ability to function independently in the elderly population.

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LIST OF SYMBOLS AND ABBREVIATIONS

ADL	Activities of daily living
DUT	Durban University of technology
GFR	Glomerula filtration rate
IREC	Institutional Research and Ethics Committee (IREC)
LBP	Low back pain
mmHg	Millimeters of mercury
MSK	Musculoskeletal
N	The population
n	The sample
NSAIDs	Non-steroidal anti-inflammatory drugs
OA	Osteoarthritis
OP	Osteoporosis
p	Level of significance
RA	Rheumatoid arthritis
SMT	Spinal manipulative therapy
TAFTA	The Association for the Aged
UN	United Nations Organization
viz.	Namely
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION TO THE STUDY

Worldwide, musculoskeletal conditions are the most common and severe cause of long-term pain and physical disability in the elderly population (Woolf and Pfleger 2003). In individuals aged 60 years and older, joint disease accounts for half of all chronic conditions. Back pain in women and men rank third, and fourth, respectively, as one of the major causes of chronic pain in adults over the age of 65 years (Boghozian 2015). The World Health Organization (WHO) reports that the four major disabling musculoskeletal conditions are osteoarthritis (OA), rheumatoid arthritis (RA), osteoporosis (OP) and back pain.

The management of the elderly population is complicated by many factors, viz. co-morbidities, such as osteoarthritis, diabetes and cancer that may limit the type of treatment which can be used (Dougherty *et al*. 2012). The chiropractic scope of practice includes spinal manipulative therapy, modalities, exercise, nutritional counselling, dry needling and fall prevention strategies, which are beneficial in the prevention and treatment of musculoskeletal disorders (Boghozian 2015).

South Africa has one of the fastest growing elderly populations in Africa, particularly in the age category between 64 to 73 years (May 2003).The increase in life expectancy will lead to an increase in the incidence of chronic musculoskeletal pain and this in turn will lead to an increase in morbidity and disability (Fejer and Ruhe 2012). The predicted future increase of the elderly worldwide makes it essential for an epidemiological study on the elderly population experiencing musculoskeletal pain, to be conducted. This study serves to add to the available, yet limited literature, so that primary health care professionals can treat musculoskeletal pain more effectively and increase the quality of life in the elderly population.

1.2 RESEARCH PROBLEM, AIM AND OBJECTIVES

1.2.1 Research Problem

An increase in the elderly population has generated the need for further understanding and research into the musculoskeletal pain experienced by the elderly population, due to the limited literature available in South Africa.

1.2.2 Aim

The aim of this study was to determine the epidemiology of the elderly presenting with musculoskeletal pain within a selected elderly care facility in KwaZulu-Natal.

1.2.3 Objectives

1. To determine the point and lifetime prevalence of musculoskeletal pain in an elderly population.
2. To investigate selected risk factors (such as age, gender, exercise, smoking, alcohol) for musculoskeletal pain in an elderly population.
3. To determine the impact (activities of daily living) of musculoskeletal pain in an elderly population.

1.3 HYPOTHESES

Hypothesis (H_A) 1: The prevalence of musculoskeletal pain in the elderly population would be significantly associated with various risk factors.

Hypothesis (H_A) 2: Musculoskeletal pain has an impact on the activities of daily living in the elderly population.

1.4 RATIONALE

Musculoskeletal pain is the most common and severe cause of long-term pain and physical disability in the elderly population (Helme and Gibson 1999). If not treated, musculoskeletal pain can become chronic, thereby, affecting the quality of life in the elderly population. A decrease in mobility, the ability to be independent, perform daily activities and changes in sleep patterns can be attributed to musculoskeletal pain. Furthermore, chronic musculoskeletal pain can lead to depression and psychological problems (Boghozian 2015).

According to the United Nations (UN 2010), the number of elderly people aged 60 years and older will triple over the next 40 years and will account for more than 20% of the world's population by the year 2050. One in five of the elderly will be over the age of 80 years. The elderly population within the Sub-Saharan African region is predicted to increase from 36.6 million to 141 million by 2050 (Gerber *et al.* 2016*)*. This rise in life expectancy is influencing an increase in the number of elderly individuals, especially in the developed countries. The increase in life expectancy will cause a greater incidence of chronic musculoskeletal pain and lead to an increase in morbidity and disability (Fejer and Ruhe 2012).

The healthcare provided to the elderly population in South Africa is unsatisfactory and may be due to a lack of expertise and understanding of the elderly patient and the musculoskeletal pain they experience or with which they present (Rabie *et al.* 2016). The elderly population in South Africa display different socio-economic needs that should be considered, such as accessibility to healthcare, nutritional requirements, shelter, transport and community amenities (May 2003). The funds that the elderly population in South Africa receive are generally allocated to food, as well as water and electricity, leaving limited funds for medical care (Aliber 2003).

Poverty amongst the South African elderly leads to a decrease in the seeking of healthcare. The majority of the elderly population cannot afford private medical care - this forms 83% of the general population who have to visit public healthcare facilities, which are often overcrowded, have long waiting times, have a shortage of staff and poor quality of care. Further factors, such as transport costs and physical challenges, also need to be noted when considering why the elderly do not seek healthcare (Rabie *et al*. 2016).

One quarter of the elderly population in South Africa can be expected to be chronically poor in terms of the poverty line, leaving minimal income to be allocated to healthcare (May 2003). The increase in the elderly population and number of elder persons presenting to chiropractic practices makes it important not only to document and understand current complaints, but also to be able to prevent musculoskeletal pain from occurring by strategising effective management plans (Dougherty *et al*. 2012).

The increase in the elderly population generates the need for greater insight into the current magnitude and impact of musculoskeletal conditions on the lives of the elderly (Fejer and Ruhe2012). The predicted future increase of the elderly worldwide makes it essential for an epidemiological study on the elderly experiencing musculoskeletal pain to be conducted. This

study can add to the literature so that medical professionals can treat musculoskeletal pain more effectively and increase the quality of life in the elderly population.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Chapter two is a detailed description of the current literature available on musculoskeletal pain in the elderly population. Musculoskeletal pain in the elderly is the most common cause of severe pain and long-term disability globally (Woolf and Pfleger 2003).

2.2 DEFINITION OF AN ELDERLY PERSON

According to the United Nations (UN 2017), an elderly individual is classified as an individual being 60 years of age and older.

2.3 DEFINTION OF MUSCULOSKELETAL AND PAIN

2.3.1 Musculoskeletal

According to the Cambridge dictionary (2017), “Musculoskeletal relates to the muscles and skeleton, including bones, tendons and joints”.

2.3.2 Pain

The definition of pain, according to the International Association for the Study of Pain (IASP 1979) is “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage”.

2.4 THE ELDERLY POPULATION IN THE CONTEXT OF SOUTH AFRICA

South Africa is one of the African countries with a continuously growing elderly population (Ramocha, Louw and Tshabalala 2017). The South African population aged 60 years and older

is expected to increase over the next two decades and account for approximately 10.5% of the total population by the year 2025. The elderly population in South Africa currently accounts for 7.3% of the total population, third behind only Reunion Island (9.9%) and Mauritius (9%). The elderly female population constitutes the majority of the elderly population in South Africa. The female population currently constitute 69% of the population aged 80 years and older. It is estimated that the female population will continue to grow at faster rates when compared to the male population(Joubert and Bradshawb 2006).

According to Ramocha, Louw and Tshabalala (2017) there is inadequate literature available on the elderly population in Africa, especially in institutionalised elderly care facilities. Old age homes in South Africa were started to combat concerns of social problems in the elderly, such as loneliness, economic and housing problems and a lack of family support systems. The majority of the elderly in South African old age homes are females 65 years of age and older. It has been suggested that the majority of the elderly care facilities are situated in urban areas and are constituted by a greater white population than African population (Ramocha, Louw and Tshabalala 2017).

The elderly population in KwaZulu-Natal (KZN) constitutes 19.6% of the total population aged 60 years and older in South Africa (Naidoo *et al.* 2015). This portion of the population are more dependent on healthcare than the general population (Robb *et al.* 2017). A significant amount of the elderly population in South Africa have a lack of basic education and skills, thereby making it difficult for them to budget and allocate money to healthcare from the limited resources that they have available (Makiwane and Kwizera 2006).

South African citizens and permanent residents are granted a state old-age pension at 60 years of age and older. The South African government pension delivers cash funds to people who have reached the pension age and do not have a private pension (Case and Menendez 2007). The elderly in South Africa use their pension income on housing, food, transport, basic needs, sanitation and support of family members living within the same households, thereby leaving minimal funds for healthcare. According to Case (2004), there is a strong association between income and health status and the state old age pension has been shown to improve the health status of all household members in South Africa.

The majority of the elderly in South Africa do not seek medical attention due to the lack of transport or the distances they have to travel to get to the nearest clinic. Healthcare facilities are not always easily accessible and the elderly population in the Mpumalanga Province, South Africa, reported that it takes on average between 30 to 60 minutes to get to the nearest clinic.

This becomes particularly difficult when walking is the only form of transport (Makiwane and Kwizera 2006).

A study conducted on the elderly population in Bloemfontein, South Africa, reported that 81.7% of the study population suffered from more than one disease. Hypertension and joint disorders were the most common diseases amongst the elderly population. These two disorders accounted for the majority of pain and decrease in mobility in older people, leading to a poorer quality of life (Gerber *et al.* 2016). Elderly South African males reported a higher level of disability when compared to the South African females. This may be related to the occupational hazards the males may encounter during their lifetime (Makiwane and Kwizera 2006).

The elderly, living in rural settlements, and those living in houses with many occupants, are at a greater risk of malnutrition. Approximately 43% to 50% of the elderly population in South Africa admitted to having experienced food shortages, to the extent that they were unable to afford a basic sustaining diet (Naidoo *et al.* 2015).

When considering the nutritional status of the elderly, a low intake of fruit and vegetables daily contributes to the development of cardiovascular disease and cancer. Malnutrition and insufficient micronutrient intake account for about 15% of deaths globally (Lock *et al.* 2005). The South African elderly population lack a sufficient fruit and vegetable intake, with 64.8% of men and 71.4% of women not consuming adequate amounts of these foods (Peltzer and Phaswana-Mafuya 2012). The lack of fruit and vegetable intake accounts for 3.2% of total deaths and 1.1% of disability in South Africa (Schneider *et al.* 2007).

The poor nutritional status of the elderly in South Africa can also be further impacted by decreased physical activity. The elderly who are greatest at risk of malnutrition are those that do not have the ability to walk to the shops, obtain and prepare food. There is also a strong association between depression and malnutrition in the elderly in the KwaZulu-Natal region (Naidoo *et al.* 2015).

A comparative study conducted between the elderly population in old age homes and community dwellers found that the community dwellers were more physically active and had a better quality of life. The individuals in the old age homes participated in very little or no physical activity, while approximately 80% of the community dwellers participated in vigorous activity (Ramocha, Louw and Tshabalala 2017).

2.5 THE INCIDENCE AND PREVALENCE OF MUSCULOSKELETAL PAIN IN THE ELDERLY

Chronic pain is very common in the elderly population aged 60 years and older, however, the prevalence of the pain experienced has not been accurately defined (Edeer and Tuna 2012). There is limited research on the musculoskeletal pain experienced by the elderly population. The effects of aging on sensory, cognitive, emotional and behavioural factors in the elderly remain almost unevaluated (Soares, Sundin and Grossi 2004). The rise in the average age globally will lead to a significant increase in the number of elderly individuals suffering from musculoskeletal pain, making effective management of pain essential (Gheno *et al.* 2012).

Musculoskeletal pain in the elderly is not confined to certain countries, it is a global concern. In a Polish study, the incidence of musculoskeletal pain increased from 35.2% between the ages of 55 to 59 years, to 42% between the ages of 65 and 69 years. The incidence of pain in the elderly was significantly greater after the age of 65. The elderly female population were most likely to complain of pain (Kozak-Szkopek *et al.* 2017). In the United States, musculoskeletal pain is the number one cause of chronic impairments with one in four individuals reporting experiencing chronic musculoskeletal pain (Nakua *et al.* 2015). The Swedish population aged 65 years and older will increase from 17% to 20% by the year 2030. Musculoskeletal pain is reported by 73% to 80% of the elderly population in Sweden, with at least 24% of the population aged 65 years and older reporting severe impairments due to back pain (Soares, Sundin and Grossi 2004).

A study conducted in the United Kingdom reported that 79% of the general population suffering from chronic musculoskeletal pain still suffer four years later. The rising life expectancy of the elderly is also increasing the frequency of musculoskeletal pain becoming chronic (Nakua *et al.* 2015). Research by Charlton (2005) suggested an estimated 57% of the elderly reported experiencing musculoskeletal pain for one or more years, while 40% of elderly patients who reported pain on initial assessments, reported worse pain at the follow-up assessment, between two to six months after the initial assessment.The most common description of pain in the Taiwanese elderly living in nursing homes is aching (77.6%), exhausting (27.6) and sharp (8.2%) (Tsai *et al.* 2004).

A comparison mentioned by Edeer and Tuna (2012), between the elderly suffering from chronic musculoskeletal pain, aged 60 years and older, in a general community dwelling, and those living in nursing homes, stated that 50% of the elderly living in the community experience pain,

while this number increases up to 80% in the elderly population living in nursing homes. At least 40% to 50% of the nursing home residents used analgesics. A study conducted in the United States by Brown *et al.* (2011) found that an even greater percentage (90%) of the elderly living in the community had experienced musculoskeletal pain within the past month, and 41% of the individuals that experienced pain described the pain as being severe, distressing or unbearable.Asghari, Ghaderi and Ashoori (2006)described 64% of the elderly participants, living in two private nursing homes in Tehran, having either moderate or severe pain.

In a study conducted in Cape Town, South Africa, the effects of musculoskeletal pain were described as moderate to severe within the elderly population. The most common complaints included back, knee and shoulder pain, with the male population being less affected than the female population (Parker and Jelsma 2010). The prevalence of chronic musculoskeletal pain, especially rheumatoid arthritis, osteoporosis and fibromyalgia, were all more prevalent in the female population, in comparison to males (Nakua *et al.* 2015). The study concluded that musculoskeletal pain with multiple joint involvement was more disabling than isolated joint involvement (Parker and Jelsma 2010).

2.6 THE FOUR MOST COMMON DISABLING MUSCULOSKELETAL DISORDERS IN THE ELDERLY

The World Health Organization (WHO) reported that the four major disabling musculoskeletal conditions are osteoarthritis (OA), rheumatoid arthritis (RA), osteoporosis (OP) and back pain (Woolf and Pfleger 2003).

2.6.1 Osteoarthritis

Osteoarthritis is the most common cause of musculoskeletal pain, affecting approximately 151.4 million individuals worldwide (Taylor *et al.* 2013). The radiographic prevalence of OA is as great as 90% in women, and 80% in men, over the age of 65. Anatomically, the main affected structures are the articular cartilage, joint capsule, subchondral bone, synovial membrane, ligaments and muscles around the affected joint (Gheno *et al.* 2012). This chronic disabling joint disease is one of the leading causes of long-term disability associated with joint pain, stiffness, muscle weakness and changes in proprioception, often resulting in loss of function, independence and a reduced quality of life (Taylor *et al.* 2013).

Osteoarthritis has the most damaging effects on the weight bearing joints of the body, such as the spine, hips and knees, although it is also commonly found in smaller joints like the hands. The lifetime prevalence of developing OA in the hip is approximately 25.3%, with the risk of developing OA in the knee being much greater at 44.7% (Howe 2016). Osteoarthritis of the knee is a common and significant cause of pain and disability in the elderly population. The increase in the prevalence in knee pain has resulted in an increase in the amount of knee replacements performed. In the United Kingdom, the rate of knee replacements performed tripled between 1991 and 2006, while it increased by eight fold in the United States, between 1979 and 2002 (Nguyen *et al.* 2011). One in four people are predicted to experience arthritic symptoms related to hip arthritis at some stage in their life. The increasing age of the elderly is making the lifetime prevalence of developing OA greater, thus, making it a public health concern, and therefore, making safe and cost effective management of OA is a healthcare priority (Howe 2016).

2.6.2 Rheumatoid Arthritis

Rheumatoid arthritis (RA) is a chronic inflammatory disease that primarily affects joints, although other clinical manifestations include rheumatoid nodules, pulmonary involvement, vasculitis and systemic co-morbidities (Smolen *et al*. 2016). Studies have suggested that RA affects 0.5% to 1% of the adult population in developed countries, with the prevalence being three times greater in the female population (Scott *et al.* 2010). The prevalence of RA increases with age, with approximately 2% of people over the age of 60 years suffering from the disease (Soubrier *et al.* 2013). Rheumatoid arthritis results in a significantly reduced functional ability due to its effect on the musculoskeletal system, decreasing the quality of the individual's life and increasing the risk of co-morbidity (Smolen *et al*. 2016).

A study conducted on household women reported that 70% of women suffering from RA had difficulty performing hobbies and general activities they were once capable of completing (Reisine, Goodenow and Grady 1987). A large portion of the population suffering with RA also experience depression due to the decrease in functional ability with which RA is associated. Individuals with RA and depressive symptoms participate in approximately 12% less of their valued activities when compared to those without depression. The increasing life expectancies will increase the frequency of the elderly suffering from RA. The maintenance of functionality and the ability to complete valued activities, or suggest similar alternative activities, is important in the healthcare management, and the preservation of psychological well-being in individuals suffering with RA (Katz 1995).

2.6.3 Osteoporosis

Osteoporosis (OP) is characterised by a loss of bone mineral density, and increased fragility of bones, affecting approximately 50% of women and 20% of men by the age of 85. The early signs of OP may be difficult to distinguish due to radiographical detection only occurring after 30% of bone loss. The increased weakness and fragility of bones in the elderly place them at significant risk of fractures. Falls are a common occurrence in the elderly, with low impact falls from standing height being the most common cause of injury and fractures. Women over the age of 60 are at the greatest risk of developing an osteoporotic fracture. The most common fracture can be observed in the vertebrae, with 25% of women over the age of 70, and 40% over the age of 80, being diagnosed with a vertebral compression fracture. After the first fracture occurs, the risk of developing another vertebral fracture is increased four fold. The impact of vertebral fractures can be severe, resulting in an exaggerated kyphosis and significant deformity, leading to higher rates of mortality and morbidity (Gheno *et al.* 2012).

2.6.4 Low Back Pain

Low back pain is one of the most common musculoskeletal complaints amongst the elderly (Hoy *et al.* 2012). In the United States, the lifetime prevalence of low back pain is more than 80%. It is the second most common cause of disability, therefore making it a global health concern. Previous low back pain sufferers have a reoccurrence rate of between 20% to 44% within the first year and a lifetime reoccurrence risk of up to 85% (Freburger *et al.* 2009). Low back pain is most prevalent in the female population, with the majority of sufferers being between the ages of 40 to 80 years (Hoy *et al.* 2012). Cecchi *et al.* (2006) reported that carrying objects (82%), lifting (81%), and bending over (79%), are the most common aggravating factors for low back pain in the Italian population, aged 65 years and older. Low back pain in the elderly decreases their ability to complete the usual activities of daily living (ADL),and this reduced level of mobility often leads to a sedentary lifestyle (Makris *et al.* 2015).

Further reasons for the elderly not seeking medical attention include poor communication and interaction with healthcare providers and having negative outlooks on medication and surgery (Makris *et al.* 2015).

The aging population is leading to a rise in the prevalence of low back pain complaints, yet it remains largely untreated in the elderly population. Numerous studies have attributed the lack of treatment to ageism, the elderly being unfairly examined, diagnosed and treated due to their old age, however, the majority of the elderly see low back pain as a consequence of old age (Makris *et al.* 2015). Low back pain can potentially be more serious in the elderly population

and it is of great importance for healthcare practitioners to examine red flags that may indicate a more sinister cause during the initial case history and physical examination (Leerar *et al.* 2007) (**Table 2.1,** as adapted from Leerar *et al.* 2007).

Table 2.1 Red flags associated with low back pain

Red Flags	Description
1. Age (50 years and older)	Increased risk of fractures, abdominal aortic aneurysms and cancer
2. Bladder dysfunction	Increased risk of cauda equine syndrome
3. History of cancer	Increased risk of spinal metastases
4. Rest/night pain	The risk of cancer, infection or an abdominal aortic aneurysm
5. Saddle anaesthesia	Increased risk of cauda equina syndrome
6. Lower extremity neurological defect	Characteristic of cauda equina syndrome
7. Immune suppression	Susceptible to infections
8. Trauma	Increased risk of fractures especially if the individual is osteoporotic
9. Fever/chills and night sweats	Risk of tuberculosis or infection

2.7 AGE RELATED PHYSIOLOGICAL CHANGES

The average age of the elderly population is increasing globally. There is a concern that with the increase in longevity, the population is not remaining active and ageing healthily, thus leading to further disability, lack of independence and a decrease in the quality of life in old age (Wilkie, Tajar and McBeth 2013). Ageing is caused by both genetic and environmental factors: a lifetime of molecular and cellular damage caused by multiple life stressors and mechanisms. Although all molecules and cells are regulated by a complex maintenance and repair network,

the effects of ageing results in numerous physiological changes within the body (Clegg *et al.* 2013). There are several physiological phenomena that occur as a result of ageing, such as a decrease in cell counts, degeneration of tissue proteins, tissue atrophy, a reduction in the metabolic rate, and body fluids. These physiological phenomena directly affect the cardiopulmonary, neurological, endocrine and immune systems function (Yeo 2013).

Healthy ageing can be described as being functionally independent. An individual, who has remained physically and mentally active, enables continuing complete cognitive, mental and physical well-being. This includes social interaction, which allows for an increased quality of life (Wilkie, Tajar and McBeth 2013).

Frailty is one of the most severe consequences of ageing. Frailty can be described as a functional decline in many of the body's physiological systems, and an increased vulnerability, and poor resolution in maintaining the body's homeostasis after a stressful event has occurred to the body (Fried *et al.* 2001). The lack of return to homeostasis increases the risk of falls, delirium and disability. Between 25% to 50% of the elderly population over the age of 85 are described as being frail (Clegg *et al.* 2013).

2.7.1 Sarcopaenia

Sarcopaenia is described as an age related progressive loss of muscle mass, strength and power, and is known to occur as a result of ageing, especially in individuals who have a sedentary lifestyle (Walston 2012). Muscle homeostasis within the body is maintained by a balance between new muscle formation, hypertrophy and protein loss. This maintenance is coordinated by the brain, endocrine system and the immune system. Healthy nutritional habits and an active lifestyle have positive effects in maintaining muscle homeostasis (Clegg *et al.* 2013).

It is common for wasting to occur in the elderly. The most prevalent areas are the proximal limbs and small muscles of the hand. Due to age being the most common mechanism of muscle wasting, little time is focused on it. Illness, bed rest and immobilisation further exaggerate muscle atrophy, with malnutrition being a significant factor (Campbell, McComas and Petito 1973). Sarcopaenia has a significant impact on the ADL in the elderly. Sarcopaenia has consequences in the elderly that include: loss of mobility, balance, increased risk of falls, fractures and disability (Gielen *et al.* 2012).

2.7.2 Bone Mineral Density

Bone mineral density tends to be lower in the elderly population. The increasing number of elderly people is therefore causing a greater prevalence of osteoporosis, and thus it is a healthcare concern worldwide. According to the WHO, osteoporosis can be described as bone mineral density being 2.5 standard deviations, or more, below the average bone mineral density of young adults, measured by dual energy X-ray absorptiometry (Tenne *et al.* 2013). The progressive loss of bone affects the axial and appendicular skeleton, compounded by micro architectural deterioration causing increased bone fragility. Ageing and signs of osteoporosis can be distinguished by a progressive loss in height, a Dowager's hump and an exaggerated kyphosis (Manolagas 2000). Osteoporosis is associated with increased risk of fractures after falls, disability and mortality (Daly *et al.* 2013).

Men and women start to lose bone density in their forties. The rate of bone mineral density loss with age is greater in the female population, especially five to ten years after menopause, caused by a decrease in oestrogen (Tenne *et al.* 2013). The bone loss is more significant in females, due to a lower skeletal mass, than the male population, with females having smaller bones and thinner cortices. The greater loss of bone mass in females makes their incidence of bone fractures two to three times greater than men. Men have a decrease in sex steroid production, leading to a more gradual linear loss of bone. Bone loss is further compromised by concurrent conditions such as a glucocorticoid excess, having increased bone resorption and decreased osteoblast formation, hyperthyroidism, gastrointestinal disorders, malignancy, prolonged immobilisation, alcohol and smoking (Manolagas 2000).

The elderly commonly have nutritional disorders, and suffering from malnutrition in turn exaggerates the age-related loss of bone mass. A low protein intake and protein malnutrition in the elderly is strongly associated with greater bone loss, therefore, advocating a sufficient protein intake to prolong bone loss is advisable (Coin *et al.* 2008). Exercise has positive effects on the musculoskeletal system. It is essential in maximising peak bone mass and reducing bone loss. Exercise appropriate for the elderly should be included in all treatment protocols (Korpelainen *et al.* 2006).

2.7.3 Cardiovascular System and Hypertension

Cardiovascular disease remains the leading cause of death in adults and the elderly. A major risk factor and link to cardiovascular disease is hypertension. Hypertension is highly prevalent with an increase in age. There are approximately one billion individuals worldwide with

hypertension and two thirds of individuals over the age of 65 are believed to suffer from hypertension. Studies have suggested that there is a 90% chance that non-hypertensive individuals at the age of 55 will develop hypertension in their later years (Lionakis *et al.* 2012).

When looking at the pathophysiology of hypertension, there are three considerations, viz. the elasticity of the arteries, the kidneys, and neurohormonal autonomic dysfunction. Elastic arteries undergo two main changes with age, i.e. they dilate and stiffen. The dilation and stiffening of the aorta can be attributed to fracture of the elastic lamellae with age. Arteriosclerosis occurs with age, causing hardening and stiffening of the artery, giving it limited ability to expand and deal with the pressure generated by the heart, causing an increase in the systolic pressure. The diastolic pressure may exhibit a decrease due to the lack of recoil during diastole. The high systolic and reduced diastolic pressures result in an increased pulse pressure, thus increasing the stress on the arteries (Lionakis *et al.* 2012).

2.7.4 The Respiratory System

With age, the trachea and bronchi decrease in size resulting in a decreased vital and maximum respiratory capacity (Dziechciaz and Filip 2014). There is calcification of the ribs and weakening of the respiratory muscles in the elderly, causing a decrease in chest expansion, as well as stiffening of the larynx and trachea. There is a decrease in the elasticity of the lung tissue, thus reducing the respiratory flow, and the cilia that function in the removal of mucous lining, and the trachea which becomes less efficient (Kiran *et al.* 2014). The damage to the alveoli, and the increase in the thickness of alveolar walls, results in a decreased diffusion capacity. The reduced number of bronchioles and alveoli causes an increase in the physiological dead space. In the elderly, their chests tends to be more rigid and barrel shaped (Dziechciaz and Filip 2014).

2.7.5 The Digestive System

The elderly population often have receding gums, missing teeth, decreased saliva and mucous secretion, and slow gastric motility and emptying (Dziechciaz and Filip 2014). The elderly population’s food consumption decreases by up to 30% between the ages of 20 and 80 years(Ahmed and Haboubi 2010). The stomach in the elderly reduces in size and the gastric mucosa often becomes inflamed, resulting in gastritis. Insufficient levels of vitamin B12 result in inadequate gastric acid secretion and this, combined with the decreased rate of peristalsis, often results in the elderly complaining of constipation. The elderly colon becomes hypotonic, resulting in a greater capacity to accommodate food and stool. The longer transition times for the stool also results in stool dehydration and constipation (Kiran *et al.* 2014). The loss of weight

in the elderly, due to a decreased appetite and energy consumption, is known as “anorexia of ageing” (Ahmed and Haboubi 2010).

2.7.6 The Kidneys and Hormonal Control of Hypertension

The kidney is one of the most significantly affected organs, both anatomically and physiologically, by age (Yeo 2013). The weight of a normal size kidney in an adult is between 180 to 200 grams, and there is a considerable reduction to an estimated 80 to 90 grams by the age of 80. The decrease in kidney size results in a decrease in the functionality and efficiency of the kidneys in maintaining sodium and water levels (Kuria 2012). The size, weight, number of glomeruli and volume of the cortex decrease as a result of ageing. There is degeneration and hardening of the glomeruli, resulting in up to a 50% decrease in the glomeruli filtration rate by 80 years (Yeo 2013).

Vasoconstriction and vascular resistance occur as a result of increased intracellular calcium and sodium, with the kidneys reduced ability to excrete the sodium overload causing an increase in blood pressure (Zhou *et al.* 2008). Neurohormonal and autonomic dysfunction occur in the elderly. This has a direct effect on the renin-angiotensin-aldosterone system, with the plasma renin activity at the age of 60 being 40% to 60% of the levels found in younger individuals. The decrease in plasma renin activity is caused by nephrosclerosis on the juxtaglomerular apparatus that occurs with age. The lack of renin-angiotensin-aldosterone efficiency decreases the body’s ability to regulate blood pressure (Lionakis *et al.* 2012).

2.7.7 The Brain

There is a reduction of brain size and weight with age. The human brain weight is reduced from 1 375 grams at 20 years, to 1 200 grams by the age of 80 (Kuria 2012). Along with weight reduction, there is white matter atrophy: the brain’s curves flatten, furrows deepen, and the lateral ventricles and third ventricle widen (Dziechciaz and Filip 2014). There is an estimated 20% reduction of cerebral blood flow with age, resulting in a significant decrease in the number of cerebral nerve cells. Numerous areas in the brain, such as the substantia nigra, hippocampus, caudate nucleus, putamen and cerebral cortex have a loss in neurons. The elderly population tend to have weaker reflexes and a loss of muscle tone (Yeo 2013).

2.7.8 The Immune System

An elderly individual experiences changes within their immune system, such as a decrease in stem cells, changes in lymphocyte production, and a decrease in the phagocytic activity of neutrophils, macrophages and natural killer cells. Primary lymphopoiesis is significantly reduced in the elderly population. The decrease in the production of B and T cells can be attributed to the shrinking of the thymus (Montecino-Rodriguez, Berent-Maoz and Dorshkind 2013). The immune system can function efficiently when an individual is experiencing low levels of stress but it is unable to function adequately under the stress of acute inflammation (Clegg *et al.* 2013).

2.8 RISK FACTORS

There are several socio–demographic factors associated with chronic musculoskeletal pain. Studies have shown that there is a correlation between musculoskeletal pain and certain lifestyle factors, such as smoking, sleep disturbance, anxiety and low physical activity. Additional risk factors for musculoskeletal pain include, but are not limited to, lowered education, social isolation, a lowered income, depression and loss of loved ones (Cimmino, Ferrone and Cutolo 2011). The impact of musculoskeletal pain within the elderly population is predicted to increase drastically in the undeveloped countries. This may also be attributed to the increase in obesity and lack of physical activity due to urbanisation globally (Woolf and Pfleger 2003). Being aware of, and understanding the effect of, the numerous risk factors is of importance when constructing a management plan and improving musculoskeletal pain in the elderly population (Cimmino, Ferrone and Cutolo 2011).

2.8.1 Gender

Epidemiological studies have indicated that with an increase in age, the prevalence of musculoskeletal pain in women is significantly higher than in males (Helme and Gibson 1999). According to Woo, Leung and Lau (2009), back pain has the highest prevalence (48%) of pain, followed by knee pain (31%), and then hip pain (8.9%), and women have a prevalence almost twice as high when compared to men. The prevalence of the pain also depends on the type of disease. Women have a greater risk of suffering from OA and RA, while gout and ankylosing spondylitis are more common in men (Helme and Gibson 1999).

There are numerous reasons why musculoskeletal pain has a greater impact on women than men. Women have lower muscle mass when compared to men, which is accentuated with age, causing a greater impact on functional ability. The most important factor is women have a lower bone mineral density than men, and the decline in bone density is accredited to post-menopause, which results in a greater risk of OP. An oestrogen deficiency also increases the risk of developing OA in women (Woo, Leung and Lau 2009).Although Fillingim *et al.*(2009) stated that women are at a greater risk of suffering from musculoskeletal pain, they continued to mention that women are also more likely to utilise healthcare facilities available to them, which may inaccurately reflect the clinical prevalence of musculoskeletal pain in the elderly male population.

2.8.2 Exercise

Globally, there is a belief that old age is a period for relaxation and there is no longer a requirement for elderly individuals to exercise, or that exercise is no longer beneficial for them (Pienaar *et al.* 2004). Physical inactivity amongst the elderly population is one of the biggest public health concerns and is currently the fourth leading cause of global mortality. There are a multitude of chronic health conditions, caused by a physically inactive lifestyle, which can affect the elderly. Diabetes, poor cardiovascular health and increased risk of cognitive and physical impairment may all result from a sedentary lifestyle, decreasing the quality of life in the elderly population (Stubbs *et al.* 2013).

The high prevalence of inactivity in the elderly is associated with numerous factors. The elderly may believe they have physical limitations and thus cannot perform exercise; they have a fear of falling; the presence of musculoskeletal pain, and a lack of energy to perform exercise (Ribeiro *et al.* 2016). As one ages, physiological changes occur at a faster rate. Inactivity in the elderly population is associated with an increased risk of cardio-metabolic disease, a decrease in bone density and sarcopaenia. As these changes occur in the elderly, it makes it increasingly difficult for them to participate in physical exercise, causing a further reduction in activity, and thus, this results in a vicious cycle (Stubbs *et al.* 2013). The portion of the elderly population who do not participate in any physical exercise are at a 20% to 30% greater risk of mortality from any disease, in comparison to those who do at least 30 minutes of exercise on most days of the week (Ribeiro *et al.* 2016).

The WHO recommends 30 minutes of moderate physical activity: walking, aqua aerobics, or even household chores for five times a week (Howe 2016). Studies have shown that the elderly partaking in regular physical activity and exercise are healthier and have a better quality of life

than those who do not perform any form of exercise. Inactivity in the elderly increases the risk of injury development, results in decreased bone density and a lower muscle tone. Exercise has also been shown to prevent the onset of OA in the elderly, reduce knee pain, and prevent and relieve mechanical low back pain (Bruce, Fries and Lubeck 2005). Although exercise has the ability to relieve the symptoms of OA, only 27.8% of individuals suffering from OA engage in sufficient exercise (Howe 2016).

Exercise is associated with a significant reduction of pain in the elderly, but it is also important to regulate the type of exercise in which the elderly participate. Exercise that is too vigorous or excessive may result in trauma to soft tissue structures from and result in increased pain and further disability. Although the reduction of pain due to exercise is significant, aerobic exercise, like excessive running, increases the risk of developing a stress fracture, resulting in increased pain (Bruce, Fries and Lubeck 2005).

2.8.3 Sleep

It is estimated that approximately 70% of individuals suffering from chronic musculoskeletal pain complain of poor sleeping habits (Smith *et al.* 2000). Sleep disturbance in the elderly occurs as a direct consequence of aging and the pain the individual is currently experiencing. Sleep deprivation may occur due to the pain the elderly individual is experiencing, but sleep disturbance also contributes largely to the way the elderly perceive their pain. Studies show that sleep deprivation may initiate an inflammatory response, as well as decrease an individual's pain threshold (Smith *et al.* 2009).

Globally, OA is the leading cause of pain and disability. At least 50% of the elderly suffering from OA report difficulty falling asleep or staying asleep, therefore, it is crucial to focus on sleep management in treatment plans (Smith *et al.* 2009). The elderly suffering from RA also complain of a lack of sleep related to pain. In a survey conducted in the United States, 23% of RA sufferers reported having insomnia, compared to the 16% without RA. Comorbid depression and anxiety are also contributing factors in individuals suffering from insomnia (Lavigne *et al.* 2011).

The National Sleep Foundation reported that at least 25% of the United States' population suffer from chronic musculoskeletal pain, which disrupts their sleep at least ten nights per month (Smith *et al.* 2000). There are various factors that may further contribute to sleep deprivation, such as an individual's lifestyle, poor physical fitness, chronic fatigue and attitude towards one's chronic disease and his or her health care (Lavigne *et al.* 2011). Pain experienced, along with difficulty coping with anxiety, and a lack of sleep, increases the

prevalence of depression (Smith *et al.* 2009). Depression, secondary to the effects of chronic musculoskeletal pain, may be linked to the large number of sleeping complaints in the elderly (Smith *et al.* 2000).

Chronic musculoskeletal pain and insomnia are linked to one another. Both of these conditions increase the risk of developing the other. Individuals suffering from sleep deprivation for three consecutive nights, or longer, have a lower pain threshold, a negative mind-set and somatic symptoms. There is a co-occurrence of chronic musculoskeletal pain and insomnia between 50% to 88% of the adult population in the United Kingdom (Baker *et al.* 2017).

2.8.4 Stress and Depression

Musculoskeletal disorders may occur as a result of psychosocial stress, whether it is continuous stress or significant events in an individual's life. Stressed elderly individuals who suffer from OA tend to perceive the pain as greater than their arthritic severity. Although stress can be associated with the development of musculoskeletal pain, the pain an elderly individual is experiencing can be seen as stress inducing, due to the potential loss, or loss of ability, to perform normal tasks and his or her ADL (Leino 1989). The elderly often do not seek medical assistance due to financial strain. Therefore, the stress of the musculoskeletal pain is compounded by the additional stress of the lack of finances (Soares, Sundin and Grossi 2004).

Musculoskeletal pain is a causative agent for depression due to its effects on the quality of life and the ADL in the elderly, yet it remains largely understudied (Soares, Sundin and Grossi 2004). Self-reported depression in the South African elderly population is an important public health issue because of the distressing consequences it has on an individual's quality of life. Depression in the elderly is linked with an increased risk of co-morbidity and decreased physical, cognitive and social functioning. There are numerous significant risk factors in the development of depression in the elderly, including socio-economic status, unhealthy behavioural habits, poor physical activity, cognitive and functional disability and chronic disease (Peltzer and Phaswana-Mafuya 2013).

The WHO has estimated that 350 million individuals suffer from depression worldwide and depression is the cause of many deaths as a result of suicide. The lifetime prevalence of individuals over the age of 50 years suffering from depression in western countries is 16.5%. Depression is the most prevalent and treatable health problem in old age, yet it remains associated with multiple medical problems (Zis *et al.* 2017).

A study conducted on the elderly population in South Africa reported that co-morbidity between chronic physical diseases and depression are common and that the elderly suffering from chronic disease are at a significantly greater risk of depression than those that did not have a chronic disease (Peltzer and Phaswana-Mafuya 2013). It has been noted that individuals suffering from depression complain of more severe pain and greater physical disability than those without depression (Talvari *et al.* 2013).

Many elderly patients are not being diagnosed with depression in primary health care facilities as a result of suffering from multiple disorders. The treatment is, therefore, focused on the other chronic diseases with which the patient is suffering. Chronic diseases should be addressed by advocating healthy behaviours, and education on the benefits of being physically active and eating healthily. Creating this awareness would help in minimising multiple depression risk factors in the elderly (Peltzer and Phaswana-Mafuya 2013).

2.8.5 Nutrition

The questionnaire in this study does not question participants on their nutritional habits but it is well established and recognised that nutrition is an integral aspect in preventing and resolving musculoskeletal pain. Malnutrition and frailty have a significant association in the elderly population. Without correct identification, they can lead to the onset of disability, which may be irreversible (Artaza-Artabe *et al.* 2016). The nutritional status of the elderly population is impacted by socio-economic status, physiological changes of aging, chronic disease, medication, a decline in functional ability and psychosocial factors (Naidoo *et al.* 2015).

There are numerous risk factors that result in malnutrition: these include chronic illness, medication, financial distress, lack of education and depression. Malnutrition in the elderly population places them at risk of frailty (Robb *et al.* 2017). Malnutrition in the elderly population can also lead to functional and cognitive decline, sarcopaenia, compromised immunity and a decreased overall quality of life (Naidoo *et al.* 2015). Mortality and morbidity is more prevalent in the elderly population when malnutrition is present. (Robb *et al.* 2017)

Current research by Ahmed and Haboubi (2010) has shown that a large percentage of the elderly population do not receive adequate amounts of micronutrients in their daily diet, such as Vitamin D and calcium (Dougherty *et al*. 2012). Vitamin D and calcium supplements have the most beneficial effects. They have been found to be crucial in the treatment of OP, and in the prevention of hip and other non-vertebral fractures (Ahmed and Haboubi 2010).

A deficiency in energy and protein leads to adverse effects in the body and its functioning. Impaired muscle function, decreased bone mass, decreased healing time, and decreased cognitive and immune function occur as a result of malnutrition (Robb *et al.* 2017).

Dehydration is one of the most common causes of hospitalisation in the elderly that live in a long-term care facility. This is especially prevalent in the individuals who suffer from musculoskeletal pain or disability and are unable to fetch their own fluids. Dehydration within the elderly population may also cause decreased muscle strength, medication toxicity and headaches. The elderly at most risk are those living in warmer regions (Robb *et al.* 2017). Nutritional treatment, a protein rich diet, correction of micronutrient deficits and physical activity are all fundamental aspects when establishing a treatment strategy for elderly patients (Artaza-Artabe *et al*. 2016).

2.8.6 Smoking

Cigarette smoking is the largest cause of preventable deaths in the world (Abate *et al.* 2013). Smoking has been described as a risk factor for multiple diseases, including cancer and cardiovascular disease. There is an association between smoking and an increased risk of chronic musculoskeletal pain, back pain, OP and RA (Kang *et al.* 2016).

Smoking has been shown to have negative consequences on the musculoskeletal system (Abate *et al.* 2013). There are numerous biological effects that increase the risk of fractures. Nicotine has a deleterious effect on osteoblasts and osteoclasts, and smoking may affect the strength of bone through decreased intestinal calcium absorption and decreased oxygen supply in the body, as well as decreased production of oestrogen and hypercortisolism (Høidrup *et al.* 2000)

Smoking causes a significantly lower bone mineral density especially in the femoral neck, tibia and calcaneus in smokers when compared to non-smokers. The loss of bone density in smokers increases the risk of developing OP. Vertebral fractures increase 32% in males and 13% in females, while the risk of hip fractures is 40% greater in males and 31% greater in females who smoke (Abate *et al.* 2013).

When considering post-menopausal women, women who smoke have a greater bone mineral density loss than non-smoking women (Høidrup *et al.* 2000). Women who smoke a box of cigarettes a day throughout adulthood have less cortical bone and 5% to 10% lower bone density around menopause. when compared to non-smokers (Abate *et al.* 2013). The lifetime risk of a hip fracture is about 50% greater in women who smoke (Høidrup *et al.* 2000). The

duration a female has been smoking for has a direct link with the risk of a hip fracture. The risk of a hip fracture only becomes significant after a cumulative duration of cigarette smoking of more than 30 years, but these effects are described as being reversible after 15 years of no smoking (Baron *et al.* 2001).

Chronic smoking has a deleterious effect on skeletal muscle because of impaired muscle metabolism, increased inflammation and atrophy. This leads to further loss of muscle mass and strength. Chronic smokers have a higher prevalence of musculoskeletal pain, especially in the neck, upper limbs and lower limbs (Abate *et al.* 2013).

When considering back pain, smoking is associated with disc degeneration. This can be attributed to the degradation of collagen and a decreased blood and oxygen supply in the vascular network around the intervertebral discs (Abate *et al.* 2013). Rotator cuff tears are more common in chronic smokers. Tendons are directly affected by the number of cigarettes smoked a day placing chronic smokers at greater risk of tendinopathy. The risk of a distal bicep tendon rupture is 7.5 times greater in smokers than non-smokers, and smoking also lengthens the healing time of tendons (Abate *et al.* 2013).

Smoking is the most well-known environmental risk for the development of RA, therefore, placing chronic smokers at greater risk of developing RA. This is due to an increase in the production of rheumatoid factor and anti-cyclic, citrullinated, peptide autoantibodies in individuals who smoke. This especially affects the male population, with smokers experiencing significantly higher levels of rheumatoid factor (Silman, Newman and Macgregor 1996). A comparison made by Westhoff, Rau and Zink (2008), between smokers and non-smokers, noted that smokers had a greater need for disease-modifying anti-rheumatic drugs. There are, however, inconsistencies as to whether smoking causes joint damage, and this may only be the case in individuals with a long history of smoking.

Chronic smoking has undesirable effects on the prognosis of musculoskeletal disorders and surgical procedures. It has been noted that cessation of smoking has numerous positive results, especially when considering post-operative effects. Individuals experience a faster healing process, with less complications, leading to a shorter stay in hospitals (Abate *et al.* 2013). The cessation of smoking in men decreases the risk of a hip fracture after five years, and 19% of all hip fractures could be prevented if smoking individuals quit tobacco smoking (Høidrup *et al.* 2000).

2.8.7 Alcohol Consumption

Current research conducted by Kim *et al.* (2013) suggested that the portions of the elderly population who consume alcohol on a regular basis are less likely to suffer from chronic pain than those who do not consume alcohol. Excessive alcohol consumption weakens the immune system and places the elderly at risk of severe bacterial infections (Lu *et al*. 2010). The amount of alcohol consumed should be low to moderate. It has been proven effective in the reduction of pain and an increase in the quality in life in those who consume alcohol, when compared to those who do not (Kim *et al*. 2013). Lu *et al*. (2010) and Maxwell *et al.* (2010) stated that moderate alcohol consumption possibly decreases the risk of the development, progression and severity of RA, and that those that consume alcohol potentially reduce inflammatory markers. Although there may be a decrease in pain with the consumption of low to moderate alcohol, the mechanism behind the decrease in pain is not well understood (Lu *et al*. 2010).

2.9 FACTORS ASSOCIATED WITH MUSCULOSKELETAL PAIN

2.9.1 Falls

Falling is the main cause of accidental death in the elderly population. The elderly who display symptoms of frailty are more prone to falls, due to the loss of muscle mass, impaired balance and loss of weight, which also exacerbates the decrease in muscle mass. This leads to a poor fall prognosis, functional decline, disability and difficulty coping with the consequences of surgery (Pi *et al*. 2015). A third of the elderly population who experience falls develop a fear of falling, leading to a further decline functionality (de Villiers and Kalula 2015). Falls amongst the elderly population area major public health dilemma and can lead to irreversible health, social and psychological consequences, which may place a large economic burden on the individual.

More than one third of the elderly population experience falls each year and half of those falls are recurrent. Due to the growth rate of the elderly population, the number of fall occurrences will continue to increase, leading to a rise in medical costs (Alekna *et al.* 2015). Therefore, fall prevention is critical when considering the elderly and musculoskeletal pain. Risk factors, such as impaired mental status, medication usage, unsuitable environments, poor vision, weakness and impairments in balance, need to be considered when creating prevention strategies. Physical therapy, vitamin D supplementation, and improved gait and balance have all been shown to reduce the risk of falls, which is in the scope of chiropractic (Dougherty *et al*. 2012).

2.9.2 Blood Pressure

Hypertension is very common in the elderly population, affecting both men and women. Women over the age of 65 tend to be significantly more at risk of developing hypertension, with the severity increasing as they advance in age. Almost half (48.8%) of women, aged 60 to 79 years, are either being treated for hypertension or have stage two hypertension (Lionakis *et al.* 2012). The American Heart Association (2018) describes stage two hypertension as having a systolic blood pressure between 140 and 159mmHg, and a diastolic blood pressure between 90 and 99mmHg.

Verdecchia *et al.* (2010) proposed that there is a direct link between individuals diagnosed with OA, and those experiencing concomitant hypertension. In the United States, 40% of individuals suffering from OA have been diagnosed with concomitant hypertension. The link between OA and hypertension may be by virtue of the use of non-steroidal anti-inflammatories (NSAIDs) and cyclooxygenase-2 (COX-2) inhibitors. The mechanism through which NSAIDs and COX-2 inhibitors increase blood pressure is not completely identified yet, but studies have proposed that they may cause vasoconstriction and an anti-natriuretic effect (Morgan, Anderson and Bertram 2000).The use of NSAIDs inhibits cyclooxygenase, which reduces the production of prostaglandins, which has a vasodilating effect.

A decrease in prostaglandin production also causes a decrease in renal blood flow and glomerula filtration rate, leading to increased levels in urea and creatinine. The increase in chloride absorption is linked to consequent sodium retention, oedema and resultant hypertension, and, lastly, the effect of antidiuretic hormone is exaggerated due to the reduced production of prostaglandins, resulting in water retention (Verdecchia *et al.* 2010). A study conducted in the United Kingdom reported that individuals using NSAIDs are at a 60% greater risk of developing congestive heart failure than those who do not use NSAIDs (Rodríguez and Hernández-Díaz 2003).

2.9.3 Headaches

Neck pain, and associated headaches, are considered to be a public health concern, due to them being one of the most prevalent causes of musculoskeletal pain in the general population. Studies have indicated that the high prevalence of neck pain, and associated headaches, is a primary concern for chronic pain. The elderly, living sedentary lifestyles, in fixed positions, and those who are immobile, are at a greater risk of neck pain and headaches (Smith *et al.* 2009). Cervicogenic headaches arise from the bony and soft tissue structures of the neck. The pain is

referred from either muscular, neurogenic, osseous, articular or vascular structures in the neck (Biondi 2005).

Intervertebral disc degeneration in the elderly population is believed to be the precursor to degenerative changes in the spine, including osteophyte formation, disc narrowing and spinal stenosis (Ahn *et al.* 2009). Disc degeneration is considered to be one of the causes of neck pain in the elderly (Teraguchi *et al.* 2014). According to the research conducted by Matsumoto *et al.* (1998), on the elderly population aged 60 years and older in Japan, the prevalence of disc degeneration in the cervical spine is as great as 86% in the male population and 89% among elderly females. Delfini *et al.* (2000) stated that between 25% and 40% of individuals with cervical spine degeneration develop cervicogenic headaches.

2.9.4 Medication

The elderly population develop a greater need for medication as they age (Robb *et al.* 2017). Medication is commonly used in the treatment of musculoskeletal pain in the elderly. The medication that the elderly use as treatment is often overprescribed, leading to adverse effects. The elderly generally have a low metabolic rate, therefore, the use of concurrent medication leads to adverse effects (Soares, Sundin and Grossi 2004). Polypharmacy in the elderly population has been associated with falls, hip fractures and confusion (Robb *et al.* 2017).

Non-steroidal anti-inflammatory drugs (NSAIDs) are one of the most frequently prescribed, and used, drugs by patients 65 years of age, or older, to alleviate pain associated with degenerative and inflammatory diseases. Approximately 40% of citizens aged 65 years or older in the United States have at least one prescription a year for the use of NSAIDs, and at least 13% of the population are taking a NSAID prescription daily (Ray *et al.* 2001). Paracetamol is recommended as the initial pharmacological treatment to alleviate pain symptoms, followed by NSAID therapy (Taylor *et al.* 2013). Non-steroidal anti-inflammatories have been proven to be effective in decreasing the pain the elderly experience with OA and RA, however, it is the adverse effects of chronic NSAID use that is of concern (Loza 2008).

Theongoing use of paracetamol or ibuprofen for chronic pain caused by osteoarthritis is found to be favourable in only half of the people taking them (Doherty *et al.* 2011), while according to the observational study conducted by Conaghan *et al.* (2014), more than half of patients using physician prescribed medication for the treatment of knee pain had inadequate pain relief. Medication proves effective for acute short term musculoskeletal pain, but less effective in long term chronic pain relief (Moore *et al.* 2015).

The use of NSAIDs increases the risk of developing gastrointestinal toxicity by five times. It also leads to direct damage of the digestive mucosa, inhibition of protective prostaglandins and increases bleeding time (Loza 2008). There is a fourfold increased risk of death from gastrointestinal bleeding due to chronic NSAID use (Ray *et al.* 2001). Gastroduodenal ulcers have been described as being most prevalent in the 70 to 79 year age category. The risk of gastrointestinal toxicity can be reduced with the use of gastric protection drugs when using NSAIDS as treatment for pain. NSAIDs have also been associated with renal alterations, causing changes in the glomerular filtration rate, and changes in blood pressure in the elderly. Non-steroidal anti-inflammatories may not be the only cause of toxicity however, as polypharmacy is highly prevalent in the elderly population, and other drugs can influence toxicity (Loza 2008).

In a study conducted by Taylor *et al.* (2013), across three European countries, patients from Spain, Germany and the United Kingdom reported on the efficacy of NSAIDs in the treatment of OA. Of the participants with mild OA progression, 31% were dissatisfied with the use of NSAIDs for disease control, but this figure increased to 60% in those patients with moderate to severe OA. Although dissatisfaction may be linked to a non-patient compliance, alternative treatment options still need to be considered for medical professionals to successfully control OA (Taylor *et al.* 2013).

It is commonly known that individuals using corticosteroid treatment are at a greater risk of developing OP. This is particularly prevalent in the 65 to 85 years of age category. Individuals using corticosteroids in this age category are significantly associated with hip fractures. The risk of developing OP and hip fractures is directly proportional to the dosage of corticosteroids and the period of time for which the drug is used. High dosages, for periods of greater, than three months, place the elderly at greater risk (Lai, Lin and Liao 2017).The results from a trial conducted by Carette *et al.* (1991) propounded that cortisone injections for chronic low back pain had minimal efficacy. Only one in five of the study participants experienced sustained low back pain relief six months after the corticosteroid injection.

Polypharmacy is a concern in the elderly, specifically in people 65 years of age and older. The elderly population have greater hospital admission rates because of adverse drug reactions and drug-drug reactions. Current research has demonstrated that potentially inappropriate medication is being prescribed to the elderly, between 22.5% and 28.4% of the time, in primary medical care settings. This is exacerbated by the use of over-the-counter self-medication by the elderly population. Caution needs to be taken when prescribing medication to the elderly.

Pharmacokinetics and pharmacodynamics change as one ages. Pharmaceutical drugs remain in the metabolic system for longer periods of time in the elderly population. Renal metabolism, clearance and the first pass effect of the liver are slower in the elderly, when compared to the younger population. This needs to be considered before drug prescription (Voigt *et al.* 2016).

2.10 IMPACT OF MUSCULOSKELETAL PAIN ONTHE ELDERLY

Musculoskeletal pain is one of the most common reasons the elderly population have a reduced quality of life and seek medical attention. The increase in life expectancy does not have meaning if the elderly have a poor quality of life. Musculoskeletal pain that is left untreated becomes chronic pain and chronic pain leads to long term disability in the elderly population (Cicekci *et al.* 2017). More than half of the elderly aged, 85 years and older, have limited mobility, a reduced energy intake and multiple co-morbidities, which is followed by frailty and disability (Niemela *et al*. 2011). The elderly suffering from arthritis, or other musculoskeletal pain, are two to three times more likely to suffer from depression or anxiety than the general elderly population. The elderly who complain of musculoskeletal pain at multiple sites have four times the risk of developing anxiety or depression when compared to individuals without pain (Rzewuska *et al.* 2015).

Low back pain and OA in the elderly result in a loss of physical ability, social function, decreased leisure activity and reduced quality of life. Chronic pain and the associated decreased physical activity becomes a vicious cycle, with a lack of physical activity being a risk factor for pain in the elderly. The chronic pain and immobility affects elderly people's ability to perform their normal ADL, resulting in dependence on family and health care givers. This places an additional financial burden not only on the individual, but on the families (Iloh *et al.* 2013). Untreated musculoskeletal pain disrupts sleep patterns, inhibits daily routines, decreases mobility and diminishes the quality of life of the elderly (Brown *et al*. 2011). The quality of life in the elderly is preserved by maintaining the ability to perform daily activities and remaining independent for as long as possible (Nickel *et al*. 2006).

2.11 TREATMENT OF MUSCULOSKELETAL PAIN IN THE ELDERLY

Of all the research reports published each year, less than 1% of them have focused on the pain that the elderly population experience. The understanding of the pain experienced, and the assessment and management strategies of this pain, is therefore limited (Edeer and Tuna 2012). According to Podichetty *et al.* (2003), in the United States, it has been well researched that effective pharmacological and non-pharmacological treatment plans are readily available, however, there remains inadequate management of pain, especially in the elderly population.

The increasing rate of surgical treatment for musculoskeletal pain in the elderly population is of concern. Amongst the Medicare (American federal health insurance for people 65 or older)population in the United States, the amount of total joint replacement surgical procedures for hip and knee arthritis increased more than two fold between 1988 and 1997, while the rate of spinal surgery in the same population increased by 57%. The drastic increase in surgical treatment for musculoskeletal pain in the elderly emphasises the healthcare concern in the elderly and need for effective management strategies (Podichetty, Mazanec and Biscup 2003).

There are a variety of therapeutic interventional therapies used in order to control the pain the elderly experience, such as neural blocks, minimally invasive procedures, epidural injections, facet joint interventions and sympathetic nerve blocks. There remains a lack of quality medical literature on the effectiveness of therapeutic interventional therapies on the elderly population.

Pharmacotherapy is the most commonly used treatment method in the management of musculoskeletal pain in the elderly (Abdulla *et al.* 2013). Musculoskeletal pain in the elderly can be relieved with the use of medication, however, the primary goal is the prevention of musculoskeletal pain, and the risk of developing musculoskeletal pain. Early diagnosis and structured treatment procedures, including musculoskeletal health education and counselling, would make prevention and treatment of musculoskeletal pain more efficient. The early prevention of musculoskeletal pain increases the quality of life in the elderly, their ability to perform usual ADL, and minimise the risk of financial burdens, polypharmacy, depression and frailty (Iloh *et al.* 2013).

A multidisciplinary approach, that includes both pharmacological and non-pharmacological management strategies, in the elderly, is effective in managing chronic pain (Edeer and Tuna 2012). Non-pharmacological treatment plans include physical therapy; occupational therapy; electrical modalities (e.g. transcutaneous electrical nerve stimulation and interferential therapy); acupuncture; education and exercise programmes (Podichetty, Mazanec and Biscup

2003). The application of two treatment strategies at once, such as a combination of acupuncture and the transcutaneous electrical nerve stimulation modality, has been proven successful in providing greater pain relief, when compared to using each method separately (Abdulla *et al.* 2013).

Physical therapy in the elderly population has been proven effective in correcting joint malalignments, correcting muscle imbalances and reducing stress, and enhancing the shock absorption ability of joints and tissue. It is important to consider the contraindications with which the elderly present when selecting a treatment method (Edeer and Tuna 2012). Occupational therapy is important for focusing on the everyday practices of the elderly. Minor modifications to the living environment, to increase safety and quality of life in the elderly, such as handrails and better lighting, can reduce injury risk and increase independence (Podichetty, Mazanec and Biscup 2003).

It is important to focus on maintaining an appropriate level of physical activity in the elderly. Reduced physical function in the elderly leads to a decrease in the ability to perform ADL and an increases a fear of falling. Treatment plans should include easing the patient's pain, improving physical capability and mobility, reducing his or her fear of falling and a continuous rehabilitation programme (Takemasa *et al.* 2015). The elderly who complain of musculoskeletal pain may benefit from remaining active for a reduction in pain to occur. Physical activities such as walking, moderate aerobics, water aerobics and cycling have shown positive effects in reducing the amount of pain experienced. The benefits of activity include a decrease in stiffness, lubrication of joints, improved fitness and release of endorphins (Brown *et al*. 2011).

There is a positive association between physical activity and quality of life in the elderly. It is of great importance for physical therapists to promote physical activity amongst the elderly population, especially in old age homes. Participation in physical activities enhances independence, ability to perform activities of daily living, and result in mental and physical well-being (Ramocha, Louw and Tshabalala 2017).

Chiropractic care involves many different types of interventions, including prevention strategies for musculoskeletal pain (Dougherty *et al*. 2012). Chiropractors are capable of utilising a wide range of treatment methods that focus on the patient as a whole and not only on the musculoskeletal condition with which the patient presents. The treatment consists of conservative therapies that can be applied to minimise musculoskeletal pain. These therapies include spinal manipulative therapy, modalities, exercise, nutritional counselling, dry needling

and fall prevention strategies (Boghozian 2015). According to Edeer and Tuna (2012), manipulation and mobilisation, combined with exercise, is effective in reducing pain.

Management needs to be structured to fulfil the needs of the elderly and it is important to distinguish between the psychological and physical causes of musculoskeletal pain, so that the cause of the pain, rather than the site of the pain alone, can be managed effectively (Woo, Leung and Lau 2009). The improvement in healthcare practitioners' knowledge related to the assessment, impact, and the treatment of pain in the elderly is important in enhancing their quality of life (Edeer and Tuna 2012).

2.12 SUMMARY

As described by Edeer and Tuna (2012), there is a high prevalence of chronic musculoskeletal pain in the elderly population, however, this prevalence is yet to be accurately defined. The impact of musculoskeletal pain on the elderly, and the significant decrease in quality of life, is going to become more deleterious with the continuous rise in life expectancy (Woolf and Pfleger 2003). The continued growth in the elderly population, and number of persons visiting primary healthcare practitioners, makes it important to be able to understand the risk factors, complaints, impact of musculoskeletal pain and appropriate management in order to increase independence and quality of life in the elderly in the future (Dougherty *et al*. 2012).

CHAPTER 3

METHODOLOGY

3.1 STUDY DESIGN

The research was in a quantitative paradigm, using a descriptive, cross sectional survey to obtain data from the elderly population, living in a selected elderly care facility.

3.2 STUDY POPULATION

According to the United Nations (UN), the elderly are described as any persons 60 years of age and older. The selected elderly care facility accepts individuals from 60 years and older, therefore the study population will include persons aged 60 years and older residing within the selected elderly care facility in KwaZulu-Natal.

3.3 STUDY LOCATION

The researcher approached the head of The Association for the Aged (TAFTA) in KwaZulu-Natal for permission to conduct the study at their premises (Appendix A). TAFTA is a registered non-profit organisation, offering multiple types of care and accommodation, including, but not limited to, sheltered housing, wellness centres, frail care, dementia care, outreach, awareness and educational programmes for the aged, to alleviate distress and promote welfare. At the time of the study, TAFTA had 11 elderly care facilities in KwaZulu-Natal.

3.4 SAMPLING

A stratified random sampling, using probability proportional to size methods, was used to sample the population. Once permission was granted for the study to be conducted at the selected elderly care facilities (Appendix A), the elderly population within the care facility were randomly sampled from lists of the residents, in the same proportion as the population (**Table 3.1**). The residents at each TAFTA building were advised by their supervisor that research would be conducted in their building by a student and the time the researcher would arrive. The

residents met in a common room and all willing participants were allowed to take part in the questionnaire. There was no selection bias.

Four homes, with a total population of approximately 731 individuals, which includes 75 frail care individuals, constituted the population of interest. In order to determine the minimum sample size required from this population, it was assumed that the prevalence of MS pain was in 50% of the population. With an error of 5%, a sample of *n*=302 people from this finite population was required (Esterhuizen 2017).

Table 3.1 Study population sample size required from each of the TAFTA facilities

Home	Population size	Proportion	Sample	Rounded off
Tafta on Ridge	148 - 42 (frail care) = 106	0.1615853659	48.79878049	49
John Conradie House	120 – 33 (frail care) = 87	0.1326219512	40.05182927	40
Kings Hall	203	0.3094512195	93.45426829	93
Tafta Lodge	260	0.3963414634	119.695122	120
Total	656	1	302	302

3.5 SAMPLE CHARACTERISTICS

3.5.1 Inclusion Criteria

- Participants were required to be 60 years of age and older.
- Completion of a letter of information (Appendix B) and informed consent form (Appendix C) by the participant.
- Participants were required to be residing within one of the TAFTA buildings.

3.5.2 Exclusion Criteria

- The elderly within the frail care facilities.

3.6 MEASUREMENT TOOL

3.6.1 Questionnaire Development

The research measurement tool was a descriptive, cross sectional survey to obtain data from the elderly population living within the TAFTA organisation. After questionnaire development, and upon approval of the study by the Institutional Research Ethics Committee, an expert group and a pilot study were conducted to determine the face validity of the questionnaire.

The pre-pilot questionnaire (Appendix D) was constructed based on the McCaffrey Initial Pain Assessment tool (McCaffery and Pasero 1999). The pre-pilot questionnaire (Appendix D) consisted of two sections, i.e. section A and B. The questions in section A addressed the demographics, social history including risk factors such as exercise, sleep, stress, smoking and alcohol and factors associated with musculoskeletal pain such as medication and blood pressure and medical history of the participant. Section B focussed on the musculoskeletal pain history, and the musculoskeletal pain characteristics, viz. location, intensity, character of pain, aggravating factors, relieving factors and the effects of the pain.

3.7 RESEARCH TOOL

3.7.1 Expert Group

An expert group can be defined as ”A group of interacting individuals having some common interest or characteristics, brought together by a moderator, who uses the group and its interaction as a way to gain information about a specific or focused issue” (Marczak and Sewell n.d.). Expert groups conduct reviews in the early stages of the questionnaire formulation to help with the structuring and the development of the questions. The expert group was composed of individuals who evaluated the questionnaire (Appendix D) for potential problems, and misunderstandings, before conducting the study. There was a structured discussion with regards to each question, and the errors and/or inconsistencies that were noted in the questionnaire (Appendix D) were corrected (Brancato *et al*. 2006). All members of the expert group were given a letter of information and informed consent (Appendix E) and a code of conduct (Appendix F). The pilot study questionnaire (Appendix G) was developed and structured based on corrections and recommendations the expert group advised during the evaluation.

3.7.2 Procedure for the Expert Group

The researcher contacted potential participants who were interested and willing to participate in the expert group meeting. The researcher sent the details regarding location, time and the expected duration of the expert group meeting to all these participants. Upon arrival, the researcher welcomed all the participants and before commencement of the meeting, the researcher indicated that all procedures from that point forward were video recorded. The participants were thereafter asked to read and sign the letter of information and informed consent (Appendix E) and the code of conduct (Appendix F). The participants were free to ask questions or voice concerns they may have had prior to the completion of the documents. Upon completion, all the documents were collected by the researcher. The researcher informed the participants that at any point a participant may ask a question or raise a concern with regards to the research or procedure of the meeting and that all comments are equally valid. All comments were discussed amongst the participants and a unanimous decision during the discussion was required to make a change to the questionnaire. The researcher took notes on all comments and recommendations made during the expert group meeting. Once the expert group meeting had been completed and all discussions agreed upon, the participants of the expert group were thanked and offered refreshments.

3.7.3 Inclusion Criteria for Expert Group

- The participants included the researcher, research supervisor and the research assistant.
- Two Chiropractic students, currently completing their Masters degrees at the Durban University of Technology.
- A person proficient in the research field.
- An elderly participant.
- Participants who read and signed the letter of information and informed consent (Appendix E) and code of conduct (Appendix F)

3.7.4 Pilot Study

The pilot study would typically be conducted once the questionnaire (Appendix G) had been developed and critiqued by the focus group. The objective would be to determine how the questions would be perceived and understood by members of the population, who were similar in age to the study population (Brancato *et a*l. 2006).

The pilot study was conducted on five, selected, elderly participants, after provisional ethical approval was granted for the study. The selected participants were required to read and complete the proposed letter of information (Appendix B), informed consent (Appendix C) and the questionnaire (Appendix G). The researcher was present to answer any questions the participants may have had. Once completed, final alterations were made to the questionnaire.

3.7.5 Inclusion Criteria for Pilot Study

- Participants were required to be 60 years of age and older.
- Completion of a letter of information (Appendix B) and informed consent form (Appendix C) by the participant.

3.7.6 Exclusion Criteria for Pilot Study

- Any participants unwilling to sign the required documents for the pilot study, which would indicate that they were willing and participating voluntarily.

3.7.7 Main Study

Once the Institutional Research Ethics Committee (IREC) approved the study (Appendix H), and TAFTA had granted permission (Appendix A) for the study to be conducted, the researcher administered the questionnaires (Appendix I) to the participants who met the inclusion criteria, on the same day that they had read and completed the letter of information (Appendix B) and informed consent (Appendix C).

Due to the study being conducted at numerous TAFTA buildings, not all questionnaires were completed within one day, and this resulted in numerous trips to the TAFTA building locations. The researcher had a research assistant, a DUT Chiropractic Master's student, who was present at all times to assist the researcher during data collection. The research assistant was trained and required to sign a letter of agreement (Appendix J). The assistant was present on each of these days to give the participants a verbal explanation of the procedure, the letter of information (Appendix B), the letter of informed consent (Appendix C) and the questionnaire (Appendix I). The researcher and the research assistant remained present to read the questions to any participants unable to read, or no longer able to read, and answer any queries or concerns the participants may have had throughout the process.

The participants were not required to use any personal information. The letter of information and letter of informed consent were handed back to the researcher on the same day once they

had been completed. The completed informed consent forms and completed questionnaires were placed into two separate ballet boxes, to ensure that questionnaires could not be linked to participants. This served to maintain confidentiality and anonymity in the study. All completed questionnaires were analysed by only the researcher and the statistician. The number issued to the participant's questionnaire was used on the data sheet to maintain confidentiality.

3.8 ETHICAL CONSIDERATIONS

- The participants were not asked to use any personal information; all questionnaires were coded to ensure confidentiality. The collected research data would be kept safely in the Chiropractic programme for a period of five years, after which, it would be shredded.
- Permission was obtained from the TAFTA organisation (Appendix A), and every participant by means of a letter of information (Appendix B) and informed consent (Appendix C).
- Participation in the study was voluntary and no coercion was used.
- To ensure the ethical principle of autonomy, each participant was required to read a letter of information that they kept (Appendix B) and complete a letter of informed consent (Appendix C) which was collected by the researcher.
- If at any point while answering the questionnaire, the participant felt discomfort in answering certain questions, they were free to withdraw from the study without prejudice.
- There were no risks involved in completing the questionnaire and the participants were not harmed.
- There was no discrimination in terms of race and gender. All participants who met the study inclusion criteria were asked to participate in the study.
- Participation in the study was voluntary and no remuneration was awarded to the participants. In the future the study would indirectly benefit the elderly suffering from musculoskeletal pain, due to the research helping medical professionals to create efficient management plans, and directly benefit the elderly participants at the TAFTA buildings, through three options given to the TAFTA CLASS committee as stated in question 27 in the ethical checklist (a presentation, a wellness day or reduced fees at

the DUT Chiropractic Day Clinic) to choose from. This result related to research beneficence.

3.9 DATA ANALYSIS

The latest version of SPSS (version 24) was used to analyse the data. Descriptive and inferential statistics were utilised, with a level of significance of less than 0.05. The prevalence of musculoskeletal pain and the characterisation of the risk factors were initially described using frequencies, and percentages with 95% confidence intervals. Continuous variables were described, using means and standard deviations, if normally distributed, and non-parametric methods, if not normally distributed. In order to assess the associations between risk factors and musculoskeletal pain, bivariate analysis was used, which entailed Pearson's chi square tests for categorical risk factors, and t-tests for continuous variables. Multiple logistic regression analysis was used to arrive at a final risk factor set, which was adjusted for the effect of confounding. Odds ratios and 95% confidence intervals were reported. The point and lifetime prevalence of musculoskeletal pain in the elderly population was determined with specific questions within the questionnaire. The number of participants answering yes to these questions was divided by the total number of elderly participants who participated in the study to determine the percentage of point and lifetime prevalence of musculoskeletal pain in the elderly (Esterhuizen 2017).

CHAPTER 4

RESULTS

Chapter four presents information on the results obtained from the questionnaire utilised in this study.

4.1 SAMPLE SIZE AND RESPONSE RATE

The total sample size required for this study was a minimum of 302 participants. A total of 302 questionnaires were handed out to willing participants, and all questionnaires were returned. This ensured the response rate was 100%. All 302 questionnaires were analysed for statistical purposes.

4.2 DEMOGRAPHICS

The elderly participants in this study were required to be 60 years of age or older, and had to reside in one of the four TAFTA buildings chosen to conduct the study.

A total of 76 (25.2%) participants were between 60 to 69 years of age; 143 (47.5%) were between 70 to 79 years of age, and 82 (27.2%) were older than 80 years of age (**Table 4.1**).

Table 4.1: Study participants described by age

		Count	Percentage (%)
Age	60-69	76	25.2%
	70-79	143	47.5%
	>=80	82	27.2%
	Total	301	100.0%

Of the 302 elderly participants who participated in the study, 236 (78.4%) were female and 65 (21.6%) were male. The ratio was approximately four female participants for every male participant (**Table 4.2**).

Table 4.2: Study participants described by gender

		Count	Percentage (%)
Gender	Female	236	78.1%
	Male	66	21.9%
	Total	302	100.0%

The ethnicity of the total population was described as follows: 141 (46.7%) of the total population were White, 135 (44.7%) were Indian, 18 (6.0%) were Coloured and eight (2.6%) were Black (**Table 4.3**).

Table 4.3: Study participants described by ethnicity

		Count	Percentage (%)
Ethnicity	Black	8	2.6%
	Coloured	18	6.0%
	Indian	135	44.7%
	White	141	46.7%
	Total	302	100.0%

4.3 THE PREVALENCE OF MUSCULOSKELETAL PAIN

Musculoskeletal pain was experienced by 260 (86.1%) of the study participants at some stage of their life, while 42 (13.9%) of the participants have never experienced musculoskeletal pain before. Thus, the prevalence of lifetime pain in the study population was 86.1% (**Table 4.4**).

Table 4.4: Lifetime prevalence of musculoskeletal pain

		Frequency	Percent
Lifetime prevalence	yes	260	86.1
	no	42	13.9
	Total	302	100.0

Of the 302 participants, 239 (79.1%) were currently suffering with musculoskeletal pain while 63 (20.9%) were not suffering from any pain. Therefore, the point prevalence of current musculoskeletal pain was 79.1% (**Table 4.5**).

Table 4.5: Participants currently suffering with musculoskeletal pain

		Frequency	Percent
Current pain	yes	239	79.1
	no	63	20.9
	Total	302	100.0

4.4 THE ASSOCIATION BETWEEN POINT PREVALENCE OF MUSCULOSKELETAL PAIN AND SELECTED RISK FACTORS

Females were significantly more likely than males to suffer from current musculoskeletal pain (p=0.022). The female study population revealed that 194 (82.2%) of them were currently suffering from musculoskeletal pain, while 45 (69.2%) of the male population currently had musculoskeletal pain (**Table 4.6**).

Table 4.6: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and gender

Cross tabulation					
			Current musculoskeletal pain		Total
			Yes	No	
Gender	Female	Count	194	42	236
		Percentage (%)	82.2%	17.8%	100.0%
	Male	Count	45	20	65
		Percentage (%)	69.2%	30.8%	100.0%
Total		Count	239	62	301
		Percentage (%)	79.4%	20.6%	100.0%

There was a statistically significant association between hours slept per day and current pain (p=0.018). The participants who slept for a greater amount of hours were less likely to suffer from musculoskeletal pain than those who had less sleep. The participants who currently suffered from musculoskeletal pain had a tendency to sleep less than those without pain. Of the 69 participants who had, on average, four hours of sleep per night, the majority of 63 (91.3%) of them were currently suffering from musculoskeletal pain. A lesser number (79% of the participants) who had, on average, six hours sleep per night experienced pain, and the least number (71%), who slept on average eight hours per night, experienced pain (**Table 4.7**).

Table 4.7: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and hours of sleep at night

Cross tabulation					
			Current musculoskeletal pain		Total
			yes	no	
How many hours do you sleep a day on average?	4 hours	Count	63	6	69
		Percentage (%)	91.3%	8.7%	100.0%
	6 hrs	Count	79	21	100
		Percentage (%)	79.0%	21.0%	100.0%
	8 hrs	Count	66	27	93
		Percentage (%)	71.0%	29.0%	100.0%
	>8 hrs	Count	31	9	40
		Percentage (%)	77.5%	22.5%	100.0%
Total		Count	239	63	302
		Percentage (%)	79.1%	20.9%	100.0%

There was an association between current musculoskeletal pain and difficulty sleeping (p=0.085). Of the 302 participants in the study, 149 reported difficulty sleeping, of which 124 (83.2%) of those participants claimed to suffer from musculoskeletal pain, 153 participants reported having no difficulty sleeping, and 115 (75.2%) of them suffered from current musculoskeletal pain (**Table 4.8**).

Table 4.8: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and difficulty sleeping.

Cross tabulation					
			Current musculoskeletal pain		Total
			Yes	No	
Do you currently have difficulty sleeping?	Yes	Count	124	25	149
		Percentage (%)	83.2%	16.8%	100.0%
	No	Count	115	38	153
		Percentage (%)	75.2%	24.8%	100.0%
Total		Count	239	63	302
		Percentage (%)	79.1%	20.9%	100.0%

Anxiety, stress and depression were all associated with current musculoskeletal pain. Those who were depressed had an almost four fold increased risk of current pain (p=0.004). A total of 25 participants suffered from anxiety, of which 22 (88.0%) of these participants suffered from current musculoskeletal pain, while 79.3% of people who had stress suffered with pain, and 88.8% of participants suffering from depression were currently experiencing musculoskeletal pain (**Table 4.9**).

Table 4.9: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and anxiety, stress or depression

Cross tabulation					
			Current musculoskeletal pain		Total
			Yes	No	
Are you currently receiving treatment, counselling or are on medication for anxiety, stress or depression?	anxiety	Count	22	3	25
		Percentage (%)	88.0%	12.0%	100.0%
	stress	Count	23	6	29
		Percentage (%)	79.3%	20.7%	100.0%
	depression	Count	71	9	80
		Percentage (%)	88.8%	11.3%	100.0%
	none	Count	123	45	168
		Percentage (%)	73.2%	26.8%	100.0%
Total		Count	239	63	302
		Percentage (%)	79.1%	20.9%	100.0%

Alcohol consumption was inversely associated with current musculoskeletal pain (p=0.055). The consumption of alcohol is associated with a decrease in musculoskeletal pain. The participants who did not consume alcohol were most likely to have pain, while the prevalence of musculoskeletal pain decreased in those who consumed alcohol. Of the participants who did not consume alcohol, 80.9% suffered with current musculoskeletal pain, 71.4% of participants, consuming between one and five units per day, reported having pain, and 50.0% of the participants, consuming between five and ten units per day, of alcohol were currently experiencing musculoskeletal pain (**Table 4.10**).

Table 4.10: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and alcohol consumption

Cross tabulation					
			Current musculoskeletal pain		Total
			Yes	No	
Alcohol consumption	None	Count	212	50	262
		Percentage (%)	80.9%	19.1%	100.0%
	1-5	Count	25	10	35
		Percentage (%)	71.4%	28.6%	100.0%
	5-10	Count	2	2	4
		Percentage (%)	50.0%	50.0%	100.0%
	>10	Count	0	1	1
		Percentage (%)	0.0%	100.0%	100.0%
Total		Count	239	63	302
		Percentage (%)	79.1%	20.9%	100.0%

4.5 THE POINT PREVALENCE OF MUSCULOSKELETAL PAIN AND THE ASSOCIATED FACTORS

There was a significant association between participants having another medical condition and current musculoskeletal pain (p=0.012). The participants, who had other medical conditions, were more likely to suffer from current musculoskeletal pain than those who did not. Of the 273 participants that reported having another medical condition, 221 (81.0%) of them were currently experiencing musculoskeletal pain (**Table 4.11**).

Table 4.11: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and other medical conditions

Cross tabulation					
			Current musculoskeletal pain		Total
			Yes	no	
Other medical conditions	yes	Count	221	52	273
		Percentage (%)	81.0%	19.0%	100.0%
	no	Count	17	11	28
		Percentage (%)	60.7%	39.3%	100.0%
Total		Count	238	63	301
		Percentage (%)	79.1%	20.9%	100.0%

Of the elderly participants suffering from headaches (*n*= 75), 87.2% of them were currently experiencing musculoskeletal pain, therefore, this shows a significant association between headaches and current musculoskeletal pain experienced (*p*=0.029) (**Table 4.12**).

Table 4.12: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and headaches experienced

Cross tabulation					
			Current musculoskeletal pain		Total
			Yes	no	
Headaches	0	Count	164	52	216
		Percentage (%)	75.9%	24.1%	100.0%
	1	Count	75	11	86
		Percentage (%)	87.2%	12.8%	100.0%
Total		Count	239	63	302
		Percentage (%)	79.1%	20.9%	100.0%

A total of 85% of the study population taking blood pressure medication were suffering from current musculoskeletal pain. Blood pressure medication was significantly associated with current musculoskeletal pain (p=0.001), with the use of them increasing the risk of current musculoskeletal pain by two fold (**Table 4.13**).

Table 4.13: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and the use of blood pressure medication

Cross tabulation					
			Current musculoskeletal pain		Total
			Yes	no	
Blood pressure medication	0	Count	80	35	115
		Percentage (%)	69.6%	30.4%	100.0%
	1	Count	159	28	187
		Percentage (%)	85.0%	15.0%	100.0%
Total		Count	239	63	302
		Percentage (%)	79.1%	20.9%	100.0%

The use of corticosteroids was associated with patients experiencing current musculoskeletal pain (p=0.028). Of the 52 participants using corticosteroids, n=47, 90.4% of them were suffering with current musculoskeletal pain (**Table 4.14**).

Table 4.14: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and the use of corticiosteroids

Cross tabulation

			Current musculoskeletal pain		Total
			Yes	No	
Corticosteriods	0	Count	192	58	250
		Percentage (%)	76.8%	23.2%	100.0%
	1	Count	47	5	52
		Percentage (%)	90.4%	9.6%	100.0%
Total		Count	239	63	302
		Percentage (%)	79.1%	20.9%	100.0%

Participants who had ever suffered from musculoskeletal pain before, were significantly associated with participants who were currently suffering with musculoskeletal pain (p<0.001). Participants who had suffered from past pain were at an 11 fold increased risk of having current pain. A total of 260 participants in the study reported having experienced musculoskeletal pain in the past, of which 222 (85.4%) of those participants stated that they were currently experiencing musculoskeletal pain (**Table 4.15**).

Table 4.15: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and past musculoskeletal pain experienced

Cross tabulation					
			Current musculoskeletal pain		Total
			Yes	No	
Have you ever experienced musculoskeletal pain?	yes	Count	222	38	260
		Percentage (%)	85.4%	14.6%	100.0%
	no	Count	17	25	42
		Percentage (%)	40.5%	59.5%	100.0%
Total		Count	239	63	302
		Percentage (%)	79.1%	20.9%	100.0%

The study population who had received treatment for musculoskeletal pain in the past (89.1%) were significantly more likely to be suffering with current musculoskeletal pain ($p<0.001$), than those that did not receive any treatment (69.3%) (**Table 4.16**).

Table 4.16: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and treatment received for musculoskeletal pain experienced

Cross tabulation

			Current musculoskeletal pain		Total
			yes	No	
Have you ever received treatment for your musculoskeletal pain?	yes	Count	172	21	193
		Percentage (%)	89.1%	10.9%	100.0%
	no	Count	52	23	75
		Percentage (%)	69.3%	30.7%	100.0%
Total		Count	224	44	268
		Percentage (%)	83.6%	16.4%	100.0%

The medication the participants were using, to treat the musculoskeletal pain they had experienced in the past, was significantly associated with current musculoskeletal pain (p=0.021). Non-steroidal anti-inflammatories and corticosteroid use were associated with the most risk of experiencing current musculoskeletal pain. Of the 160 participants who used NSAIDS, n=144, 90.0% of them were currently experiencing musculoskeletal pain, while 87.5% of the study participants using corticosteroids, were currently experiencing musculoskeletal pain (**Table 4.17**).

Table 4.17: Cross tabulation to demonstrate the point prevalence of musculoskeletal pain and medication used

Cross tabulation

			Current musculoskeletal pain		Total
			yes	no	
What medication have you used in the past for your musculoskeletal pain?	NSAIDS	Count	144	16	160
		Percentage (%)	90.0%	10.0%	100.0%
	Corticosteroids	Count	7	1	8
		Percentage (%)	87.5%	12.5%	100.0%
	Unknown	Count	5	4	9
		Percentage (%)	55.6%	44.4%	100.0%
	Other	Count	15	3	18
		Percentage (%)	83.3%	16.7%	100.0%
Total		Count	171	24	195
		Percentage (%)	87.7%	12.3%	100.0%

4.6 CURRENT MUSCULOSKELETAL PAIN CHARACTERISTICS

Of the 302 participants who took part in the questionnaire, 239 were currently experiencing musculoskeletal pain.

The most frequent sites for participants suffering from current musculoskeletal pain were the low back (41.4%), followed by knee (33.1%), and shoulder (20.1%) (**Table 4.18**).

Table 4.18: Location of current musculoskeletal pain experienced by the study participants

	Current MS pain	
	Count	Percentage (%)
Jaw	3	1.3%
Neck	26	10.9%
Mid back	17	7.1%
Low back	99	41.4%
Shoulder	48	20.1%
Elbow	12	5.0%
Wrist and hand	26	10.9%
Hip	23	9.6%
Knee	79	33.1%
Foot and ankle	24	10.0%

The intensity of the current musculoskeletal pain experienced by the participants was split into current pain intensity and worst pain intensity. The median current musculoskeletal pain intensity, on a scale of zero to 10, was four, while the median, worst, musculoskeletal pain intensity was seven. The percentiles indicated that 25% of the participants suffering with current musculoskeletal pain had a current pain level of less than 2.00 and a worst pain level of less than 5.00 while participants in the 75th percentile had a current pain less than 7.00 and a worst pain less than 9.00. (**Table 4.19**).

Table 4.19: Intensity of the current musculoskeletal pain experienced by the study participants

Statistics			
		Current pain	Worst pain
Count		239	239
Minimum pain experienced		0	2
Maximum pain experienced		10	10
Percentiles	Quartile		
25	1st	2.00	5.00
50	2nd	4.00	7.00
75	3rd	7.00	9.00

The character of the musculoskeletal pain, most frequently experienced by the study participants, was aching and dull, flowed by sharp pain (**Figure 4.1**).

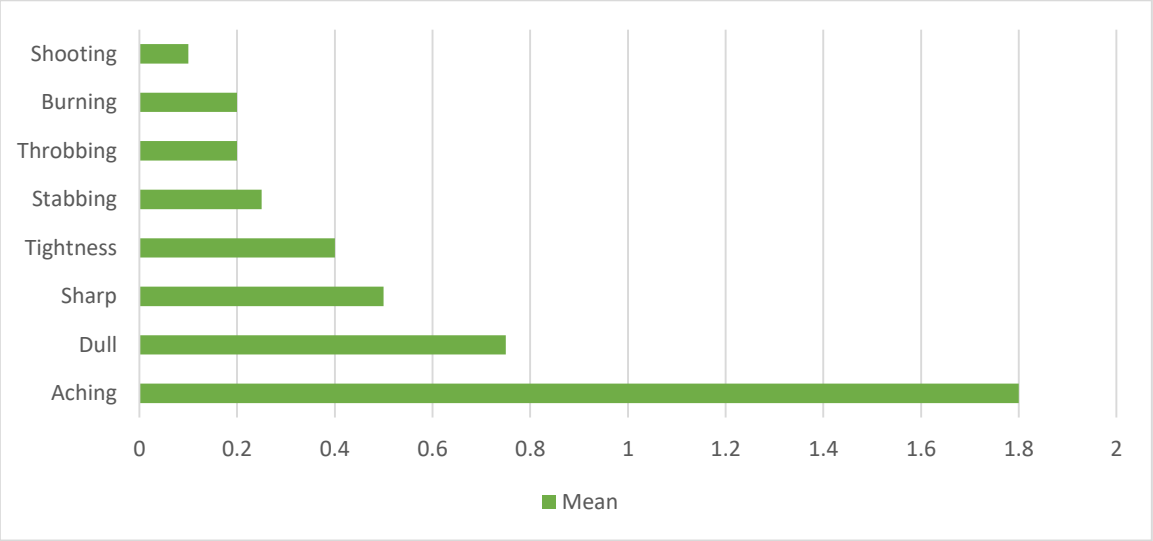

Figure 4.1: Bar graph representing the character of the current musculoskeletal pain experienced

The most common musculoskeletal pain aggravating factors experienced by the study participants, were walking, fatigue/exertion and the pain being worst in the morning (**Figure 4.2**).

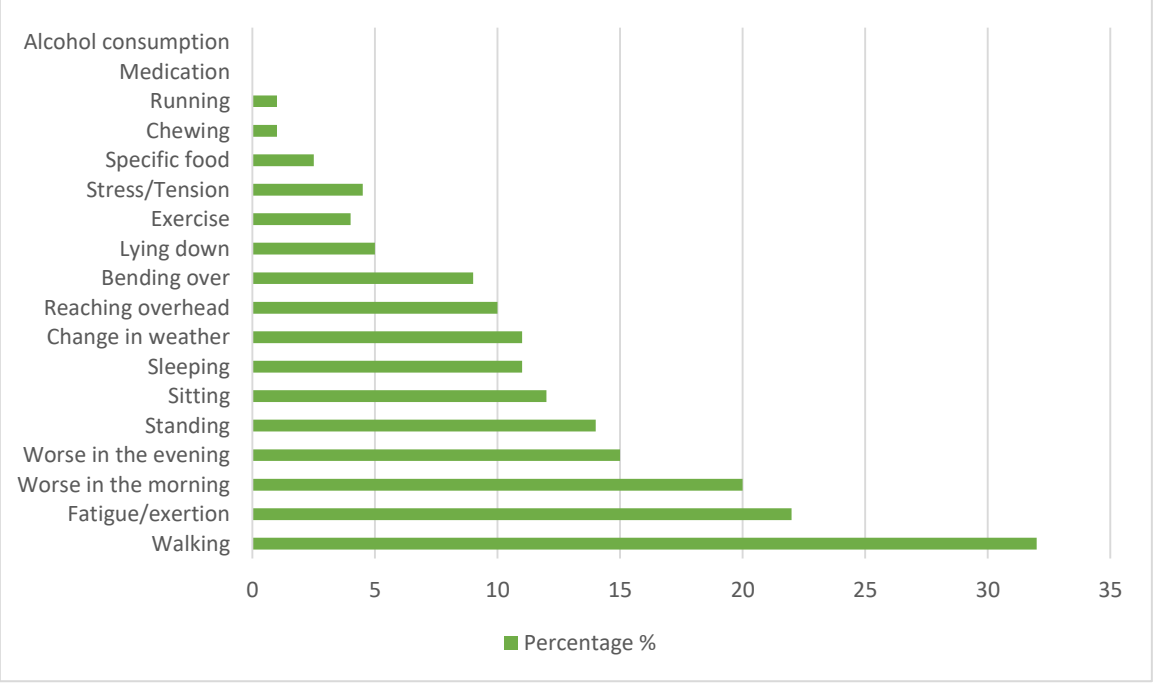

Figure 4.2: Bar graph representing the current musculoskeletal pain aggravating factors (%)

Figure 4.3 shows the most common ways used by the study participants to relieve their current musculoskeletal pain. Medication (55.6%) was the most frequent method used to relieve the pain followed by massage (23%) and heat (16.3%).

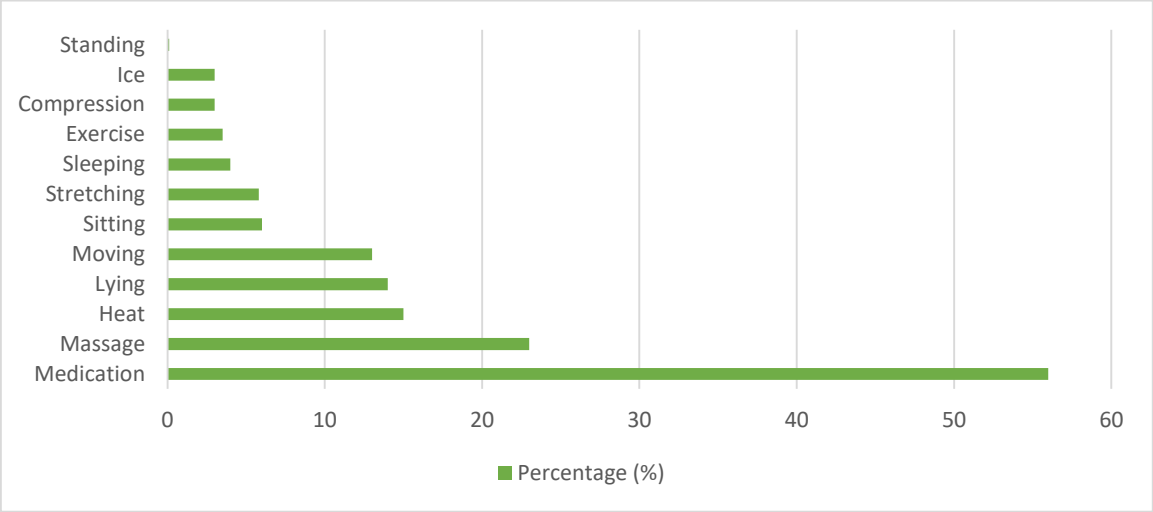

Figure 4.3: Bar graph representing the current musculoskeletal pain relieving factors (%)

The most commonly affected activities of daily living amongst the study participants, was walking, exercise and walking up/down stairs (**Figure 4.4**).

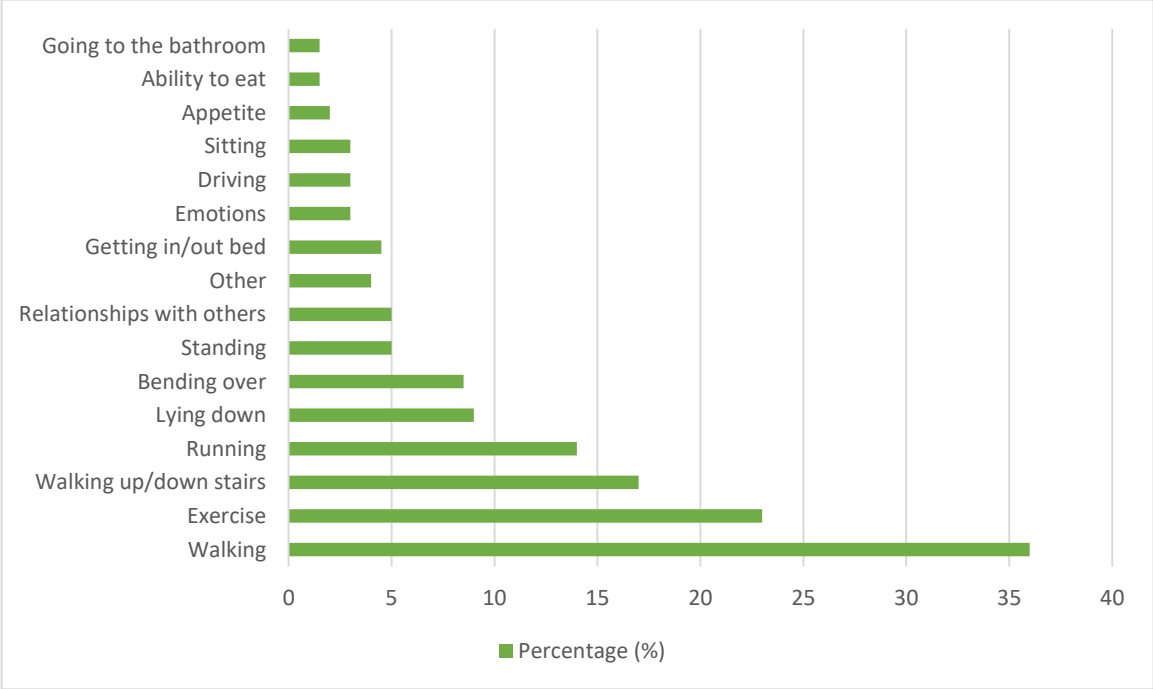

Figure 4.4: Bar graph representing the activities of daily living impacted (%)

The scale used to describe the level of the current musculoskeletal pain that affected the study participants' ADL was rated from no affect (zero), to seriously affected (10). The median impact was rated two (**Table 4.20**).

Table 4.20: The level of impact current musculoskeletal pain had on activities of daily living

Statistics		
14c		
N	Valid	239
	Missing	0
Minimum		0
Maximum		10
Percentiles	25	.00
	50	2.00
	75	6.00

4.7 SUMMARY

The significantly noted associated risk factors in this study were gender, the number of hours of slept at night, anxiety, stress and depression. Depression was the most significantly associated with an almost four fold increased risk of current musculoskeletal pain (p=0.004). Alcohol consumption was the only risk factor that was inversely associated with musculoskeletal pain. The participants who consumed alcohol were less likely to suffer from musculoskeletal pain. The factors associated with musculoskeletal pain were all significant with elderly participants previously suffering from musculoskeletal pain, those who had treatment for musculoskeletal pain and elderly participants using blood pressure medication being at the greatest risk of pain (**Table 4.21**).

Table 4.21: Risk factors and associated risk factors with musculoskeletal pain

	Pearson Chi-Square	*p*-value
Risk Factor		
Gender	5.244[a]	0.022
Hours slept at night	10.013[a]	0.018
Difficulty sleeping	2.969[a]	0.085
Anxiety, stress and depression	9.238[a]	0.026
Alcohol	7.612[a]	0.055
Associated factors		
Other medical conditions	6.285[a]	0.012
Headaches	4.743[a]	0.029
Musculoskeletal pain medication	9.719[a]	0.021
Corticosteroids	4.812[a]	0.028
Blood pressure medication	10.311[a]	0.001
Past musculoskeletal pain	44.172[a]	<0.001
Previous treatment for musculoskeletal pain	15.409[a]	<0.001

CHAPTER 5

DISCUSSION

Chapter five discusses the results that were obtained and presented in chapter four and compares them to studies of a similar nature. This includes the sample size and the response rate, the prevalence of point and period musculoskeletal pain in the elderly, associated risk factors and affected activities of daily living.

5.1 SAMPLE SIZE AND RESPONSE RATE

Four elderly care facilities in the KwaZulu-Natal region, with a total population of approximately 731, which included 75 frail care people, constituted the population of interest. The total sample size required was 302 (Esterhuizen 2017). In total, 302 questionnaires were handed out and 302 questionnaires were returned, with none discarded, making the response rate 100%. Of the 302 participants in the study, 236 (78.4%) were female and 65 (21.6%) were male, making the ratio approximately 4:1. The age categories included 76 (25.2%) participants, aged 60 to 69, 143 participants (47.5%), aged 70 to 79, and 82 participants (27.2%),who were 80 years and older.

Other studies conducted with similar population characteristics had larger sample sizes. Woo *et al*. (2009) conducted a study on musculoskeletal pain in the Chinese elderly, with 4000 participants aged 65 years and older. The study consisted of approximately 33% of participants in the 65 to 69 category, 33% were 70 to 74, and 33% were 75 years and older. A study conducted by Brown *et al.* (2011) consisted of a smaller sample size of 124 participants, of which 94 (75.8%) were female and 30 (24.2%) were male.

Approximately 60% of individuals aged 65 years and older are female, and by the year 2020,it is predicted that approximately 73% of the elderly population will be female (Helme and Gibson 2001).The gender ratio displayed in this study is considerably greater than the statistics mentioned by Helme and Gibson (2001). Of the 302 participants, 236 (78.1%) were female.

The ethnicity of the study participants from the elderly care facility included 141 (46.7%) White, 135 (44.7%) Indian, 18 (6%) Coloured, and 8 (2.6%) Black participants. Research conducted by Ramocha, Louw and Tshabalala (2017) suggested that the majority of elderly care facilities

are situated in urban areas, with the most of the occupants being White, while the majority of the Black population remain in rural areas throughout their lifetime.

The sample size of this study was not consistent with the larger sample sizes of other studies conducted, however, the size when compared to the total population of the elderly care facility in KwaZulu-Natal, and the response rate, was sufficient for the study to be statistically significant. The gender distribution of this study was consistent with the study conducted by Brown *et al.* (2011).

5.2 THE INCIDENCE AND PREVALENCE OF MUSCULOSKELETAL PAIN IN THE ELDERLY

This study served to determine the point and lifetime prevalence of musculoskeletal pain in an elderly population in an elderly care facility in the KwaZulu-Natal region. Of the 302 elderly participants (**Table 4.4**), 260 (86.1%) had experienced musculoskeletal pain at some point in their life, with only 42 (13.9%) never having experienced pain. The number of participants currently suffering with musculoskeletal pain were 239 (79.1%) (**Table 4.5**), with 63 (20.9%) currently pain free.

The results of this study are consistent and comparable to numerous other studies conducted on musculoskeletal pain in the elderly. The most comparable study is mentioned by Edeer and Tuna (2012), who expounded that approximately 80% of the elderly population, aged 60 years and above, living in nursing homes, suffer from musculoskeletal pain. The study conducted by Soares *et al.* (2004), on the elderly population aged 65 years and older, living in Sweden, found that 73% to 80% of the elderly population reported experiencing musculoskeletal pain, while research conducted on the elderly in Brazil, estimated that the prevalence of musculoskeletal pain in any location in that country reached up to 85.5% (Miranda *et al.* 2012). Brown *et al.* (2011) also found that over 75% of the 124 elderly participants from the United States in their study reported experiencing musculoskeletal pain.

Those findings are however, are inconsistent with the research conducted by Kozak-Szkopek *et al.* (2017) who found a significantly reduced incidence (42%) of musculoskeletal pain in a Polish population between the ages of 65 to69 years.

5.3 THE PREVALENCE OF MUSCULOSKELETAL PAIN AND ASSOCIATED RISK FACTORS IN THE ELDERLY

5.3.1 The Association between Gender and Musculoskeletal Pain

Musculoskeletal pain was significantly found to be more prevalent in the elderly female participants in this study. Of the 236 female participants in the study, 194 (82.2%) were currently suffering with musculoskeletal pain, while a considerably smaller number (*n*=45) (69.2%) out of the 65 males participating were currently suffering with musculoskeletal pain (**Table 4.6**). This is comparable to the research conducted by Parker and Jelsma (2010) which described musculoskeletal pain as being more prevalent in the female population living in Cape Town. According to Fillingim *et al.* (2009), women are at a greater risk of suffering from musculoskeletal pain, however, they are also more likely to utilise healthcare facilities available to them which may inaccurately reflect the clinical prevalence of musculoskeletal pain in the elderly male population.

Helme and Gibson (1999) suggested that the majority of epidemiological studies conducted on the elderly population describe females as being at greater risk of the development of musculoskeletal pain than males. The prevalence of musculoskeletal pain in females becomes even greater with an increase in age. The proposed reasons for the greater prevalence of musculoskeletal pain are a lower muscle mass, causing a greater functional limitation, and a lower bone mineral density, especially post-menopause, in the elderly female population. Women are almost twice as prevalent to develop musculoskeletal pain when compared to the male population (Woo, Leung and Lau 2009).

5.3.2 The Association between Difficulty Sleeping and the Amount of Hours Slept and Current Musculoskeletal Pain

There is a significant association (*p*=0.018) between the amount of hours slept per night and participants suffering from musculoskeletal pain (**Table 4.7**). The elderly, sleeping fewer hours per night, were more inclined to suffer with current musculoskeletal pain. Of the 69 elderly participants reporting an average of four hours of sleep per night, 63 (91.3%) of them were currently suffering with pain. This was significantly greater than the 71% of elderly participants suffering from current pain getting, on average, eight hours of sleep per night. The association between difficulty in sleeping and current musculoskeletal pain was slightly less significant, with 124 (83.2%) of the 149 participants who reported difficulty sleeping, suffering with current pain, while 75.2% of the participants, who had no difficulty sleeping, still suffered from pain (**Table**

4.8). Although the participants, who had less hours of sleep and difficulty sleeping, were more prevalent to suffer from musculoskeletal pain, it could not be established whether the lack of sleep was as a result of the pain, or the pain was a result of the lack of sleep. This is comparable to a study by Smith *et al.* (2009) which stated that sleep disturbance may occur as a result of chronic musculoskeletal pain, however, a lack of sleep may cause the elderly to perceive their pain more negatively. Baker *et al.* (2017) also mentioned that chronic musculoskeletal pain and insomnia are directly linked to one another, and both increase the risk of developing the other.

The percentage of elderly participants who have difficulty sleeping and who have current musculoskeletal pain was considerably greater (83.2%) than the estimated 70% reported by Smith *et al.* (2000). The results of this study are more comparable to Baker *et al.* (2017), who reported that there is a co-occurrence of chronic musculoskeletal pain and insomnia of up to 88% in the United Kingdom general population. Minimal sleep for three consecutive nights or more can lower the pain threshold, cause a negative mind set and somatic symptoms, which could explain the increased prevalence of pain (Baker *et al.* 2017). Sleep deprivation is caused by multiple, additional factors, such as an individual's lifestyle, poor physical fitness, chronic fatigue and attitude towards pain, disease and healthcare (Lavigne *et al.* 2011).

5.3.3 The Association between Current Musculoskeletal Pain and Anxiety, Stress and Depression

There was a significant association between individuals suffering with current musculoskeletal pain and anxiety, stress and depression (p=0.026). Of the participants who reported suffering from anxiety, 88% of them complained of current musculoskeletal pain, while 79.3% who claimed to be stressed, and 88.8% of the participants with depression, also reported pain (**Table 4.9**). The participants who reported being depressed were four times more likely to complain of current pain (p=0.004). It could not be established whether these were risk factors of current musculoskeletal pain, or occurred as a result of the pain.

The results of this study have been consistent with the research related to anxiety, stress and depression and musculoskeletal pain. According to Rzewuska *et al*. (2015), the elderly who suffer from musculoskeletal pain are two to three times more likely to develop depression or anxiety, and the elderly complaining of musculoskeletal pain at multiple sites are four times more likely to develop anxiety or depression. Stressed, elderly individuals tend to perceive their pain as greater than the severity of the pain. The stress may be associated with the development of musculoskeletal pain, but the pain the elderly experience is stress inducing and

increases the risk of depression, due to the potential loss of function and the ability to perform activities of daily living (Leino 1989).

In South Africa, Peltzer and Phaswana-Mafuya (2013) reported that co-morbidity between chronic physical diseases and depression were common, and that the elderly with chronic physical diseases were at a significantly greater risk of developing depression. The high levels of self-reported depression, in the elderly in South Africa, must be addressed because of the severe impact on physical, cognitive and social functioning.

5.3.4 The Association between Current Musculoskeletal Pain and Alcohol Consumption

The results of this study concluded that alcohol consumption was inversely related to the elderly currently suffering from musculoskeletal pain. The participants who did not consume alcohol were most likely to have pain, when compared to the participants that consumed alcohol. Of all the participants, there were 80.9% who did not consume alcohol who were suffering with current musculoskeletal pain, 71.4% of participants who consumed between one and five units reported having pain, and 50% of participants consuming between five and ten units of alcohol currently experienced musculoskeletal pain (**Table 4.10**).

These results are relatable to the study conducted by Kim *et al.* (2013) that suggested that participants who consumed alcohol on a regular basis were less likely to suffer from musculoskeletal pain than those that do not consume alcohol. Lu *et al.* (2010) and Maxwell *et al.* (2010) mentioned that moderate alcohol consumption possibly decreases the risk of development, progression and severity of rheumatoid arthritis, and that those who consumed alcohol would potentially reduce inflammatory markers such as interleukin 6.

5.3.5 The Association between Current Musculoskeletal Pain and Other Medical Conditions

There was a significant association between the elderly participants suffering with musculoskeletal pain in association with other medical conditions (p=0,012). Of the 273 elderly participants who reported having current musculoskeletal pain, 221 (81.0%) of these participants reported having another medical condition (**Table 4.11**). Headaches (p=0.029) and hypertension were the most significantly associated conditions with musculoskeletal pain. Of the 86 elderly participants who reported having headaches, 75 (87.2%) of them also suffered from musculoskeletal pain (**Table 4.12**). Hypertension and musculoskeletal pain were even

more closely related with 159 (85.0%) of the 187 elderly participants, who reported hypertension and musculoskeletal pain (**Table 4.13**).

The association between current musculoskeletal pain and headaches may be greatly related to the elderly suffering from neck pain. According to the research conducted by Matsumoto *et al.* (1998) on the elderly population aged 60 years and older in Japan, the prevalence of disc degeneration in the cervical spine is as great as 86% in the male population, and 89% among the elderly females. Biondi (2005) suggested that the high association between neck pain is a result of cervicogenic headaches (headaches that refer pain from the bony and soft tissue structures of the neck). Delfini *et al.* (2000) stated that between 25% and 40% of individuals, with cervical spine degeneration, develop associated cervicogenic headaches. The prevalence of headaches in the elderly participants suffering with current musculoskeletal pain, in this study, was significantly greater than the percentage of cervicogenic headaches mentioned by Delfini *et al.* (2000).

The significance of the association between current musculoskeletal pain and hypertension in this study was considerably greater than literature presented by Verdecchia *et al*. (2010). Although the prevalence of high blood pressure increases with an advance in age, Lionakis *et al.* (2012) discussed that there was an association between the elderly suffering from musculoskeletal pain and having concomitant hypertension. Verdecchia *et al*. (2010) described a direct link between the elderly suffering with OA and associated hypertension. In the United States, 40% of the elderly population with OA have concomitant hypertension. The mechanism of NSAIDs in the treatment of elderly with musculoskeletal pain may explain the increased risk of hypertension, as a result of their proposed vasoconstriction and anti-natriuretic effect. The use of NSAIDs inhibit cyclooxygenase, which would reduce the production of prostaglandins, which would have a vasodilating effect (Morgan, Anderson and Bertram 2000). Research conducted in the United Kingdom stated that individuals using NSAIDS were at a 60% greater risk of developing congestive cardiac failure (Rodríguez and Hernández-Díaz 2003).

5.3.6 The Association between Current Musculoskeletal Pain and Medication Used

There was an association between the medication the elderly had used in the past and the current musculoskeletal pain being experienced (p=0.021). NSAIDS and corticosteroids had the greatest association to current musculoskeletal pain. Of the 160 elderly participants using NSAIDs in the past, 144 (90%) of them were currently suffering with musculoskeletal pain, while 87.5% of the elderly participants that used corticosteroids in the past, currently had pain (**Table**

4.17). Blood pressure medication was the only medication used that had a significant association (p=0.001) with current musculoskeletal pain (**Table 4.13**). Diabetic and cholesterol medication had no association with current musculoskeletal pain.

This study has a greater percentage of musculoskeletal pain re-occurrence after the use of medication for treating pain, which is comparable with Doherty *et al.* (2011) who highlighted that ongoing use of paracetamol or ibuprofen for chronic pain caused by OA is found favourable in only half of the people taking them, while according to the observational study conducted by Conaghan *et al.* (2014), more than half of patients using physician prescribed medication for the treatment of knee pain, had inadequate pain relief. Taylor *et al.* (2013) reported on patients from three European countries, from Spain, Germany and the United Kingdom, on the efficacy of NSAIDs in the treatment of OA. Of the participants with mild OA progression, 31% were dissatisfied with the use of NSAIDs for disease control. This figure increased (60%) in those patients with moderate to severe OA. Medication proved effective for acute short-term musculoskeletal pain, but it was less effective in long-term chronic pain relief (Moore *et al.* 2015).

Medication was the most commonly used treatment method to relieve musculoskeletal pain (**Figure 4.3**). This was consistent with the statement made by Soares *et al.* (2004) that medication is the most common treatment for elderly patients suffering from musculoskeletal pain. In the United states, approximately 40% of citizens aged 65 years and older have been on NSAID prescription for a year, at least, and approximately 13% of the elderly population use them daily (Ray *et al.* 2001). Voigt *et al.* (2016) reported that potentially inappropriate medication is being prescribed to the elderly between 22.5% and 28.4% of the time in primary medical care settings. This is exacerbated by self-medicating by the elderly population using of over-the-counter medicines. The common use of medication as a treatment method potentially results in over-prescription and polypharmacy, which is associated with falls, hip fractures and confusion (Robb *et al.* 2017).

The use of corticosteroids by the elderly, between the ages of 65 to 85 years, significantly increases the risk of developing osteoporosis, especially in females. The increased risk of developing osteoporosis is significantly associated with fractures, especially hip fractures, as a result of falling, often leading to chronic pain (Lai, Lin and Liao 2017). The results from a trial conducted by Carette *et al.* (1991) suggested that cortisone injections for chronic low back pain had minimal efficacy. Only one in five of the study participants experienced sustained low back pain relief six months after the corticosteroid injection, which is comparable to the 87.5% of

participants in this study currently experiencing pain after using corticosteroids for past musculoskeletal pain experienced.

5.3.7 The Association between Current Musculoskeletal Pain and Past Musculoskeletal Pain Experienced

The elderly participants who had suffered from musculoskeletal pain in the past were significantly at risk of suffering from musculoskeletal pain in the present (p=0.001). Of the 260 elderly participants who reported experiencing past musculoskeletal pain, 222 (85.4%) of them were currently experiencing pain (**Table 4.15**). Participants having suffered from past pain were at an 11 times greater risk of experiencing pain currently.

The results of this study are comparable to a study conducted on the general population in the United Kingdom, which discovered that 79% of the general population who suffered from musculoskeletal pain then, still suffer from chronic pain four years later (Nakua *et al.* 2015). Numerous studies have reported that the risk of recurrent low back pain at three months, six months, and 12 months, is as great at 79% (Manchikanti 2000). Research by Charlton (2005) suggested an estimated 57% of the elderly reported experiencing musculoskeletal pain for one, or more years, while 40% of elderly patients who reported pain on initial assessments, report worse pain at the follow-up assessment, between two to six months after the initial test.

Many of elderly South African citizens do not seek healthcare because of a lack of finances, the belief that pain is a consequence of ageing, and/or a lack of transport or great distances to travel to the nearest medical facility, resulting in recurrent and chronic pain (Makiwane and Kwizera 2006).Although many elderly participants do not seek medical attention, the participants who had received treatment for musculoskeletal pain experienced in the past, were more likely to be suffering with current musculoskeletal pain. Of the 193 elderly participants who had had treatment for past pain, 172 (89.1%) of them later suffered from recurrent pain (**Table 4.16**).

Brown *et al.* (2011) mentioned that, although no information had been collected on which healthcare professionals, friends or caregivers the elderly participants were receiving treatment from, there was strong evidence supporting inadequate pain management. Inadequate pain management in the elderly population increases the prevalence of recurrent and chronic pain, which would lead to long-term disability and a decreased quality of life (Cicekci *et al.* 2017).

5.4 CURRENT MUSCULOSKELETAL PAIN CHARACTERISTICS

5.4.1 Current Musculoskeletal Pain Location

This study consisted of 302 elderly participants of which 239 of the participants were currently suffering from musculoskeletal pain. The three most frequent sites of pain the elderly complained about were the low back (41.4%), the knee (33.1%) and the shoulder (20.1%) (**Table 4.18**). The results are comparable to that of Woo, Leung and Lau (2009), who put forth that back pain was the most prevalent location of pain in the elderly (48%) followed by knee pain (31%) and hip pain (8.9%). Shoulder pain was the only inconsistency between the two studies. Parker and Jelsma (2010) found that the back, knees and shoulders were the most commonly affected joints in people who suffered with pain. In contrast to this study, Asghari, Ghaderi and Ashoori (2006) suggested that the most common site of pain in the elderly population in Tehran was the legs and hips, similar to Tsai *et al.* (2004) who stated that the knees and hips were the most common sites of pain in the elderly population in nursing home residents in Taiwan.

5.4.2 Intensity and Character of the Current Musculoskeletal Pain Experienced

The intensity of the current musculoskeletal pain experienced by the elderly was recorded as current pain intensity and the worst pain intensity. The scales were graded from having no pain (zero), to having severe disabling pain (10). The median current musculoskeletal pain intensity was four, while the worst median musculoskeletal pain intensity was seven (**Table 4.19**). **Figure 4.1** illustrated the most common pain characteristics being as aching and dull pain, followed by sharp pain experienced by the elderly participants. Those pain characteristics are relatable to that of Tsai *et al.* (2004), who stated that the most common description of pain in the Taiwan elderly was aching (77.6%), exhausting (27.6) and sharp (8.2%).

A study conducted by Brown *et al.* (2011) found that over 80% of the elderly participants reported their pain to be moderate to severe, while the study conducted on the Polish population by Kozak-Szkopek *et al.* (2017) stated that a high pain intensity was experienced by the elderly in the hips and the knees. Asghari, Ghaderi and Ashoori (2006)described 64% of the elderly participants living in two private nursing homes in Tehran as having had either moderate or severe pain.

5.4.3 Aggravating Factors

The most common musculoskeletal pain aggravating factors were walking (31%), fatigue (21.8%) and the pain experienced being worst in the mornings (20.1%) (**Figure 4.2**). Parker and Jelsma, (2010) found that 80% of their study participants with musculoskeletal pain, in Cape Town, reported that their pain and stiffness was worse on awakening in the morning. Cecchi *et al.* (2006) reported contrasting findings to this study, describing carrying (82%), lifting (81%) and bending over (79%) as the most common aggravating factors for low back pain in the Italian population aged 65 years and older.

5.4.4 Relieving Factors

The elderly participants used multiple ways to try relieve their pain. The most common relieving factors were medication (55.6%), massage (23%) and heat (16.3%) (**Figure 4.3**). The results of this study are comparable to the study conducted by Brown *et al.* (2011), who found that medication was the most common form of pain relief used by the elderly participants (48.1%), followed by inactivity (48.1%), and the use of heat and cold (28.3%). Exercise was reported to be effective in pain relief by 16% of the elderly participants. The research conducted in Japan by Nakamura *et al.* (2011) had different findings, noting the most common form of relief to be massage (31%), followed by medication (22%), and then physical therapy (16%).

5.4.5 Impact on Activities of Daily Living

Of the 239 elderly participants who reported experiencing current musculoskeletal pain, 58.6% of them complained of the pain affecting their ADL. Walking (35.6%), exercise (23%) and walking up or down stairs (16.3%) were reported as the most affected activities (**Figure 4.4**). In terms of the scale used to describe the level of the current musculoskeletal pain which affected the study participants, ADL was rated from no effect (zero) to seriously affected (10) (**Table 4.20**). The median impact of the pain on ADL was two.

The results are comparable to Parker and Jelsma, (2010), who explained that walking, reaching and rising were the most common activities individuals with musculoskeletal pain had difficulty performing. The majority of the study population with pain had difficulty walking up stairs. The study conducted by Brown *et al.* (2011) suggested that walking, general activity, mood, sleep and enjoyment of life were the greatest affected areas on a daily basis. According to Niemela *et al.* (2011), more than half of the elderly population, aged 85 years and older, have limited

mobility, reduced energy intake and multiple co-morbidities, impacting their ability to perform general ADL.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 CONCLUSION

The current and lifetime prevalence of musculoskeletal pain in the elderly population was extremely high. Of the 302 elderly participants in the elderly care facility in KwaZulu-Natal, 260 (86.1%) had experienced musculoskeletal pain at some stage of their life, while 239 (79.1%) were experiencing pain at the time of this study. The most common areas of pain reported by the participants were the low back (41.1%), the knee (33.1%) and the shoulder (20.1%).

The most statistically significant risk factors for musculoskeletal pain in the elderly were difficulty sleeping and the amount of hours slept per night, anxiety, stress and depression, concomitant medical conditions, medication used, and past musculoskeletal pain experienced. Although difficulty sleeping, and anxiety, stress and depression, have been mentioned as risk factors for musculoskeletal pain, it could not be determined whether these were risk factors for musculoskeletal pain experienced, or occurred as a result of musculoskeletal pain. The elderly female participants were significantly more at risk of experiencing musculoskeletal pain.

The majority of the elderly participants reported moderate pain intensity with the most common aggravating factors being walking, fatigue and pain that were worse in the mornings. Medication, massage, and the use of heat therapy, were the most common forms of pain relief used by the participants. Of the 239 elderly participants who complained of experiencing current musculoskeletal pain, 58.6% reported that the pain affected their ADL. Although the median impact was mild, the most common activities affected were walking, exercise and walking up or down stairs.

This study has added to the current literature on the prevalence, risk factors and impact of musculoskeletal pain in the elderly, and has illustrated the importance of a greater understanding of the pain the elderly experience, and the impact pain has on their daily living. The study will help medical professionals understand the psychological impact musculoskeletal pain has on the elderly and how stress, depression and anxiety as a result of musculoskeletal pain or caused by musculoskeletal pain has the ability to decrease their quality of life. The risk factors and associated factors most significantly linked to musculoskeletal pain will help health

professionals determine which patients are at risk of developing musculoskeletal pain and how to minimise musculoskeletal pain through the correct management of the risk factors. This study helps determine the effectiveness of the pain management strategies within the elderly population and describes the effectiveness of each of these strategies. The focus needs to be placed on satisfactory and effective healthcare, with patient education and rehabilitation, to enhance the quality of life and ability to function independently in the elderly population. The elderly population will directly benefit from this study because health professionals will have a greater understanding of the risk factors, impact of musculoskeletal pain and the alterations that should be made to treatment protocols to increase the quality of life in the elderly.

With regards to the hypotheses that were set at the onset of the study:

Hypothesis (H_A) 1 is accepted. The hypothesis which stated that the prevalence of musculoskeletal pain in the elderly population would be significantly associated with various risk factors.

Hypothesis (H_A) 2, which stated musculoskeletal pain has an impact on the activities of daily living in the elderly, is accepted.

6.2 LIMITATIONS

The sample size included participants who had previously been diagnosed with psychological deficits, e.g. dementia. There was difficulty in determining the mental status of each participant. The questionnaire, therefore, included a question on whether the participant had been previously been diagnosed with any psychological deficits. There was one participant who mentioned previous diagnosis of psychological deficits. Participants with psychological deficits potentially report information that is untrue which has a direct effect on the results of the study. This study was conducted in the KwaZulu-Natal urban elderly care facilities and does not include information on the musculoskeletal pain the elderly experience in the rural communities of South Africa.

The majority of the participant representation was from a white and Indian ethnic background with an under-representation of African participants. Therefore, there is a limitation in generalising the results based on ethnicity. This study design was unable to establish the association between current pain and sleep and current pain and anxiety, stress and depression. It could not be determined whether the current musculoskeletal pain occurred as

a result of these risk factors or if these factors occurred as a result of the current musculoskeletal pain.

6.3 RECOMMENDATION

This study was conducted in the buildings of an elderly care facility in KwaZulu-Natal. Future research should aim to have a larger population size and be conducted in the rural communities of South Africa in order to be able to make a comparison between those suffering with musculoskeletal pain in the rural communities and the elderly living in the urban elderly care facilities. This will create a greater ability to include a larger number of participants from each ethnic background and further investigate and understand the prevalence and burden of musculoskeletal pain in communities with limited or no access to healthcare facilities. The two separate communities have different living standards, activities of daily living, risk factors and methods of relieving pain that needs to be explored to appropriately cater for the elderly population in each community in South Africa.

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APPENDICES

Appendix A: Memorandum of agreement with TAFTA

Inspiring active ageing

MEMORANDUM OF AGREEMENT

Between
The Association for the Aged
(TAFTA)
And

Luke Fitzroy Pendock
(Full name) (Hereinafter referred as the Applicant)

Performing research on human subjects, and in particular elderly participants, is a privilege and should therefore be conducted with due regard for the highest ethical and professional standards. Researchers must be cognizant of the fragile physical and mental health status of many residents and research methodologies should reflect knowledge, sensitivity and accommodation for their general and specific health (physical, mental, emotional, spiritual, social, cultural) needs.
Primum non nocere–first, do no harm

1. **Purpose of the Agreement:**
   Whereby TAFTA (hereinafter referred as the Organization), provides research opportunity to the applicant for academic purposes in terms of the following conditions:

1.1 The purpose and scope of the research is declared in full by submission of a full research protocol.
1.2 The research bears relevance to the organization and is shown to potentially directly or indirectly benefit the organization and or its clients.
1.3 The completed research protocol is to be made available to the organization after verification by the academic institution and approval from a bona fide research ethics committee.

[redacted]

1.4 Research may only commence after Tafta's research committee reviews the requested documents-see annexure list-and provides written consent.

1.5 Consent to conduct research does not automatically equate to individual consent by clients/residents/staff of Tafta; obtaining individual written informed consent from study participants shall remain the responsibility of the researcher/s.

1.6 All persons who will be engaged in the field work will be identified to Tafta, will at all times be identifiable to staff and residents and will conduct themselves in a professional and ethical manner within Tafta premises.

1.7 All researchers conduct their research at their own risk and Tafta will not be liable for any damages or injuries sustained on Tafta's premises or inflicted by Tafta residents.

1.8 Upon completion of the project or at any relevant time during the research, researchers may be called upon to present their findings to the Tafta research or other relevant sub/committee/s.

1.9 As far as is possible, research projects should include long term and sustainable benefits for Tafta/residents. A section in your submission should position the social responsibility dimension of the planned research project. As research benefits are often futuristic, it is required that researchers discuss ways with Tafta in which their expertise can benefit residents or clients immediately.

1.10 Scientific or other publications emanating from the research conducted with Tafta may not be published without prior written consent by the Organization. Identification and or acknowledgement of TAFTA in any publication may only be done after prior informed consent from the research committee of Tafta.

1.11 Media coverage relating to the study that makes reference to Tafta or uses audio-visual material related to property/staff/clients of Tafta will require additional a priori written authorization.

1.12 No financial or other compensation will be exchanged in respect of this research study without prior written agreement.

2. Roles and Responsibilities:

2.1 Tafta agrees to make relevant resources and information required for the completion of the specified research available to the Applicant.

2.2 A minimum of six weeks is required to process/respond to requests relating to the research project.

2.3 As the staff of Tafta are otherwise engaged, minimum reliance should be placed on Tafta staff for the implementation of the project. Staff will avail themselves in a supportive capacity, at their convenience and subject to adequate advance notice.

2.4 The Applicant agrees to comply with the regulations and restrictions in regard of the Protection of Personal Information Act no.4 of 2013.

2.5 The Applicant agrees to conduct the research in an ethical manner with respect and consideration for all parties concerned and the Organizations' limited resources.

2.6 All ethical principles governing the conduct of research in general and with human subjects in particular are adhered to. In particular, the personal identities of staff and or clients/residents will remain confidential except in exceptional circumstances at which time special written consent will be obtained by mutual agreement.

3. Duration of the Agreement

This agreement will be in effect from (start date) 30/10/17 to (end date) 17/11/17 and may be updated at any time through written request. Either party can terminate the agreement with 30 days written notice.

For longer term research, periodic / 6 monthly progress reports will be required and annual renewal of permission should research be delayed.

4. This Agreement constitutes the whole Agreement in respect of this research study.

I, Luke Fitzroy Pendock

Identity Document Number 930824 5225 089

Registered to study at Durban University of Technology, student number 21208294

having read and understood the contents of this Agreement agree to accept and abide by the terms of the Agreement.

Applicant signature: [redacted] Witness [redacted]

Signed at Durban on the 25 day of October year 2017

On behalf of TAFTA:

Femada Shamam — Name

CEO — Designation

[redacted] — Signature

02.11.2017 — Date

ANNEXURES

1. Copy of research protocol
2. Copy of research ethics approval letter
3. Copy of GCP ethics certificate of all researchers who will be engaging directly with Tafta/residents
4. Contact details of at least two persons involved in the research, including that of the supervisor

[redacted]

2017 -10- 25

[redacted]

Appendix B: Letter of information to elderly participants

LETTER OF INFORMATION

Dear participant

Welcome to my study, thank you for agreeing to participate in this study

Title of the Research Study: An epidemiological investigation of musculoskeletal pain in an elderly population within a selected elderly care facility in KwaZulu-Natal

Researcher: Mr Luke Pendock (B.Tech: Chiropractic)

Supervisor: Dr Desiree Varatharajullu (M.Tech: Chiropractic)

Brief Introduction and Purpose of the Study:

The amount of the elderly people suffering with bone, joint and muscle pain (musculoskeletal pain) has not been well documented in South Africa. If musculoskeletal pain is not treated, it can disrupt sleep patterns, affect daily routines, decreases movement and reduce the quality of life of the elderly. Therefore the aim of this study is to investigate the amount of musculoskeletal pain in an elderly population within a selected elderly care facility in KwaZulu-Natal by means of a questionnaire.

Outline of the Procedures:

All willing participants who have completed the informed consent (Appendix E) are encouraged to complete the questionnaire. The questionnaire will be delivered to you by myself. The questionnaire will take approximately 10-15 minutes to complete and hand in. I will be present while you are completing the questionnaire so that any questions or queries you may have can be addressed. **You may feel free to withdraw from the study at any point, should you feel any discomfort while completing the questionnaire,**

Risks or Discomforts to the Participant:

There are no foreseeable risks or consequences due to taking part in the questionnaire. **The questionnaire may include questions relating to alcohol consumption, cigarette smoking, drug usage that will bring some of you discomfort. Those of you who no longer want to partake in the questionnaire should feel free to withdraw.**

Benefits:

Many people within the elderly population suffer from untreated musculoskeletal pain, but to date there is not a lot of research on the type of pain experienced. With your help this study can add to the research so that medical professionals can treat musculoskeletal pain more effectively and increase the quality of life in the elder population.

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

You are free to withdraw for the study at any time. However once the questionnaire is completed and placed into a sealed box it may not be reopened as this will infringe on the confidentiality of the study. Your withdrawal will not result in any negative consequences for you from the DUT Chiropractic Clinic or any of its agents.

Remuneration:

Participation in the study is voluntary and no remuneration will be awarded to you as a participant.

Costs of the Study:

There is no cost associated with participating in the study

Confidentiality:

All answers are confidential and will not be linked to your participation. The informed consent and questionnaires will be kept in separate sealed boxes as to ensure that no questionnaire can be linked to you. The questionnaire will be analysed by a statistician and all information will only be used for research purposes. After a period of 15 years the data collected will be destroyed through shredding.

Research-related Injury:

You will only be required to fill in a questionnaire and therefore there is no risk of injury.

I kindly ask for permission to proceed with the study. Before the study can take place permission needs to be given by every geriatric participant.

Your assistance is vital to the research and is greatly appreciated.

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

Head of Department: Dr. A. Docrat, Contact number: 031 373 2589.

Please contact the researcher, Luke Pendock on (079 0909561), Supervisor: Dr Desiree Varatharajullu (0313732533) or the Institutional Research Ethics administrator on 031 373 2375. Complaints can be reported to the DVC: TIP, Prof S. Moyo on (031) 373 2576 or moyos@dut.ac.za.

Appendix C: Letter of informed consent for the elderly participants

CONSENT

Statement of Agreement to Participate in the Research Study:

I hereby confirm that I have been informed by the researcher, Mr Luke Pendock, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,

I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.

I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.

In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.

I may, at any stage, without prejudice, withdraw my consent and participation in the study.

I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.

I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____ _____ _____ _____

Full Name of Participant Date Time Signature / Right Thumbprint

I, Luke Pendock herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____ _____ _____

Full Name of Researcher Date Signature

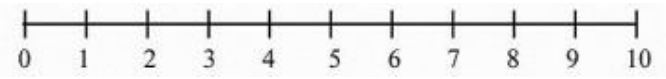
_____ _____ _____

Full Name of Witness (If applicable) Date Signature

Appendix D: Pre-pilot Questionnaire

SECTION A					
Demographics: *(Participant: Please fill in or tick where relevant)*					
a. Age:					
b. Gender:	Female		Male		
c. Race:	Black	Coloured	Indian	White	Other _____

Social History:		
2. Exercise		
a. Do you have a regular exercise programme e.g. walking, gym, exercise class?	Yes	No
b. If yes, how many days per week do you exercise?	_____days per week	
c. How long do you exercise for?	_____minutes per day	
3. Sleeping Habits		
a. How many hours do you sleep a day on average?	_____hours per day	
b. Do you currently have difficulty sleeping e.g. difficulty falling asleep, waking up during the night?	Yes	No
4. Stress		

a. Are you currently receiving treatment, counselling or are on medication for anxiety, stress or depression?	1) Anxiety	2) Depression	3) Stress	4) None
b. Do you consider yourself as being under a lot of stress (mental or physical) in the last 3 months? *(please rate your answer on the scale provided)*	 *(0=least amount of stress and 10=most amount of stress)*			

6. Smoking					
a. Do you smoke cigarettes/pipes/ cigars?	Yes		No		Ex-smoker
b. If yes, how many per day	1-5	6-10	11-15	16-20	more than 20
c. If an ex-smoker, how many years ago did you stop?					

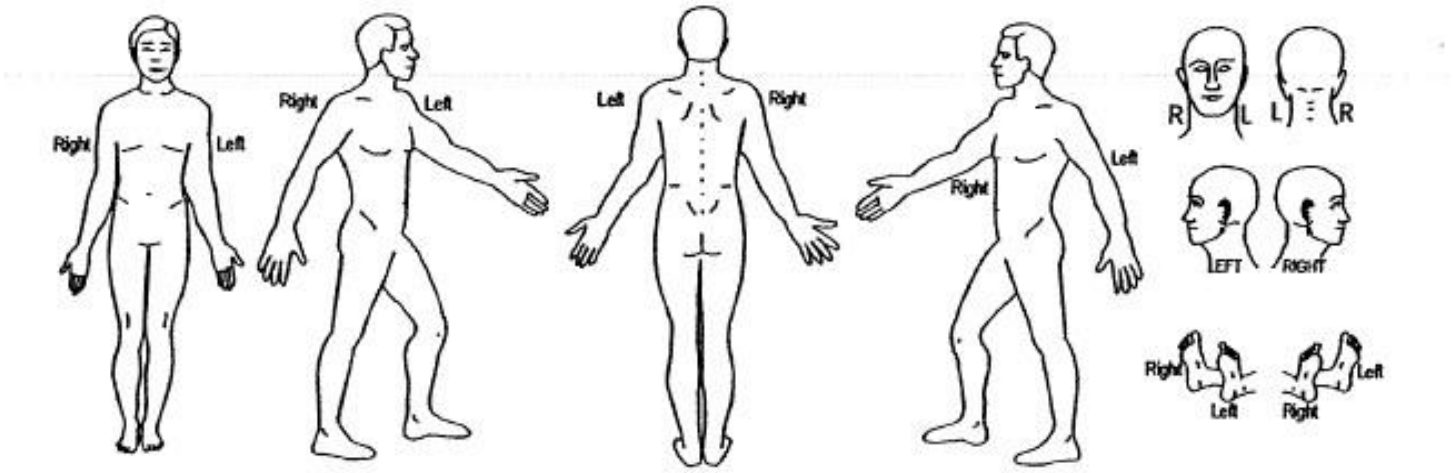
7. Alcohol Consumption		
a. Do you drink alcohol?	Yes	No
b. If yes, how much of the following do you drink per week?	1) Litres of beer per week? _____	
	2) Litres of wine per week? _____	
	3) Litres of cider per week? _____	
	4) Tots of spirits per week? _____	
8. Social Drugs		
a. Do you use social drugs? e.g. marijuana /dagga	Yes	No

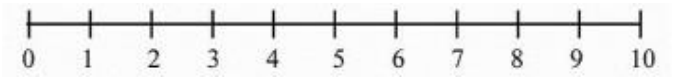
9. Medical History:
a. Do you have any other significant medical condition/s which you are being treated for? Please list condition/s : 1)_____

2)_____ 3)_____ 4)_____			
B. Are you currently taking any medication/s for the conditions you mentioned above? Yes □ No □ If yes, please list medication/s: *(please include and over-the-counter medication, herbs or birth control pills/injection, acne treatments)* 1)_____ 2)_____ 3)_____ 4)_____ 5)_____			
c. Have you had any previous trauma resulting in prolonged pain?	Yes	No	
d. If yes, did you receive any treatment for the injury?	Yes	No	
e. If yes, who did you get treatment from?	_____		
f. Have you been previously diagnosed with any psychological deficits e.g. Dementia,	Yes	No	
10.			
a. Do you know what a chiropractor is or does?	Yes	No	
b. If yes, have you ever been treated by a Chiropractor?	Yes	No	
c. If yes, what did your Chiropractor treat?	Headache	Neck pain	Upper back pain

More than one block can be ticked if necessary	Low back pain	Arm or leg joints or muscles	Other: 1._____ _2._____ __

Section B		
11. Musculoskeletal pain history		
a. Have you ever experienced musculoskeletal pain in the past?	Yes	No
b. If yes, what musculoskeletal pain did you experience? *e.g. low back pain*	_____	
c. At what age did you first start experiencing musculoskeletal pain?	_____ years old	
d. Have you ever received treatment for your musculoskeletal pain?	Yes	No
e. If yes, who did you see? *e.g. General practitioner, Chiropractor, Sangoma, Pharmacist, Inyanga, Physiotherapist, Occupational therapist*	1)_____ 2)_____	
f. Please state what you were diagnosed with (if known)?	1)_____ 2)_____	
g. What medication have you used in the past for your musculoskeletal pain? *E.g. Panado, Grandpa, Myprodol, Adco-dol*	1)_____ 2)_____ 3)_____	

	4)_____
Musculoskeletal pain Characteristics	
12. Location	
a. Please indicate on the diagrams below where you are currently experiencing pain.	
	
13. Intensity	
a. The amount of pain you are currently experiencing? *(please rate your answer on the scale provided)*	0 1 2 3 4 5 6 7 8 9 10 *(0=least amount of pain and 10=most amount of pain)*
b. The worst the pain gets? *(please rate your answer on the scale provided)*	0 1 2 3 4 5 6 7 8 9 10 *(0=least amount of pain and 10=most amount of pain)*
c. The best the pain gets?	0 1 2 3 4 5 6 7 8 9 10

(please rate your answer on the scale provided)	*(0=least amount of pain and 10=most amount of pain)*
d. An acceptable level of pain? *(please rate your answer on the scale provided)*	 *(0=least amount of pain and 10=most amount of pain)*

14. Character of pain

Please tick the appropriate box which best describes how your musculoskeletal pain feels?

(please answer question a-h)

Description	Never	Sometimes	Often	Always	Only if severe
a. Aching					
b. Dull					
c. Sharp					
d. Shooting					
e. Stabbing					
f. Throbbing					
g. Tightness					
h. Other: 1)_____ 2)_____ 3)_____					

15. Aggravating Factors

Is your musculoskeletal pain aggravated/made worse by any of the following? Please tick the box/s that most apply to you *(you may tick more than 1 box).*		
a. Alcohol □ b. Bending over □ c. Certain foods (if yes, please list): 1) _____ 2)_____ 3) _____ d. Certain time of day □ e. Change in weather/ seasons □ f. Chewing/ clenching teeth □	g. Medication □ h. Stress/tension □ i. Exercise □ j. Fatigue/exertion □ k. Walking □ l. Lack of sleep □ m. Lying down□ n. Over sleeping □ o. Reaching overhead □ p. Sneezing/Coughing	q. Standing □ r. Sitting □ s. Other (if yes please list) 1)_____ 2)_____ 3)_____

16. Relieving Factors

Is your musculoskeletal pain relieved/made to feel better by any of the following? Please tick the box/s that most apply to you *(you may tick more than 1 box).*		
a. Applying ice/something cold □ b. Compression □ c. Exercise □ d. Heat □ e. Lying down □ f. Massage □	g. Medication h. Moving around/walking □ i. Sleep j. Relaxing □ k. Sitting l. Standing □	m. Stretching n. Other (if yes, please list) 1)_____ 2)_____ 3)_____

17. Effects of the pain		
a. Does the pain affect your sleep?	Yes	No

b. Does the pain affect your appetite?	Yes	No
c. Does the pain affect your physical activities?	Yes	No
d. Does the pain affect your relationship with others? *e.g. irritability*	Yes	No
e. Does the pain affect your emotions? *e.g. anger, depression, suicidal*	Yes	No

Thank you for taking the time to complete the questionnaire. Your participation in this study is greatly appreciated.

Appendix E: Letter of information and informed consent for members of the expert group

Letter of Information and Informed Consent to Expert group

Dear Participant

Welcome to my research study.

Title of the Research Study: An epidemiological investigation of musculoskeletal pain in an elderly population within a selected elderly care facility in KwaZulu-Natal

Principal Investigator/researcher: Luke Pendock, B.Tech: Chiropractic

Co-Investigator/supervisor: Dr. D. Varatharajullu, M.Tech: Chiropractic

Brief Introduction and Purpose of the Study: The epidemiology of musculoskeletal pain in the elderly population has not been well documented in South Africa. Untreated musculoskeletal pain disrupts sleep patterns, inhibits daily routines, decreases mobility and diminishes the quality of life of the elderly. Therefore, the aim of this study is to investigate the epidemiology of musculoskeletal pain in an elderly population within a selected elderly care facility in KwaZulu-Natal by means of a questionnaire.

Study objectives:

1. To determine the point and period prevalence of musculoskeletal pain in an elderly population
2. To investigate selected risk factors (age, gender, exercise, sleep, stress, smoking, alcohol, falls, medication) for musculoskeletal pain in an elderly population
3. To determine the impact (activities of daily living) of musculoskeletal pain in an elderly population

Outline of the Procedures: Please read and complete the informed consent letter and the code of conduct and confidentiality statement prior to commencement of the focus group meeting. Each member of the focus group will receive a copy of the questionnaire before the discussion begins. During the focus group meeting, the questions will be discussed according to the structure of the questionnaire and members of the focus group should feel free to make recommendations and voice their opinion on any advice they have that may improve the questionnaire. The focus group meeting will be recorded for the researcher to look back on the comments made during the meeting and will be able to make suggested alterations.

Risks or Discomforts to the Participant: There are no foreseeable risks, discomforts or adverse consequences to the focus group participants.

Benefits: The focus group is valuable in ensuring validity of the questionnaire.

Reason/s why the Participant May Be Withdrawn from the Study: You may withdraw from the study at any time.

Remuneration: Participation in the study is voluntary and no remuneration will be awarded to the participants in the focus group.

Costs of the Study: There are no costs associated with participating in the study

Confidentiality: All information discussed during the focus group meeting will be kept confidential and used for research purposes only.

Research-related Injury: Not applicable to this study as it is a questionnaire based study.

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

Head of Department: Dr. A. Docrat, Contact number: 031 373 2589.

Please contact the researcher, Luke Pendock on (079 0909561), Supervisor: Dr Desiree Varatharajullu (0313732533) or the Institutional Research Ethics administrator on 031 373 2375. Complaints can be reported to the DVC: TIP, Prof S. Moyo on (031) 373 2576 or moyos@dut.ac.za.

CONSENT

Statement of Agreement to Participate in the Research Study:

I……..., ID number……., have read this document in its entirety and understand its contents. Where I have had any questions or queries, these have been explained to me by…… to my satisfaction. Furthermore, I fully understand that I may withdraw from this study at any stage without any adverse consequences and my future health care will not be compromised. I, therefore voluntarily agree to participate in this study.

_____	_____	_____	_____
Full name of the participant	**Date**	**Time**	**Signature**

I, Luke Pendock, hereby confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full name of the Researcher	**Date**	**Signature**
_____	_____	_____
Full name of the Witness	**Date**	**Signature**
_____	_____	_____
Full name of the Legal Guardian (If applicable)	**Date**	**Signature**

Appendix F: Code of Conduct

Code of Conduct and Confidentiality Statement

This form needs to be completed by every member of the focus group prior to the commencement of the expert group meeting.

As a member of this committee I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed during the expert group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.
2. None of the information shall be communicated to any other individual or organisation outside of this specific expert group as to the decisions of this expert group.
3. The information gathered from this expert group by the researcher will be made public in terms of a dissertation and journal publication. The researcher will ensure that any participants in the expert group and research remain anonymous and confidential.
4. The expert group may be either voice or video recorded, as a transcript of the proceedings will need to be made. The data will be stored securely under password protection.
5. All data generated from this focus group (including the recording) will be kept for 15 years in a secure location at Durban University of Technology and thereafter will be destroyed.

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

_____	_____
Full name of the participant	**Signature**
_____	_____
Full name of the Witness	**Signature**
_____	_____

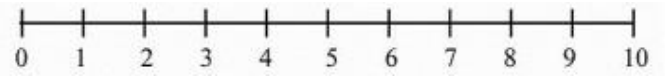
Full name of the Researcher	**Signature**
_____	_____
Full name of Supervisor	**Signature**

Appendix G: Pilot study questionnaire

Please read each question and answer with a tick in the relevant block unless otherwise stated to.

SECTION A					
Demographics:					
a. Age:	60 – 69 years		70 – 79 years		>80 years
b. Gender:	Female		Male		Other
c. Race:	Black	Coloured	Indian	White	Other _____

Social History:				
1. Exercise				
a. Do you have a regular exercise programme?	Yes		No	
b. If yes, what type of exercise do you perform? *(please tick the top two forms of exercise you do)*	Walking		Gym/weight exercises	
	Running		Exercise classes	
	Swimming/Aqua classes		other	
c. If yes, how many days per week do you exercise?	1 day	2 days	3 days	>3 days
d. How long do you exercise for?	20 minutes	40 minutes	60 minutes	>60 minutes
2. Sleeping habits				
a. How many hours do you sleep a day on average?	4 hours	6 hours	8 hours	>8 hours

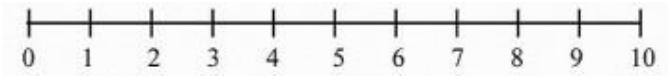
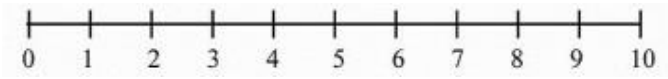
b. Do you currently have difficulty sleeping e.g. difficulty falling asleep, waking up during the night?	Yes		No	
3. Stress				
a. Are you currently receiving treatment, counselling or are on medication for anxiety, stress or depression?	1Anxiety	2Depression	3Stress	4None
b. Do you consider yourself as being under a lot of stress (mental or physical) in the last 3 months? *(please rate your answer on the scale provided)*	 *(0=least amount of stress and 10=most amount of stress)*			
4. Smoking				
a. Do you smoke cigarettes?	Yes	No	Ex-smoker	
b. If yes, how many per day	1-5	6-10	11-15	16-20 >20
c. If an ex-smoker, how many years ago did you stop?	1 year	5 years	10 years	>10 years
d. If an ex-smoker, how many cigarettes were you smoking a day?	1-5	6-10	11-15	16-20 >20
5. Alcohol consumption				
a. How many units of alcohol do you drink a week? (1 unit of alcohol = 1 x glass of wine or 1 x beer or 1 x tot of whiskey, etc.)	None	1-5	5-10	>10
6. Social drugs				
a. Do you use social drugs? e.g. marijuana /dagga	Yes		No	

7. Medical history:		
a. Do you have any other significant medical condition/s which you are being treated for?	Yes	No
	Anaemia Stroke	Headaches No

b. If yes, what medical conditions are you being treated for? *Please tick the relevant medical conditions from the list)*Heart disease	Arthritis	Heart disease
	Cancer	High blood pressure
	Diabetes	Stroke
	Epilepsy	Other: _____
c. Are you currently taking any medication/s for the conditions you mentioned above?	Yes	No
d. If yes, what medications are you currently taking? *(Please tick the relevant medications from the list below)*	Blood pressure medication	Diabetic medication
	Blood thinners	Non-steroidal anti-inflammatory e.g. Cataflam, Voltaren, Myprodol
	Cholesterol medication	Corticosteroids
. Have you had any previous injury/injuries resulting in significant pain?	Yes	No
f. If yes, did you receive any treatment for the injury?	Yes	No
g. If yes, who did you receive treatment from? (*Please tick who you received treatment from)*	Chiropractor	Physiotherapist
	Homeopath	Occupational therapist
	General practitioner	Sangoma/Inyanga
	Orthopaedic specialist	Other: _____
h. Have you been previously diagnosed with any psychological deficits e.g. dementia	Yes	No

SECTION B **e**		
8. Musculoskeletal Pain History		
a. Have you ever experienced musculoskeletal pain?	Yes	No
b. If yes, please tick the two most severe areas the pain was experienced in and the age at which the pain started at.	AREA	AGE
	Jaw joint pain	
	Neck pain	
	Mid-back pain	
	Low back pain	
	Shoulder pain	
	Elbow pain	
	Wrist and hand pain	
	Hip pain	
	Knee pain	
	Foot and ankle pain	
c. Have you ever received treatment for your musculoskeletal pain?	Yes	No
d. If yes, Please tick who you received treatment from?	Chiropractor	Physiotherapist
	Homeopath	Occupational therapist
	General practitioner	Sangoma/Inyanga

	Orthopaedic specialist	Other: _____
e. Please tick what you were diagnosed with (if known)?	Osteoarthritis	Joint sprain
	Rheumatoid arthritis	Muscle sprain
	Osteoporosis	Bone fracture
	Gout	Unknown
f. What medication have you used in the past for your musculoskeletal pain? *(Please tick the medication used)*	on-steroidal anti-inflammatories e.g. Myprodol, Voltaren, Cataflam, Unknown	
	Corticosteroids e.g. cortisone, prednisone	
	Unknown	
Current musculoskeletal pain characteristics		
9. Location		
a. Please indicate where you are currently experiencing pain *(Please tick the two most severe areas)*	Jaw pain	
	Neck pain	
	Mid-back pain	
	Low back pain	
	Shoulder pain	
	Elbow pain	
	Wrist and hand pain	
	Hip pain	
	Knee pain	
	Foot and ankle pain	
10. Intensity		

a. The amount of pain you are currently experiencing? *(please rate your answer on the scale provided)*	 *(0=least amount of pain and 10=most amount of pain)*
b. The worst the pain gets? *(please rate your answer on the scale provided)*	 *(0=least amount of pain and 10=most amount of pain)*

11. Character of pain

Please tick the appropriate box which best describes how your musculoskeletal pain feels and how often this pain occurs?

Description	Never	Sometimes	Often	Always	Only if severe
a. Aching					
b. Dull					
c. Sharp					
d. Shooting					
e. Stabbing					
f. Throbbing					
g. Tightness/spasm					
h. Burning					

12. Aggravating factors

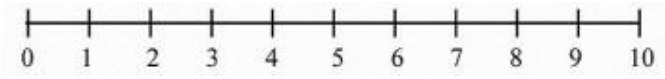
Is your musculoskeletal pain aggravated/made worse by any of the following?

Please tick the box/es that most apply to you *(the two worst aggravating factors).*

Worse in the morning	Bending over	Fatigue/exertion
Worse in the evening/night	Lying down/sleeping	Stress/tension

Change in weather/season	Walking	Chewing/clenching jaw
Standing	Reaching overhead	Alcohol
Sitting	Exercise	Medication
13. Relieving factors		
Is your musculoskeletal pain relieved/made to feel better by any of the following? Please tick the box/s that most apply to you *(the two best relieving factors).*		
Heat	Standing	Stretching
Applying ice/something cold	Lying down	Sleep
Compression	Moving around/walking	Massage
Sitting	Exercise	Medication

14. Effects of the pain		
. Does the pain affect your activities of daily living?	Yes	No
b. If yes, please tick the activities that are affected by your pain from the list below		
Sitting	Running	Driving
Standing	Exercise	Relationships with others
Lying down	Walking up/down stairs	Emotions
Bending over	Getting in/out bed	Appetite
Walking	Going to the bathroom	Ability to eat
Other: _____		

. The extent to which the pain impacts your activities of daily living? *please rate your answer on the scale provided)*	 *(0=no impact and 10=can no longer do these activities)*

Appendix H: Ethical clearance

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

6 November 2017

IREC Reference Number: **REC 112/17**

Mr L F Pendock
119 Plumbago Terrace
Westwood Estate
Westville
3629

Dear Mr Pendock

The epidemiological investigation of musculoskeletal pain in an elderly population within a selected elderly care facility in KwaZulu-Natal

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

We are pleased to inform you that the data collection tool has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your Memorandum of Understanding with TAFTA.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC Standard Operating Procedures (SOP's).

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely

[redacted]

Professor J K Adam
Chairperson: IREC

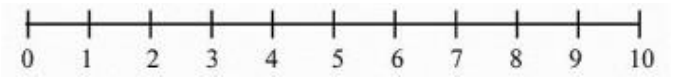
DUT DURBAN UNIVERSITY OF TECHNOLOGY
2017 -11- 06
INSITUTUTIONAL RESEARCH ETHICS COMMITTEE
P O BOX 1334 DURBAN 4000 SOUTH AFRICA

Appendix I: Final Questionnaire

Please read each question and answer with a tick in the relevant block unless otherwise stated to.

SECTION A					
Demographics:					
a. Age:	60 – 69 years		70 – 79 years		>80 years
b. Gender:	Female		Male		Other
c. Race:	Black	Coloured	Indian	White	Other _____

Social History:				
1. Exercise				
a. Do you have a regular exercise programme?	Yes		No	
b. If yes, what type of exercise do you perform? *(please tick the top two forms of exercise you do)*	Walking		Gym/weight exercises	
	Running		Exercise classes	
	Swimming/Aqua classes		other	
c. If yes, how many days per week do you exercise?	1 day	2 days	3 days	>3 days
d. How long do you exercise for?	20 minutes	40 minutes	60 minutes	>60 minutes
2. Sleeping habits				

a. How many hours do you sleep a day on average?	4 hours	6 hours	8 hours	>8 hours
b. Do you currently have difficulty sleeping e.g. difficulty falling asleep, waking up during the night?	Yes		No	
3. Stress				
a. Are you currently receiving treatment, counselling or are on medication for anxiety, stress or depression?	Anxiety	Depression	Stress	None
b. Do you consider yourself as being under a lot of stress (mental or physical) in the last 3 months? *(please rate your answer on the scale provided)*	 *(0=least amount of stress and 10=most amount of stress)*			
4. Smoking				
a. Do you smoke cigarettes?	Yes	No	Ex-smoker	
b. If yes, how many per day	1-5	6-10	11-15	16-20	>20
c. If an ex-smoker, how many years ago did you stop?	1 year	5 years	10 years	>10 years
d. If an ex-smoker, how many cigarettes were you smoking a day?	1-5	6-10	11-15	16-20	>20
5. Alcohol consumption				
a. How many units of alcohol do you drink a week? (1 unit of alcohol = 1 x glass of wine or 1 x beer or 1 x tot of whiskey, etc.)	None	1-5	5-10	>10
6. Social drugs				
a. Do you use social drugs? e.g. marijuana /dagga	Yes		No	

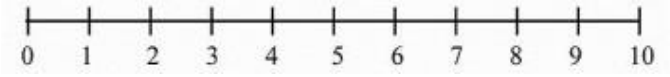
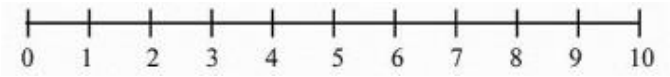
7. Medical history:		
a. Do you have any other significant medical condition/s which you are being treated for?	Yes	No

b. If yes, what medical conditions are you being treated for? (*Please tick the relevant medical conditions from the list)*	Anaemia	Headaches
	Arthritis	Heart disease
	Cancer	High blood pressure
	Diabetes	Stroke
	Epilepsy	Thyroid disease
	Tuberculosis	Other
c. Are you currently taking any medication/s for the conditions you mentioned above?	Yes	No
d. If yes, what medications are you currently taking? *(Please tick the relevant medications from the list below)*	Blood pressure medication	Thyroid medication
	Blood thinners	Non-steroidal anti-inflammatory e.g. Cataflam, Voltaren, Myprodol
	Cholesterol medication	Corticosteroids
	Diabetic medication	Other
e. Have you had any previous injury/injuries resulting in significant pain?	Yes	No
f. If yes, did you receive any treatment for the injury?	Yes	No
g. If yes, who did you receive treatment from? (*Please tick who you received treatment from)*	Chiropractor	Physiotherapist
	Homeopath	Occupational therapist
	General practitioner	Sangoma/Inyanga
	Orthopaedic specialist	Other

h. Have you been previously diagnosed with any psychological deficits e.g. dementia	Yes	No

SECTION B		
8. Musculoskeletal Pain History		
a. Have you ever experienced musculoskeletal pain?	Yes	No
b. If yes, please tick the two most severe areas the pain was experienced in and the age at which the pain started at.	Jaw joint pain	
	Neck pain	
	Mid-back pain	
	Low back pain	
	Shoulder pain	
	Elbow pain	
	Wrist and hand pain	
	Hip pain	
	Knee pain	
	Foot and ankle pain	
c. Have you ever received treatment for your musculoskeletal pain?	Yes	No
d. If yes, Please tick who you received treatment from?	Chiropractor	Physiotherapist
	Homeopath	Occupational therapist

	General practitioner	Sangoma/Inyanga
	Orthopaedic specialist	Other
e. Please tick what you were diagnosed with (if known)?	Osteoarthritis	Joint sprain
	Rheumatoid arthritis	Muscle sprain
	Osteoporosis	Bone fracture
	Gout	Unknown
	Sciatica	Other
f. What medication have you used in the past for your musculoskeletal pain? *(Please tick the medication used)*	Non-steroidal anti-inflammatories e.g. Myprodol, Voltaren, Cataflam	
	Corticosteroids e.g. cortisone, prednisone	
	Unknown	
	Other	
Current musculoskeletal pain characteristics		
9. Location		
a. Are you currently experiencing musculoskeletal pain? *(If yes, continue to question b. If no, thank you for your participation in this study. You are not required to complete the remaining questions)*	Yes	No
b. Please indicate where you are currently experiencing pain	Jaw joint pain	
	Neck pain	

(Please tick the two most severe areas)	Mid-back pain
	Low back pain
	Shoulder pain
	Elbow pain
	Wrist and hand pain
	Hip pain
	Knee pain
	Foot and ankle pain
10. Intensity	
a. The amount of pain you are currently experiencing? *(please rate your answer on the scale provided)*	 *(0=least amount of pain and 10=most amount of pain)*
b. The worst the pain gets? *(please rate your answer on the scale provided)*	 *(0=least amount of pain and 10=most amount of pain)*

11. Character of pain					
Please tick the appropriate box which best describes how your musculoskeletal pain feels and how often this pain occurs?					
Description	Never	Sometimes	Often	Always	Only if severe

a. Aching					
b. Dull					
c. Sharp					
d. Shooting					
e. Stabbing					
f. Throbbing					
g. Tightness/spasm					
h. Burning					

12. Aggravating factors

Is your musculoskeletal pain aggravated/made worse by any of the following?

Please tick the box/es that most apply to you *(the two worst aggravating factors).*

Worse in the morning	Sleeping	Fatigue/exertion
Worse in the evening/night	Lying down	Stress/tension
Change in weather/season	Walking	Specific food
Standing	Running	Chewing/clenching jaw
Sitting	Reaching overhead	Alcohol
Bending over	Exercise	Medication

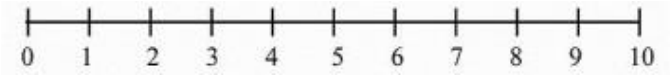
13. Relieving factors

Is your musculoskeletal pain relieved/made to feel better by any of the following?

Please tick the box/s that most apply to you *(the two best relieving factors).*

Heat	Standing	Stretching
Applying ice/something cold	Lying down	Sleep
Compression	Moving around/walking	Massage

Sitting	Exercise	Medication

14. Effects of the pain		
a. Does the pain affect your activities of daily living?	Yes	No
b. If yes, please tick the activities that are affected by your pain from the list below		
Sitting	Running	Driving
Standing	Exercise	Relationships with others
Lying down	Walking up/down stairs	Emotions
Bending over	Getting in/out bed	Appetite
Walking	Going to the bathroom	Ability to eat
Other: _____		
c. The extent to which the pain impacts your activities of daily living? *(please rate your answer on the scale provided)*	 *(0=no impact and 10=can no longer do these activities)*	

Thank you for taking the time to complete the questionnaire. Your participation in this study is greatly appreciated.

Appendix J: Research assisstant contract

Assistant contract and confidentiality agreement

I, _____, have been fully informed and trained on the research procedure and agree to assist the researcher with this study by helping with the distribution of the letter of information, informed consent and the questionnaires and answering of any questions the participants may have. I agree to maintain full confidentiality when performing these tasks.

I agree to:

1. Giving a verbal explanation to participants about the letter of information, informed consent and the questionnaire.
2. To answer all questions the participants may have.
3. To collect and place all completed letters of informed consent and questionnaires in two separate sealed ballot boxes, to maintain complete confidentiality
4. Keep all participants identifying information in any form (Consent forms, questionnaires) secure while it is in my possession.
5. Not to make any copies of raw data in any form or format.
6. Keep all research information shared with me confidential by not discussing or sharing the information with anyone other than the primary investigator.

_____ _____ _____ _____

Full Name of Research Assistant Date Time Signature

I, Luke Pendock herewith confirm that the above research assistant has been fully informed and trained on the appropriate research procedure.

_____ _____ _____

Full Name of Researcher Date Signature