Six Week Exercise and Education Programme for Weight-Bearing Joint Pain at Primary Health Care Facilities

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Kopano Malebo Malebo

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Supervisor: Dr Roline Barnes, PHD

"I, Kopano Malebo Malebo, declare that the Master's Degree research dissertation or interrelated, publishable manuscripts/published articles, or coursework Master's Degree mini-dissertation that I herewith submit for the Master's Degree qualification in Physiotherapy at the University of the Free State is my independent work, and that I have not previously submitted it for a qualification at another institution of higher education".

Kopano Malebo 30 November 2021

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Background: Joint pain is a common cause of functional limitation and increased health expenditure among older people. The ageing population is increasing the prevalence of joint pain and the demand for care. Joint pain is prevalent globally, one in three individuals experience joint pain, and in South Africa, 24.48% of primary health care clinics patients experience joint pain. In adults over 65 years old in a rural context, 29.7% reported experiencing joint pain. Physiotherapists working in a primary health care context are required to treat many patients with joint pain in the absence of clear guidelines. In urban and peri-urban contexts, health education and exercise programmes have been shown to improve pain, quality of life and self-efficacy of individuals with joint pain.

The study aimed to determine and compare the impact of six-week education and exercise intervention programme on female patients 50 - 70 years old living with weight-bearing joint pain for three months or longer in the Maluti-a-Phofung health sub-district receiving care at PHC Clinics.

Method: A single-blind randomised controlled trial was conducted using convenience sampling. Following baseline measurement, participants were randomised into the intervention, workbook, and usual care groups. Data was collected using interviewer administered outcome measures and physical performance task battery. Demographic data was collected using a self-developed demographics questionnaire. Pain severity and pain interference data were collected using the brief pain Inventory short from. Self-efficacy data was collected using the chronic diseases self-efficacy scale. Quality of life data was collected using the EQ-5D-3L, and physical function data was collected using Physical Performance Task Battery. Data was collected at baseline and six weeks. A self-developed acceptability questionnaire to collect acceptability data for the intervention group was used at six weeks.

Results: Forty-seven participants enrolled in the study with a median of three painful joints. The majority of the participants were obese and presented with hypertension. There was no statistically significant difference in the pain severity scores between the groups at baseline or six weeks. There was no statistically significant difference in the pain interference score at baseline, but there was a statistically significant change within the intervention group for pain severity (p=0.00) and workbook group for pain severity (p=0.02). There was a statistically significant change in the pain severity and pain inference score for the intervention and workbook group for change within groups. The was not statistically significant difference in self-efficacy at baseline but there was statistically significant improvement in self-efficacy for the intervention (p=0.02) group and workbook group (p=0.04) at six weeks. The was no statistically significant difference in quality of life at baseline but there was a statically significant change in the quality-of-life (p=0.00) VAS=90 IQR (85-9) perception in the intervention group. There was no statistically significant difference between groups in the physical performance task battery at baseline nor at six weeks but there was a statistically significant improvement in the physical performance task battery within the intervention and workbook groups. There was a statically significant change of the timed-six-minute walk test with an improvement of 66 meters in the intervention group.

Conclusion: The impact of the intervention on the intervention group was to decrease pain severity and pain interference, improve quality of life, improve self-efficacy and to improve physical function. In the workbook group the programme improved pain severity and interference, improved self-efficacy, and improved physical function. The six-week intervention can be used to manage joint pain in primary health care clinics and the workbook group should be investigated further but provides a bases for the use of a short formats in remote primary health care clinics.

Keywords: “joint pain” “musculoskeletal conditions” “non-communicable disease “, “self-management” “self-efficacy” “exercise” “physical activity” “health education” “primary health care clinics” “female”

Abbreviations

BMI	**Body mass index**
BOA	**Better Management for Patients with Osteoarthritis**
BPI-sf	**Brief pain Inventory short form**
CDSES	**Chronic diseases self-efficacy scale**
DM2	**Diabetes Mellitus Type 2**
GLA:D	**Good Life with Osteoarthritis in Denmark**
HIV	**Human immunodeficiency virus**
MSC	**Musculoskeletal conditions**
MSK	**Musculoskeletal**
NCD	**Non-communicable Disease**
OA	**Osteoarthritis**
PHC	**Primary Health Care**
QOL	**Quality of Life**
RA	**Research Assistant**
VAS	**Visual analogue scale**
WHO	**World Health Organisation**

1 INTRODUCTION

1.1 Background

Joint pain is a common cause of functional limitation and increased health expenditure amongst the elderly, a population group that is increasing in number (Hermsen et al., 2016; Cieza et al., 2020; Wang et al., 2021). The occurrence of joint pain increases with age, and the prevalence of joint pain is growing across the world as people live longer (Woolf & Pfleger, 2003; Brooks, 2005; Igumbor et al., 2011; Wang et al., 2021). The impact of joint pain is not only experienced by the individual living with the joint pain, but the burden extends to those who care for the individual with joint pain, and the health system that is required to manage the individual (Hunter, Schofield & Callander, 2014; Samison, Randriatsarafara & Ralandison, 2017).

1.2 Extent and nature of the problem

The increasingly ageing population is burdening Health professionals with the need for treatments for joint pain, and the need for management is substantiated by epidemiological data (Cieza et al., 2020; Vos et al., 2020). In the United Kingdom, as early as 2012 osteoarthritis (OA) accounted for 55% of all joint pain-related hospital admissions, and the cost for hip and knee arthroplasties to manage joint pain escalated to 22.6 billion dollars, a cost which is still increasing (Chen et al., 2012). In a primary health care (PHC) clinic in Gauteng, 24.48% of patients receiving care at the clinic experienced joint pain, and 55.54% of these individuals were between the ages of 45 - 60 years, with an increase to 65.56% occurring in people 61-80 years of age (Rauf et al., 2013). Weight-bearing joints are cited as the most common areas of joint pain, particularly the low back and knee joints (Hunter, Schofield & Callander, 2014; Storheim & Zwart, 2014).

In rural South Africa, joint pain was estimated to be 29.7% in adults over 65 years (Usenbo et al., 2015). There is a higher prevalence of (40-58.2%) joint pain in South Africa's PHC clinic users when compared to the prevalence of joint pain in other developed countries of between 11-44% (Copley et al., 2013; Rauf et al., 2013; Barnes, Jelsma & Parker, 2018). Copley et al.

(2013) found that of the patients that reported joint pain in PHC clinics in Mangaung, Free State, the majority (64%) were females. Rauf et al. (2013) similarly noted that more females in South Africa were living with joint pain compared to males. Therefore, there is a need to provide middle-aged women in South Africa with effective interventions for joint pain, solutions that are culturally appropriate in a context where the current treatment approaches are not effective for managing long term joint pain (Barnes, 2016; Hutting et al., 2021).

Pain in the absence of an injury or underlying musculoskeletal conditions is considered as primary joint pain, which is the joint pain of interest in the current study, as opposed to secondary joint pain following an external injury (Barnes, Jelsma & Parker, 2018). Joint pain can be caused by degeneration of ligaments, cartilage or other soft tissue structures, and the pain can persist beyond normal tissue healing periods, becoming chronic pain. Pain that lasts longer than three months is considered as chronic pain (Edwards et al., 2016; Booth et al., 2017; Hutting et al., 2021). Pain is multifactorial and is influenced by the interaction between genetic, social, environmental, cultural factors, comorbidities, and lifestyle factors (Brooks, 2005; Lewis & O'Sullivan, 2018). The effects of joint pain are pervasive and may impact negatively on the psychosocial well-being of the individual, including perceptions of their body being fragile, and this negatively affects interaction with family and friends (Woolf & Pfleger, 2003; Lewis & O'Sullivan, 2018). The approach to the treatment of joint pain cannot remain exclusively a biomedical approach aimed at alleviating pain through medication and maintaining joint mobility but must also be geared towards a biopsychosocial approach which responds to the physical, and psychosocial aspects of the individuals that influence pain (O'Reilly, Muir & Doherty, 1999; Booth et al., 2017; Louw, Nijs & Puentedura, 2017). The biopsychosocial approach to the management of pain is widely accepted as an effective approach to managing joint pain (Booth et al., 2017; Hutting et al., 2021).

The sedentary lifestyles of individuals with joint pain predisposes them to non-communicable diseases (NCDs) and other comorbidities (Brosseau et al., 2012). Common NCDs that may occur in individuals living with joint pain are cardiac diseases, hypertension, diabetes mellitus type 2 (DM2), obesity, chronic obstructive pulmonary disease (COPD) and depression (Brosseau et al., 2012; de Rooij et al., 2014). Epidemiological data in South Africa reports the prevalence of hypertension ranging between 14-33%, and the prevalence of DM2 the ranges is between four percent to six percent with 50% of the adult female population characterized as overweight or obese (Mayosi et al., 2009; Pillay-van Wyk et al., 2016; Pheiffer et al., 2021). The relationship between diseases of lifestyle, joint pain and physical inactivity is cyclical, physical inactivity predisposes people to chronic diseases and obesity, and joint pain causes individuals to be even less active (Lee et al., 2012; Molton & Terrill, 2014; Lewis & O'Sullivan, 2018).

The treatment of joint pain in PHC is not prioritized in the presence of other NCDs and chronic disease of lifestyle (Hermsen et al., 2011; Visagie & Schneider, 2014; Lalken & Mash, 2015). There is a small number of physiotherapists in South Africa that provide outreach services to PHC clinics, and their numbers are inadequate to treat a large number of patients that present with joint pain (National Department of Health, 2015). PHC clinics are different to hospital settings with regard to the availability of resources and the approach to joint pain management which challenges physiotherapist to provide innovative joint pain treatments with limited resources (Maleka, Franzsen & Stewart, 2008). Current management of joint pain at PHC level affirms negative beliefs regarding the cause of pain, treatment, prognosis of symptoms, and fails to foster positivity regarding exercise and the benefits thereof (Hurley et al., 2010). Joint pain interventions in PHC settings should aim to provide a comprehensive approach to the treatment of joint pain, to ensure that effective management is provided for patients in rural South Africa (Hurley et al., 2007, 2010; Bearne et al., 2011; Lewis & O'Sullivan, 2018).

1.3 Management of joint pain

Multiple studies have investigated the effectiveness of exercise on pain amongst middle-aged patients living with joint pain, and it is accepted as an effective approach to manage joint pain (Hurley et al., 2007; Skou et al., 2012; Booth et al., 2017). The complex nature of joint pain requires effective interventions during every stage of joint pain, a comprehensive management approach including exercises, education and lifestyle changes (Rolfson et al., 2016).There seems to be professional reluctance to the uptake of the collaborative treatment approaches and a continuation of passive modalities which places the clinician as the administrator of care, based on the biomedical approach, where the pain is to be cured and not managed (Booth et al., 2017; Lewis & O'Sullivan, 2018)

1.4 Problem statement and justification of study

Working in hospitals in the rural Eastern Free State has required that physiotherapists provide outreach services to PHC clinics serviced by district hospitals. The frequency of the PHC clinic outreach varies significantly at each of the three facilities, and the visits seemed to be scheduled arbitrarily and not driven by need or resource availability. Mofumahadi Manapo Mopeli Regional Hospital's outreaches to clinics are once a month or less. Thebe District Hospital outreaches vary with weekly visits to some clinics, only once every two weeks to other clinics and monthly to another clinic. At Elizabeth Ross District Hospital, outreaches to PHC clinics are done once a month to each clinic, and the need exceeds the once a monthly visit. From the researcher's experience, approximately 5-20 female patients with non-specific joint pain attend the clinics serviced by Elizabeth Ross Hospital for non-specific joint pain per week. At the time of the study, only one permanent physiotherapist was employed at the district hospital level in the Maluti-a-Phofung health sub-district and is required to provide an effective treatment to many patients living with joint pain.

Rehabilitation programmes comprising of education and exercises have been investigated for their effect on pain in different populations, including people 50 – 70 years old in Cape Town and Johannesburg in an urban context; as well as in the United Kingdom for patients 50 years and older (Hurley et al., 2007; Saw et al., 2016). In Bloemfontein, the exercise and education intervention has been investigated amongst women 40 – 64 years old (Barnes, Jelsma & Parker, 2019). These interventions are effective in managing pain and improving physical function amongst urban and peri-urban populations. A rehabilitation programme comprising health education and exercise for joint pain is yet to be tested in a rural South African population receiving health care primarily at a PHC clinic. An effective intervention comprising education and exercise using the biopsychosocial approach is required for patients with joint pain receiving care at primary health care clinics. These interventions can be provided by physiotherapists with varying degrees of clinical experience, as physiotherapists are trained in exercise and education approaches even in resource restricted environments.

A study is needed to provide empirical data on the effectiveness of an education and exercise intervention using the biopsychosocial models for physiotherapy treatments in rural areas. There has been a haphazard application of these approaches by physiotherapists working in rural areas which have yielded varying clinical outcomes. There is a need to solidify the approach routed in scientific evidence. The use of exercise and education treatments by physiotherapists in urban and peri-urban of South African areas makes it pertinent that this approach be tested in a rural South African context.

1.5 Aim and objectives

The aim of the study was to determine and compare the impact of an exercise and education intervention programme on female patients 50 - 70 years old living with weight-bearing joint pain for three months or longer in the Maluti-a-Phofung health sub district receiving care at PHC Clinics.

However, before this could be achieved, several other objectives had to be met, and these are set out below.

The specific objectives of the study are:

- To determine and compare the impact of a six-week education and exercise rehabilitation programme on the severity and interference of weight-bearing joint pain using the Brief Pain Inventory short form (BFI-sf).
- To determine and compare the impact of a six-week education and exercise rehabilitation programme on the quality of life of patients living with weight-bearing joint pain using the EQ-5D-3L.
- To determine and compare the impact of a six-week education and exercise rehabilitation programme on the self-efficacy of patients living with weight bearing joint pain using the Chronic Diseases Self-Efficacy Scale 6-item scale (CDSES-6).
- To determine and compare the impact of a six-week education and exercise rehabilitation programme on the physical function of patients living with weight-bearing joint pain using a battery of physical function tests.
- To determine the acceptability of a six-week education and exercise rehabilitation programme using a self-developed questionnaire.

1.6 Hypothesis

For females between the 50 – 70 who receive the care primary from a PHC clinics the impact of six-week education and exercise program will be to improve pain severity and pain interference scores on the BPI-sf. To improve quality of life scores using the EQ-5D-3L, improve self-efficacy score on the CDSES-6 and to improve physical function of a battery of physical function tests. The six-week education and exercise program will more greatly decrease pain severity and pain interference scores when compared to workbook and usual care interventions. The six-week education and exercise program will more greatly improve quality of life and improve self-efficacy score compared to the workbook and usual care interventions. The six-week education and exercise program will improve physical function more greatly than the workbook and usual care groups interventions.

The six-week education and exercise program will be acceptable to the participants.

2. LITERATURE REVIEW

2.1 Introduction

The literature review was performed using information sourced from various electronic databases, including PubMed Central, BMC Health Services Research; EBSCO search engine; CIHNAL; Science Direct; Research Gate; Medline, and Google Scholar. Only English literature was included. The keywords used in the search strategy were: “musculoskeletal conditions”; “joint pain”; “chronic joint pain”; “non-communicable diseases”; “chronic disease”; “physical activity”; “health education”; “health promotion”; “primary health care”; “primary care physiotherapy”; “exercise”; “exercise prescription”; “self-management” and “self-efficacy.” There were no date limits sets for the search, and cross-referencing was used to identify literature not found in the literature search but deemed appropriate for the literature review.

This literature review discusses the prevalence of musculoskeletal conditions (MSC) and the prevalence of MSC in weight-bearing joints, which are common areas for non-specific joint pain. Following the discussion on the quantitative burden of joint pain, factors and variables that determine the quality of life of individuals living with joint pain are explored. Individuals living with joint pain often experience non-communicable diseases, and in this literature review, the relationship between non-communicable diseases and joint pain is unpacked. The primary health care clinic is the pathway into the health system in South Africa, and information is provided regarding joint pain management at this level of health care. Following the discussion of the primary health care sector, the literature review moves to a discussion on what has emerged in literature as the key intervention strategies of management of joint pain, as well as a discussion on education and exercise. The interventions that utilised a combination of health education and exercise are also discussed. A discussion on the medical interventions, namely surgery and the use of pharmacological agents concludes the literature review.

2.2 Pain

Pain is the most common complaint of all of humanity and is defined by the International Association for the Study of Pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in term of such damage"

(Loeser & Treede, 2008, p475). The description of pain recognises that pain may potentially be driven by actual tissue damage or may be modulated by many factors other than noxious stimuli (Jackson, 2017). The evolving understanding of pain changed from a purely biomedical understanding to a biopsychosocial understanding which comprehensively considers the multiplicity of factors that influence the pain experience (Jackson, 2017; Parker & Madden, 2020). The desire to objectively quantify pain reduces pain to a biological phenomenon negating the socio-cultural and subjective experience of pain, particularly pain in a chronic state (Neogi, 2013a; Markman, Gewandter & Frazer, 2020). South African women are said to have stoic attitudes towards pain, this results in a delay in seeking care until they experience significantly high levels of pain, and this delay in seeking care continues even when these women are regularly accessing care from primary health care clinics (Jackson, 2017; Barnes, Jelsma & Parker, 2018).

The effects of pain are widespread and impact on both the individual, their social well-being, social circle, and the health system (Dueñas et al., 2016). The physical consequences of pain include the loss of joint range of motion, diminished capacity to perform activities of daily living, this diminished capacity is often driven by a desire to avoid pain and fear of activities that may illicit pain (Borsook et al., 2018). Although pain intensity is not an indicator of tissue damage, the intensity of pain and functional limitations experienced by individuals are significant prognostic factors in the management of joint pain (Parker & Madden, 2020; Quentin et al., 2021). Joint pain can lead to sleep disturbance, where the experience of severe pain results in a sleep disturbance, and a bad night of sleep results in experiencing an increase in pain the following day (Dueñas et al., 2016). Pain is often highly distressing psychosocially and can cause depression, and relational tension between individuals living with pain and people with whom they interact (Borsook et al., 2018).

The management of joint pain utilising the biopsychosocial approach requires that physiotherapists adopt changes in treatment approaches developed by the pain neurosciences, from trying to decrease pain but also to equip both physiotherapists and patients to understand the underlying drivers of pain and respond accordingly, thereby forming an alliance in the management of pain (Leary et al., 2020; Parker & Madden, 2020). This approach ensures that individuals with joint pain are not passive recipients of care but become actively involved in managing their joint pain, including managing their pain severity, pain inference, and managing the psychosocial consequences of pain (Neogi, 2013b; Wahl et al., 2018).

2.3 Musculoskeletal conditions

Musculoskeletal conditions (MSC) are a group of 150 different conditions that affect the locomotor system, the common presenting complaint being "joint paint", and these conditions include low back pain; osteoarthritis as well as rheumatoid arthritis (Woolf & Pfleger, 2003; Briggs et al., 2018). Joint pain is a key motivator for individuals to seek help from primary health care providers, and globally one of three adults is affected by MSC (Woolf & Pfleger, 2003; Briggs et al., 2018). In literature, a clear distinction is made between primary joint pain and secondary joint pain, where primary joint pain is insidious and not attributed to an external injury or underlying musculoskeletal diseases, while secondary joint pain is attributable to external injuries (Saltzman et al., 2005; Barnes, Jelsma & Parker, 2018). It is a common occurrence that individuals with chronic joint pain do not have an identifiable tissue dysfunction or access to diagnostic tests to confirm pain, and thus experience insidious joint pain (Booth et al., 2017). In this study, of particular interest is primary joint pain and specifically in the weight-bearing joints, including the hip, knee, ankle, and lumbar spine, with the understanding that up to 80% of adults report experiencing pain in more than one joint (Walsh et al., 2013; de Luca et al., 2019). The experience of MSC or joint pain may become chronic pain which involves complex interactions between joint pathology, emotions, and psychological systems, and the management thereof requires a response to the various factors that drive pain (Hurley et al., 2013).

2.4 Prevalence of joint pain

A global burden of disease study indicates that musculoskeletal conditions are a significant cause for disability globally, accounting for 16% of all years lived with disability, and low back pain being the most disabling MSC globally since 1990 (James et al., 2018). There is a high prevalence of joint pain globally, with 30% of all adults reporting joint pain within the previous 30 days (Neogi, 2016). The prevalence of joint pain is increasing in both developing and developed nations, with 1.7 billion people living with musculoskeletal (MSC) conditions in 2012 (Briggs et al., 2016; Neogi, 2016). There is a marked increase in the prevalence of individuals living with joint pain in the age group 65 years and older, and the prevalence in this group is set to increase in the coming decades (United States Bone and Joint Initiative, 2015; Briggs et al., 2016; Neogi, 2016). Approximately 25% of European and 30% of American adults are living with a chronic MSC problem that limits everyday activities, including mobility, the ability to care for themselves, and completing other activities of daily living (Mody & Woolf, 2003; Health, 2005; Mlinac & Feng, 2016). In France, 27.7% of the population reported living with one or more MSC, equalling 17.3 million people living with a debilitating condition, and in a prevalence study amongst individuals 50 years and older, the prevalence of joint pain was 45.6% (Palazzo et al., 2014; Cimas et al., 2018). In a German telephonic survey determining the prevalence of MSC-related pain, the prevalence for current pain; pain in the past four weeks and pain in the last twelve months were 37.4%; 53% and 60% respectively (Thiem et al., 2013). In a study assessing chronic musculoskeletal (MSK) pain in South Africa and Uganda the prevalence of moderate pain was 34.5%, and the prevalence of severe pain was 15.7% the sampled populations (Wang et al., 2018).

In a South African township in Cape Town, 36% of adults above the age of 18, with one participant aged 97, who presented to PHC clinics were living with a MSC, and 63% of those individuals were females (Parker & Jelsma, 2010). Similarly, in a Bloemfontein peri-urban area PHC clinic, the prevalence of MSC was 36% for patients aged between 19 – 82 years old, with 64% of the sample being female (Copley et al., 2013). In a peri-urban township in Tshwane, amongst adult clinic attendees the chronic pain prevalence was 41%, and within the chronic pain group, 30.83% of the individuals were living with back pain and 23.48% with peripheral joint pain (Rauf et al., 2013). Although joint pain is prevalent amongst primary health care clinic attendees, the reason for attending clinics is often to seek care for other chronic diseases such as hypertension, diabetes mellitus type 2, and heart problems (Parker & Jelsma, 2010; Copley et al., 2013; Rauf et al., 2013; Barnes, Jelsma & Parker, 2018). (Barnes, Jelsma & Parker (2018) found a significantly higher joint pain prevalence amongst clinic attendees in the Free State (58.2%) of a study sample of women between the ages of 40-64 years as compared to earlier studies. Although joint pain may not be fatal, the prevalence of musculoskeletal conditions is a significant cause for increased years lived with disabilities, especially in older populations, and overall, the second largest contributor to years lived with disability in various countries and regional territories (Parker & Jelsma, 2010; Vos et al., 2012; Blyth et al., 2019).

2.5 Burden of joint pain

The significance of the burden of MSC was highlighted globally with the bone and joint decade from the year 2000 – 2010, and it is clear from the literature that the burden of joint pain is increasing rapidly (Woolf, 2000; Vos et al., 2020). The burden of disease is a broad term that addresses the technical and conceptual approach to measuring the impact of various health conditions, however the range of the health impact of MSC ought to also consider function and social participation, which is not included in the global burden of disease studies (GBD) (Blyth et al., 2019). The burden of MSC can be determined using various methods such as the challenges that are associated with the presence MSC, including pain, impaired function, aetiology of the MSC, or the diagnosis attributed to the MSC (Woolf & Pfleger, 2003; Woolf, Vos & March, 2010).

The burden of joint pain statistics may vary as different methods of surveillance of MSC are used by researchers, including areas of non-specific pain localised to a body region, amongst which neck and back pain are the most common areas of pain (Jhun & Sung, 2013; Morris et al., 2018). A specific diagnosis is often localised to body regions and can be used to track the incidence or prevalence of MSC like osteoarthritis of the hip or knee joint (Kassebaum et al., 2016; Moss et al., 2016). Amongst the 150 conditions that are considered MSC, the most common of these conditions are osteoarthritis, osteoporosis, back and neck pain (Briggs et al., 2018).

Bythe et al. (2019) in an editorial piece, discussed the challenges of estimating the burden of disease related to non-specific pain during various stages of MSC, and in the absence of tissue-based cause of pain. The severity of disability is the extent that the presence of MSC limits the movement and function of an individual. The prevalence measure of musculoskeletal conditions is often underestimated due to measurement errors related to case definitions of the various conditions(WHO, 2011). To gain a comprehensive view, an amalgamation of these various methods of quantifying MSC prevalence and incidence can be used by looking at population percentages and disease-adjusted life years (Blyth et al., 2019).

The Global Burden of Disease (GBD) studies are population-based surveys that assess health, and are often used as guides to measure the prevalence of disease in the form of years of life lost (YLL) to premature death, years lived with disability (YLD), both of which are used in the calculation of disability-adjusted year (DALYS). Years of life lost is an estimate of the number of years an individual would have lived had they not demised prematurely due to disease, and DALY is the sum of years of life lost and years lived with disability (DALY = YLL+YLD) (James et al., 2018). These measures have been utilised and published since 1990 and the GBD studies allow for useful estimates regarding the burden of MSC, and of disability related to low back pain and osteoarthritis, which have high DALYS (Vos et al., 2012; Kassebaum et al., 2016; James et al., 2018). Another measure utilised is the quality adjusted life year (QALY), which is a metric where one year lived in perfect health is equal to one QALY.

Years lived with disability for MSC constituted a count of 334 744.9 thousand in 2017, a change of 38.4% from 1990 (James et al., 2018). The disease-adjusted life years were 1994.7/100 000 in 2017 with a 61.6 % change from 1990 to 2016, while the disease-adjusted life years (DALYS) for individuals with musculoskeletal conditions increased by 34% between 1990 and 2016 (Vos et al., 2020). This denoted a 19.6% increase in the decade from 2005 – 2015 where individuals living with low back pain contributed to 10.7% of total years lived with disability (Vos et al., 2012; Kassebaum et al., 2016). The quality adjusted life year was 1612.6/100000 amongst females between 40 -64 years who attended clinics in Bloemfontein, South Africa, which was lower than that of the global estimate of 4722/100 000 in females between the ages of 50 -69 years (Barnes, Jelsma & Parker, 2018; Blyth et al., 2019).

Associated with the years lived with a disability are the direct and indirect costs of treatment, particularly those related to the loss of productivity during the presence of joint pain (Blyth et al., 2019). In Germany, the costs associated with MSC is 26.6 billion Euros, which represented 11.3% of total health care expenditure, while OA accounts for 3.3% of total health expenditure at the cost of 7.1 billion Euros (Thiem et al., 2013). In 2005, the direct costs in Canada for joint pain management were $2300 per individual, and the indirect cost of OA was estimated to be $17.6 billion in lost wages of people who stopped working (Gupta et al., 2005; Sharif et al., 2017). In Australia, 80 000 workers retired early due to joint pain at the cost of AUS$ 3.8 billion in personal income lost annually (Gupta et al., 2005).

As can be seen from the above, joint pain has been shown to lead to significantly higher rates of productivity loss compared to individuals that do not live with joint pain, with individuals between the ages of 55 – 64 years showing the highest loss of income (Sharif et al., 2017). Women in rural settings are the most likely to bear higher individualised costs for joint pain as access to care is scarce and the sequalae of illness will impact more readily because of impeded access to health care (Gupta et al., 2005; Blyth et al., 2019). Rural communities are often subsistence communities where joint pain results in a loss of livelihoods (Briggs et al., 2016).

The global burden of disease studies has consistently demonstrated that MSC contributes substantially to disability at a high cost to health systems in both developing and developed nations. There seems to be a particular demographic population which MSC more significantly impacts, and in the next section, this is discussed.

2.6 Age

Age is strongly associated with an increased prevalence of joint pain in both high and low-income countries (Ralston, 2018; Wang et al., 2018). When the prevalence of joint pain is adjusted for people over the age of 50 years, the prevalence is significantly higher than for the entire population's prevalence of joint pain (Coleman et al., 2008; Nguyen et al., 2011; Walsh et al., 2013; Hunter, Schofield & Callander, 2014; Blyth et al., 2019). In population surveys across the United States of America (USA), the prevalence of knee pain has increased by 66% when adjusted for body mass index (BMI) and age, and this increase has been consistent from 1974 to 1994, with a subsequent increase anticipated in the following decades (Nguyen et al., 2011; Neogi & Zhang, 2013). The self-reported doctor-diagnosed prevalence of arthritis was 21.6% in the general population in 2003 in the United State of America, where half of older patients below 65 years of age reported a doctor-diagnosed arthritis (Helmick et al., 2008). In six low and middle-income countries, including South Africa, the prevalence of joint pain was consistently increasing in all six counties with the peak of joint pain in South Africa in the 60 to 69-year-old age group (Brennan-Olsen et al., 2017). In rural settings where the elderly is required to continue with participation in community activities, there is a need to prioritise a response to joint pain amongst older individuals and amongst those whose joint pain is at a peak (Cimas et al., 2018; Ralston, 2018; Gill et al., 2021).

2.7 Females

Joint pain is not consistent between males and females, with women experiencing higher levels of joint pain than men. In the older Chinese population, the prevalence of knee joint pain was 22% in men and 43% in women, while in a rural Japanese population, the prevalence of knee joint pain was 30% in women compared to the significantly less 11% in men (Fransen et al., 2011). A systematic review conducted by Dagenais, Garbedian & Wai (2009) results contrasted with the results of the study conducted by Fransen et al (2011). The study of Fransen et al's (2011) results were for Asian countries and for people 15 – 99 years of age where for Deganais and colleagues (2009) the prevalence of hip pain was greater amongst men than in women in a global study with ages ranging from 19 -91 years, however, the findings of the study was not statistically significant (Dagenais, Garbedian & Wai, 2009). (Hoy et al. (2012) in their systematic review, found that the median prevalence of back pain was higher for women than men and that the difference became more pronounced in older populations. During analysis of joint pain where the researchers controlled for age, women showed a consistently higher prevalence of joint pain than males (Jhun & Sung, 2013). (Hurley et al. (2018) in their review of studies on hip and knee pain found that few studies exclusively recruited females for participation yet the number of females enrolled in studies consistently outnumbered the number of males.

Therefore, it is evident that advanced age and being female are two intrinsic predisposing factors for joint pain and should be considered when planning joint pain management (Bitton, 2009; Fransen et al., 2011; Hoy et al., 2012).

2.8 Body Mass Index

Alongside age, and being female, having a higher body mass index (BMI) is also a risk factor for experiencing more severe pain (Nguyen et al., 2011). Individuals with a higher body mass index (BMI) are reported to experience more severe pain than individuals with a lower BMI; and when individuals with joint pain lose weight, they experience a decrease in pain (Rogers & Wilder, 2008; Nguyen et al., 2011; Plotnikoff et al., 2015). The physiological production of leptin is often seen as the driver of pain as leptin is released by white adipose tissue, which affects cartilage. Chondrocytes have a leptin receptor, and a higher concentration of leptin is found in arthritic joints as compared to joints without arthritic changes (Duclos, 2016). Increased loads can often drive increased deterioration of joints due to higher BMI (Duclos, 2016). Obesity and inactivity have a well-established association and decreased physical activity, which is also a risk factor for joint pain, contradicts a commonly held view that physical activity may be a driver of joint pain (Plotnikoff et al., 2015; Duclos, 2016). The association of joint pain and BMI was more significant amongst females than males, although fortunately, BMI is among the modifiable risk factors for joint pain (Plotnikoff et al., 2015).

2.9 Osteoarthritis

Arthritis is a generic term used to describe rheumatic musculoskeletal conditions with the primary symptom of joint pain, and the most common of the rheumatic conditions being osteoarthritis (OA). The term arthritis includes but is not limited to rheumatoid arthritis, fibromyalgia, and gout (Sacks et al., 2005; Murphy et al., 2019). OA is the most common diagnosis made when the symptom of pain is not driven by an underlying systemic disease, autoimmune illness, or recent external injury (Briggs et al., 2018). The burden of OA has been investigated numerous times, and the DALYS of OA increased by 104.9% in the period from 1990 to 2016, which translates to a 63.1% change in years lived with disability (Hay et al., 2017; James et al., 2018).

The prevalence of nonspecific joint pain is not reported readily as compared to prevalence of regional joint OA, which is often seen as a proxy for joint pain (Moss et al., 2016). An everyday diagnosis of joint pain simply being OA means that the prevalence of OA can be representative of non-specific joint pain, whether it is self-reported or a diagnosis communicated to patients by primary care providers (Sacks et al., 2005; Storheim & Zwart, 2014; Barbour et al., 2017).In studies evaluating primary joint pain, OA was often discussed as formally diagnosed by doctors or self-reported by individuals (Zhang, Doherty, et al., 2010). Clinically the terms “joint pain”, “osteoarthritis”, and “arthritis” are used interchangeably. Epidemiological studies discussing joint pain often omit a clear operational definition for the diagnosis of OA, and therefore a layman diagnosis of OA provides a clinical nomenclature to the experience of pain within the joints (Gooberman-Hill et al., 2007; Jessep et al., 2009; Morden, Jinks & Ong, 2014). The challenge of OA as a diagnosis is that there are two main categories of OA: radiographic OA and symptomatic OA (Neogi, 2013a). Radiographic OA is defined using the Kellgren-Lawrence definition which is a grading scale of zero to four of changes seen on X-rays, and people with radiographic changes do not necessarily have pain, whereas symptomatic OA is joint pain where there are changes visible on X-ray alongside pain (Neogi & Zhang, 2013). Symptomatic OA prevalence rates provides great clinical insight because there is pain which can be attributed to changes in the joints (Kellgren & Lawrence, 1957; Neogi, 2013a; Neogi & Zhang, 2013; Kohn, Sassoon & Fernando, 2016). Nguyen et al. (2011) noted that in the United State of America both knee pain and symptomatic osteoarthritis resulted in an increased need for total knee replacement surgeries which is a management strategy for severe cases of osteoarthritis illustrating the interchangeable nature of the description and diagnosis.

Please refer below to Table 1 indicating the diagnostic criteria for OA as stated by The European League against Rheumatism and The American College of Rheumatology (Altman et al., 1986; Zhang, Doherty, et al., 2010).

Table 1 Table 1 OA diagnostic criteria

The European League against Rheumatism (EULAR) diagnostic criteria for OA (Zhang, Doherty, et al., 2010)	The American College of Rheumatology (Altman et al., 1986)
Symptoms: Persistent knee pain Limited morning stiffness Reduced function Signs: Crepitus	History and Physical Examination: Knee pain + any three of the symptoms below: > 50 years >30 minutes of morning stiffness Crepitus on active movement Bony tenderness Bony enlargement

Restricted movement	No palpable heat
Bony Enlargement	Pain
Joint Effusion	
Radiographic OA	
Risk Factors:	
Age 50 years	
Female	
Higher BMI	

2.10 Most common areas of joint pain

2.10.1 Back pain

Low Back Pain (LBP) is the leading cause for years lived with disability in the world and a significant public health challenge (Palazzo et al., 2014; Quentin et al., 2021). Most people will experience back pain at some point in their lives, and those who experience activity limiting back pain will go on to experience recurrent back pain episodes (Hoy et al., 2010; Driscoll et al., 2014). Prevalence data in middle and low-income countries is not readily available, in contrast there is increasing data produced from high-income countries regarding low back pain (Hoy et al., 2012). In a systematic review of global LBP, the general prevalence was 31%, where the point prevalence was 18.3% and the one-year prevalence was 38% (Hoy et al., 2012). The African lifetime prevalence of LBP was significantly higher at 47%, and the one-year prevalence of 57% is more than the percentages reported by Hoy et al. in (2012) (Morris et al., 2018). The prevalence of LBP in Africa has an extensive range of 14% -72% in a year, whereas in western counties, the range was between 20%S- 62% in adults, indicative of a public health problem in Africa that may be going unreported and not planned for in public health systems (Louw, Morris & Grimmer-Somers, 2007; Morris et al., 2018). A systematic review of LBP prevalence found that while LBP increased with age with the highest prevalence amongst 40 – 69-year-old individuals, the prevalence peaked earlier for males than females, seemingly during their economically productive years (Hoy et al., 2012). In the United States of America, LBP was reported as most disabling in the elderly over 75 years, a cumulative effect of joint pain and ageing (Docking et al., 2011; Hoy et al., 2012). LBP arising from occupation linked activities accounted for 35% of disability Adjusted Life year (DALYS) amongst workers between the ages of 35 – 55 years globally (Driscoll et al., 2014).

In order to determine the economic burden of LBP, the direct and indirect costs related to the management of LBP should be considered (Odole et al., 2011). The expenditure on the direct management of LBP in the United Kingdom was £ 12.3 billion as early as in 2000, whereas the expenditure of LBP in the United States of America is approximately $100 billion per year in both direct and indirect expenditure (Katz, 2006; Docking et al., 2011). The cost of indirect expenditure is calculated considering absence from work, the loss of productivity due to absence or limitation in productivity, and the cost of providing care in the form of transportation and other expenses (Maniadakis, Maniadakis & Gray, 2016).

LBP prevalence in South Africa has not been determined at a national level but prevalence has been determined on primary health care level (Major-Helsloot et al., 2014; Yates, Jelsma & Parker, 2017). LBP rates at a clinic in Cape Town are 73.2%, amongst PHC clinic patients who experienced LBP 26.3% of the study sample reported pain for longer than three months, which was higher than the 39%-point prevalence in a systematic review of LBP prevalence in Africa (Major-Helsloot et al., 2014; Morris et al., 2018). In a study determining national chronic pain levels, interviewees reported a 30.5% prevalence of back pain (Kamerman et al., 2020). In a Bloemfontein clinic, among the participants with pain, 42.57% reported back pain (Copley et al., 2013).

2.10.2 Hip Pain

The hip joint is among the joints commonly affected by joint pain, but the prevalence of joint pain in the hip is not as high as the low back and knee joints (Jotanovic et al., 2015). Individuals affected by knee joint pain often develop hip joint pain at a later stage due to biomechanical changes that occur during walking (Dawson et al., 2004). A multicounty systematic review placed hip primary OA ranges between 0.9% and 27% with a mean prevalence of 8% in the 39 studies included (Dagenais, Garbedian & Wai, 2009). In adults above 50 years of age in the

United States of America, the hip joint pain prevalence was 24.7% for women and 14.7% for men, and the prevalence of hip OA was less than that of non-specific joint pain at 13.6% for both sexes (Kim et al., 2015). Moss et al. (2016) reported on incident rates for symptomatic hip pain as well as hip OA and divided the hip pain into three types: symptomatic; radiographic and severe radiographic hip OA. The study was based in Johnston County, North Carolina, in the United States of America, and the authors found that symptomatic hip pain was higher at 37/1000, symptomatic OA was 23/1000, radiographic OA 13/100 and severe OA 2.9/1000 (Moss et al., 2016).In South Africa, the prevalence of hip pain has only been reported as part of studies surveying pain in general (Rauf et al., 2013; Barnes, 2016). A national study on chronic pain found that pain in the whole limb, which includes hip pain, to be 43.6% of the sample (Kamerman et al., 2020). In their study, Parker & Jelsma (2010) found that only three participants (0.8%) of the sample experienced standalone hip joint pain, but 44.2% of the participants experienced hip pain alongside another lower limb joint pain.

2.10.3 Knee and ankle pain

Knee joint pain is one of the most common forms of joint pain and results in disability and limited mobility, particularly amongst the elderly, while individual knee pain is the most common symptom in people presenting with osteoarthritis (Skou et al., 2012; Neogi, 2013a; Thorstensson et al., 2015). In The United States, knee OA in adults above 45 years was 18.6% in males from a Framingham OA study; 19.3% for females and 19.2% across both sexes (Neogi, 2013b). In a Johnston County OA project, the prevalence rates were higher with 24.3% and 30.1% for males and females, respectively, with an average of 27.8% (Lawrence et al., 2008). In a Korean population wide study, the prevalence of knee pain was 23.1% in all subjects and 31.9% and 11.7% for females and males respectively, in people 50 years and older (Jhun & Sung, 2013). In a clinic survey of joint pain in South Africa, knee joint pain ranged between 13.3% to 38% of all body areas responsible for joint pain (Parker & Jelsma, 2010; Copley et al., 2013).

Surgical management of knee pain in the form of knee arthroplasty has tripled in the period from 1991 to 2006 and increased to 138.7 people from 42.5 people per 100 000 worldwide (Nguyen et al., 2011). OA joint pain accounted for 55% of all joint pain related admissions in the United Kingdom, and the cost of joint replacements to manage joint pain was $22.6 billion dollars in 2004 which increased significantly from $7.9billion in 1997, in Australia the cost of joint replacement to health system was $AUD1.2Billion (Chen et al., 2012; Ackerman et al., 2019). There is no national register for the number of joint replacements in South Africa, however, it is estimated that between 8000 – 10 000 joint replacement surgeries are done annually in South Africa (News, 2019).

There is less research on the epidemiology of ankle joint pain compared to the larger lower limb joints (Valderrabano et al., 2009). The estimated global range for ankle joint pain is between seven and 15%, where a community survey in England placed the prevalence at 8.8%, which is significantly lower than the prevalence of f knee OA of 18.6% in England (Neogi, 2013a; Murray et al., 2018). Ankle joint pain is attributed mainly to OA, and secondary to previous traumatic injuries for example fractures or recurrent ligament sprains (Saltzman et al., 2005; Murray et al., 2018). Although total hip and knee replacements are significant cost drivers for OA management, arthrodesis of the ankle joint is usually the chosen strategy for managing traumatic ankle pain (Saltzman et al., 2005).

2.11 Quality of life

In chronic long-term diseases the measurement of life and death does not suffice to fully understand the impact and severity of a disease (Karimi & Brazier, 2016). The concept of qualify of life (QOL) describes the impact of illness beyond morbidity and biological functioning and includes subjective well-being experiences. Health, as defined by the World Health Organisation (WHO), is not just the absence of infirmity but also the holistic well-being, including the physical, social and mental aspects of the individual affected by the disease (Karimi & Brazier, 2016). QOL can be determined by utilising different measurement instruments which comprise of set dimensions including mobility, physical function, self-care, activities of daily living or usual activities, as well as social and emotional functioning (Jelsma & Maart, 2015). The measurement of qualify of life has been shown to be effective and valid and allows health care professionals and policy makers the opportunity of using various measurement instruments to investigate and plan for interventions in individuals living with various health conditions based on their quality of life (Jelsma & Maart, 2015).

Individuals with joint pain experience variable levels of quality of life, with individuals with severe joint pain having poor QOL and increased levels of psychological distress compared to the general population (Ackerman, Bennell & Osborne, 2011; Jhun & Sung, 2013). In a Korean population wide survey, it was found that all adults with joint pain experienced lower QOL scores compared to individuals without joint pain, and those with more severe experiences of knee pain also had lower QOL scores (Kim et al., 2011). QOL scores decrease with an increase in the number of joints with pain, which correlates with the loss of independence (Finney et al., 2017).

The QOL of individuals with joint pain is not static and can continue to decrease, evident in individuals awaiting joint replacement surgeries (Saw, 2015). The individuals awaiting joint replacement surgeries experienced a decrease in QOL during the waiting period, and unfortunately for these individuals, lower QOL scores indicate poorer post-operative outcomes (Ackerman, Bennell & Osborne, 2011). In a systematic review of exercise interventions for hip and knee joint pain, exercise improved quality of life outcome, particularly social functioning (Hurley et al., 2018). (Barnes, Jelsma & Parker, 2018) found that South African women between the ages of 40-64 years had lower quality-adjusted life years compared to the global estimates of their peers. Improvement in the OQL of individuals with joint pain can therefore be achieved with exercise, health education, or mixed interventions as indicated by previous research studies (Lorig, Sobel, et al., 2001; Coleman et al., 2010; Saw et al., 2016).

An individual's QOL should be attributed greater importance in the health framework, its impact must be considered when planning interventions for joint pain. The biopsychosocial model is one such health framework. The functional limitations and disabilities that coexist with joint pain can significantly impact the quality of life.

2.12 International Classification of Function

MSCs are the leading cause of disability in four of the six world health organisation regions, with the resulting disabilities having a significant bearing on individuals with MSC (WHO, 2019). The International Classification of Function (ICF) conceptualised health, function, and disability from the understanding of the human experience and provided a means by which factors external to the individual and individual's experiences can be factored into functioning and disability (Cieza & Stucki, 2008). The ICF framework (Figure 1 below) ensures that disability and diagnosis are not conflated, but that disability is understood as a relationship between diagnosis, impairment, subsequent activity limitation, participation restrictions together with environmental and personal factors which have bearing on the interlinked relationship (Cieza & Stucki, 2008). The comprehensive nature of the framework assists health professionals in understanding concepts and outcome measures within musculoskeletal research and provides a means by which disability can be described (Brockow et al., 2004). The ICF framework provides a platform for the complete expression of the biopsychosocial model of health where disability is a product of biological, social, and individual factors (Cieza & Stucki, 2008). The framework also provides a tool with which health professionals can plan and communicate interventions where the individual's challenges are considered, a person-centred approach (Stucki & Ewert, 2005).

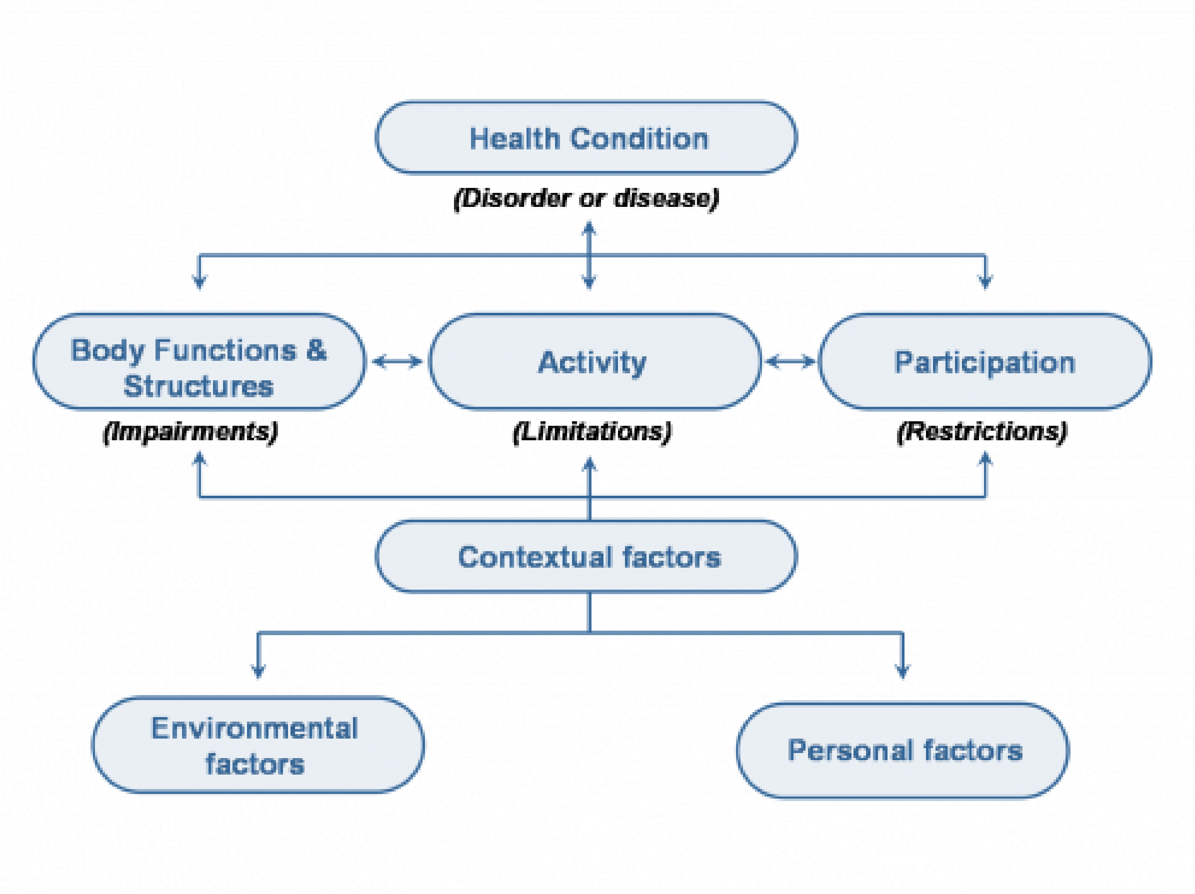

Figure 1 ICF Framework

Musculoskeletal conditions are a group of conditions that fall into the realm of a health condition according to the ICF. Impairments including pain, decreased range of motion and decreased muscle strength all influence activities, for example walking, stair climbing, and self-care activities which may result in an inability for the individual to fully participate in social activities (Pollard, Johnston & Dieppe, 2011). The relationship between joint pain and activity limitations is bidirectional, which implies that the activity limitations and participation restriction can worsen the impairment and other health conditions that depend on physical activity as part of their management (Stucki & Ewert, 2005). In addition, joint pain can lead to psychosocial impairments and activity limitations, including but not limited to altered mood and interrupted sleep (Stucki & Ewert, 2005; Machado, Gignac & Badley, 2008). The severity to which an individual experiences pain is not exclusively responsible for participation restriction, but the contextual issues, personal factors and environmental factors can also impact how an individual experiences participation restriction (Machado, Gignac & Badley, 2008).

Personal factors both variable and invariable factors, where invariable factors include age, race, and education level influence the impairment and limitations of individuals (Stucki & Ewert, 2005; Cieza & Stucki, 2008). The age of individuals tends to predispose them to joint pain, as discussed earlier and to non-communicable diseases such as hypertension, diabetes mellitus type 2, and heart disease (Donald & Foy, 2004; Anderson & Durstine, 2019). The sedentary lifestyle of individuals means that physical inactivity is also viewed as a personal factor that adds to the predisposition of joint pain and comorbid conditions (Joubert et al., 2007). The BMI of an individual is also a personal factor that predisposes the individual to joint pain and can contribute to the experience of severe joint pain, as described in section 2.9 (Plotnikoff et al., 2015). A population survey of South Koreans found that individuals with lower levels of education had a greater risk of knee joint pain although no reason for this was provided (Lee et al., 2021). In a study of six low and middle-income countries those with formal education below the level of secondary school were more likely to report pain and, at the same time, more severe pain than their counterparts with a higher level of education (Brennan-Olsen et al., 2017). A Japanese study investigating post-operative pain and educational status indicated an association between educational status anxiety and depression where individuals experienced greater severity of pain and anxiety when less educated (Lanitis et al., 2015). The author has hypothesised that the comprehension related to the pain experience was a possible reason for this finding (Lanitis et al., 2015). It is therefore clear that there is a higher risk of joint pain amongst individuals with lower levels of education, and in South African primary health care clinics, the level of education amongst respondents in multiple surveys does not seem to extend beyond secondary education, predisposing the individuals to a higher risk of joint pain (Parker & Jelsma, 2010; Brennan-Olsen et al., 2017; Barnes, Jelsma & Parker, 2019). It is therefore essential that information relating to pain must be communicated and tailored in such a way to aid the comprehension of individuals living with pain, particularly those individuals with lower educational levels (Jhun & Sung, 2013; Lanitis et al., 2015; Yates, Jelsma & Parker, 2017).

2.13 Physical activity

The World Health Organization (2015) has defined physical activity as, any bodily movement that requires energy expenditure, including various activities leisure and work activities. Whereas the American College of Sports Medicine 2018 defined physical activity as “any” bodily movement that results in skeletal muscle using additional energy compared to the body being at rest” (American College of Sports Medicine, 2018, p49). Exercise and physical activity while being closely related, are not synonymous. Exercise is included within the definition of physical activity, but exercise is viewed as a physical activity where the goal is improving and or maintaining a component of physical fitness. These activities are planned, structured, and usually consist of repetitive body movements (Caspersen & Christenson, 1985; American College of Sports Medicine, 2018). When discussing exercise and physical activity amongst people living with joint pain and other chronic diseases the terms exercise and physical activity are often used interchangeably (Kassebaum et al., 2016; Neogi, 2016; Geneen et al., 2017). Physical fitness is the “ability to carry out daily tasks with vigour and alertness, without undue fatigue and with ample energy to enjoy leisure-time pursuits and to meet unforeseen emergencies” (Caspersen & Christenson, 1985, p126). Exercise and physical activity have been shown to be effective across varying degrees of joint pain and are considered the departure point in the conservative management of joint pain (Bennell & Hinman, 2011). The prevention of chronic pain is linked to greater physical activity, as chronic pain seems more common amongst sedentary individuals (Law & Sluka, 2017).

Physical activity is an essential part of the wellbeing of all individuals and the benefits of physical activity are universal, benefitting people of all ages, ethnicities, and sexes (World Health Organization, 2015). Physical activity is one of the cornerstones of the prevention and the management of various non-communicable diseases, and exercise is a first-line intervention in managing joint pain (Jessep et al., 2009; United State Department of Health and Human Services, 2018a). Although there is a drive to increase participation of all people in physical activity and increase the amount of physical activity across all groups despite these efforts, there are still persistently high levels of sedentary individuals worldwide (Sallis, 2011). While information on the benefits of exercise is widely available, and there are public health awareness campaigns to encourage exercise, very few people embrace exercise for reasons as simple as not knowing how to exercise, or community environments which make exercising unsafe (Joubert et al., 2007; Duncan et al., 2010; United State Department of Health and Human Services, 2018a).

Sedentary behaviour is engaging in activities with low metabolic demands such as lying down or sitting and people with joint pain have fewer active lifestyles compared to individuals without pain and live sedentary lives (Tremblay et al., 2017; Jönsson et al., 2018). The avoidance of physical activity and exercise are often related to ill-informed beliefs such that exercise has no benefit for pain, and one must remain sedentary to manage pain, thus further exacerbating the lack of cardiovascular fitness and strength in the individual (Hanney, Kolber & Beekhuizen, 2009). Thirty-seven percent of the osteoarthritic population living with joint pain are defined to be inactive, and South Africans generally have a lower level of physical activity compared to global levels; and those individuals living with joint pain have even lower levels of physical activity than the general population (Joubert et al., 2007; Gay et al., 2016; Parker et al., 2017). South African females were less active than their male counterparts, and more than half of all adults in the Free State province were reported to be classified as inactive in two separate studies (Joubert et al., 2007; van Zyl et al., 2012).

Pain often limits physical activities that are done as part of daily living, causing these individuals to experience further limitations affected by various changes and demands related to ageing (Bennell & Hinman, 2011; United State Department of Health and Human Services, 2018a). In the older population groups, people above 50 years, the normal ageing process decreases the capacity for physical activity and, consequently, exercise (Chodzko-Zajko et al., 2009). Social and cultural constructs and the perceptions of physical activity can affect how people in different communities' view exercise, with the exercise being seen as inappropriate for older women deterring some older women from of engaging in physical activity (Orhan et al., 2018). A commonly held idea amongst rural people is that physical activity in the form of exercise is only for younger people (Lees et al., 2005; Jaeschke et al., 2017).

Individuals living with joint pain often experience both intrinsic and extrinsic barriers to exercise (Gay et al., 2016). The intrinsic factors that often limit participation in exercise are previous experiences of pain and views held about ageing and exercise while experiencing joint pain (Gay et al., 2016). Individuals that have advanced years and living with non-communicable diseases may have an aversion to exercise due to difficulties related to doing activities of daily living. They have doubts about engaging in exercises in general, and more so as part of managing their symptoms, and these beliefs may be reinforced by poorly implemented exercise management programmes (Hurley et al., 2007; Rivera-Torres, Fahey & Rivera, 2019).

An extrinsic barrier to exercise is the environment in which patients live, especially in South Africa. Lower-income socioeconomic environments do not have spaces to exercise safely, and safety during exercise is a challenge in these communities, especially for women who are more vulnerable to incidents of contact crimes, further deterring individuals from exercising to relieve their joint pain (Hurley et al., 2018). The novel SARS-Cov-2 pandemic has added to the barrier to exercise in the first half of 2020 where people were forced into lockdown, and in South Africa, there was limited time for exercise as stipulated by National Guidelines. In addition, people older than 60 years and those with non-communicable diseases were required to isolate from the public, limiting exercise opportunities (Margaritis et al., 2020).

There is an interplay between a positive disposition towards exercise, perceptions of improvement in joint pain symptoms, and motivation to continue with exercise, and interventions for joint pain are required to manage this relationship (Campbell et al., 2001; Ambrose & Golightly, 2015). These factors will be explored more closely in the discussion on self-management and self-efficacy.

2.14 Non-communicable Diseases

Global life expectancy has been rising with advances in the management of infectious and non-communicable diseases (NCD), decreasing fatalities and increasing individuals that live with chronic diseases (Blyth et al., 2019). Non-communicable diseases cannot be transferred from person to person and affect a similar population to those living with joint pain. These non-communicable diseases include hypertension, diabetes mellitus type 2, and various cardiac illnesses (Briggs et al., 2016). Although MSC do not feature prominently amongst the plethora of other non-communicable diseases it should be included in the planning of NCD's within the health system (Blyth et al., 2019; Gouda et al., 2019)

Musculoskeletal health is a vital part of the non-pharmacological strategy used in the management of NCD, and individuals need to exercise to yield benefits that allow for the management of NCD (Briggs et al., 2016). Globally there have been efforts to manage non-communicable disease by the World Health Organisation (WHO) and other organisations, and these efforts have been replicated in South Africa, nonetheless the prevalence of NCD continues to increase (Ndinda et al., 2018). Sub-Saharan Africa, which includes South Africa, experiences higher rates of non-communicable diseases than any of the other three African regions (Gouda et al., 2019). This increase is not only attributed to population growth but also to a change in the lifestyle and diet of sub-Saharan Africans (Gouda et al., 2019).

Diabetes mellitus type 2, hypertension and heart disease are NCD that receive public health and policy attention, whereas there is often inadequate response to the public health and policy needs of MSCs (Briggs et al., 2018; Blyth et al., 2019). The risk factors associated with non-communicable disease, such as physical inactivity, unhealthy diets, alcohol, and tobacco use, are similar to those that predispose MSC, particularly those associated with ageing (Ndinda et al., 2018). The comprehensive management of individuals with NCDs requires that concerns be directed to the coexisting MSCs (Briggs et al., 2018). The presence of joint pain increases the chances of developing these NCD's mainly in the aged and those with sedentary lifestyles, the commonality between these conditions is best displayed in the common risk factors (Briggs et al., 2018). Individuals with joint pain are more likely to be sedentary, which increases the risk of chronic diseases of lifestyle, because physical inactivity is a primary driver for hypertension, diabetes mellitus type 2, and coronary heart disease (Schoster et al., 2005; Nunan et al., 2013).

The increase in the prevalence of non-communicable diseases is consistent with global trends where 45% of diseases in low and middle-income countries are attributed to non-communicable diseases, and globally the disease adjusted life years of non-communicable disease increased to 61.4% in 2016 from 43.9% in 1990 (Cerniauskaite et al., 2011; James et al., 2018). There has been evidence of higher levels of patient mortality linked to the presence of co-morbidities in patients with joint pain (Gay et al., 2016). Cardiovascular diseases contributed to 15.1% of the total DALY of NCDs in Sub-Saharan Africa, where DM2 had increased by 126.4% between 1990 – 2017 (Gouda et al., 2019). In a clinic in Cape Town, among those with joint pain, 59.1% were living with had hypertension, 24.8% were living with DM2, and 18.9% experienced heart problems (Parker & Jelsma, 2010). In the Free State Province, a self-reported survey in the general population reported an 11.1% prevalence of DM2 and 62.6% of hypertension in the rural areas amongst adults between the age of 24 -64 years (van Zyl et al., 2012). When trying to manage NCDs, the concurrent management of joint pain forms an integral part of the person-centred approach (Hoy et al., 2015).

(van Zyl et al., 2012) suggested that in managing of NCD, there is a need for low-cost interventions that facilitate an increased knowledge of risk factors and also improve physical activity levels. The impact of NCD on the musculoskeletal system must be monitored and reported to the public health system to complement the existing evidence that with health education and exercise, there can be improvements in the quality of life of individuals living with NCD and joint pain (Anderson & Durstine, 2019; Blyth et al., 2019).

2.15 Primary Health Care Settings

In 1994 the Primary Health Care approach was adopted as the health care strategy for the provision of health care services by the South African government as a response to the racial and social inequalities that existed in health care as a result of apartheid (Maleka, Franzsen & Stewart, 2008; Bresick, von Pressentin & Mash, 2019). At the Alma Ata Declaration (1978) the World Health Organisation defined PHC as, “essential health care based on a practical, scientifically sound and socially acceptable method and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain."

The approach requires that health care services be provided as close as possible to where the patients live (Maillacheruvu & Mcduff, 2014; Malakoane et al., 2020). The primary health care approach care continuum includes health promotion, preventions of illness, treatment of illness, rehabilitation and palliative care. This health care philosophy is policies expressed that rehabilitation would be provided via the district health systems using the principles of primary care, which ensures that services are provided from the primary level of care through to the tertiary level of care (Dayal, 2010; National Department of Health, 2015). However, in preparations for the roll-out of the national health insurance, the South African government desires to re-engineer primary health care services, a plan in which little to no considerations was given to the role of physiotherapists and other rehabilitation professionals (Myezwa & Van Niekerk, 2013).

Whilst the PHC clinic in South Africa are open to all and despite the legislated policy of free primary health care services there is still unequal access to services across provinces and between rural and urban areas (Myezwa & Van Niekerk, 2013; Visagie & Swartz, 2016; Malakoane et al., 2020). Patients who access care in clinics in rural context are often serviced in situations that are understaffed and have less health care professionals, and where the infrastructure and built environment is inadequate to accommodate a large number of patients (Dizon et al., 2018; Malakoane et al., 2020).

The PHC clinics in South Africa are primarily nurse driven, where they are the first point of contact into the health system, the volume of patients overburdens these nurses, and joint pain management is not prioritised in the presence of other infectious and chronic diseases (Visagie & Schneider, 2014; Visagie & Swartz, 2016; Morris et al., 2018; Bresick, von Pressentin & Mash, 2019). Nursing services at PHC are supplemented by outreach services to the clinics by doctors, and other health care professionals, including physiotherapists who are skilled and trained to manage joint pain (Visagie and Schrinder, 2014; Lalken and Marsh, 2015). Physiotherapists are first-line practitioners in South Africa, and therefore ideally suited to manage joint pain, which will allow for continuity of care for individuals living with musculoskeletal conditions though the health system (Hay et al., 2006; Myezwa & Van Niekerk, 2013; Rauf et al., 2013)

2.15.1 Physiotherapy and Primary Health Care

In PHC clinics, the physiotherapist's role is to provide direct patient care, perform health promotion, and advocate for patients' rights (World Confederation of Physical Therapy, 2011). Rehabilitation services in the primary health care clinics often happen in the absence of clear guidelines, where it becomes the prerogative of the individual to determine the service provided and the standard of care, often causing a misunderstanding of the exact role of physiotherapy by other health care professionals (Dayal, 2010; Maharaj et al., 2018). Assessment and treatments in PHC clinics require robust clinical reasoning from physiotherapists in a resource scares environment (Maleka, Franzsen & Stewart, 2008). Physiotherapists are required to manage individuals living with conditions representative of South Africa's burden of disease when working at the PHC clinics, and these individuals present with non-communicable diseases that should be managed (Myezwa & Van Niekerk, 2013; Dizon et al., 2018). The infrastructure in many PHC clinics limits the way services can be delivered, and the PHC clinic context directs the treatment provided away from passive treatment modalities like manual therapy techniques towards management strategies, including home exercise programmes and self-management techniques (Worsfold et al., 1996). The limited amount of time and the resources available at PHC clinics translates to augmented assessments of joint pain, where the comprehensive assessment of joint pain including subjective questioning, physical assessment, special test, and investigations are often not possible (Ludvigsson & Enthoven, 2012; Sennehed et al., 2017). The treatments currently available in PHC clinics are similar to other physiotherapy contexts, including individualised manual therapy, exercise prescription, and group-based exercise. Individualised treatments are punted as the most effective treatment method but are impractical in PHC clinics (Maharaj et al., 2018). Exercise and education as treatment present an opportunity for treatment of joint pain in resource-restricted rural areas.

The role of physiotherapists in the primary health care context is being explored in developed nations like Canada where the role of physiotherapy in primary care settings is limited due to a lack of clarity on the exact role of the profession (Stewart & Haswell, 2013; Dufour, Lucy &

Brown, 2014). The Canadian exploration does not seek to investigate the clinical service roles but instead seeks to facilitate the presence of physiotherapists in the primary level of care (McColl et al., 2009; Dufour, Lucy & Brown, 2014; Guilcher, 2018). As the burden of joint pain increases, so will the demand on physiotherapists as they possess the skillset to treat joint pain in the primary health care context (Maleka, Franzsen & Stewart, 2008; Ned, Cloete & Mji, 2017).

The outreach and the clinic models of care are commonly used to increase the presence of rehabilitation professionals in the primary care setting in rural areas of both South Africa and counties like Canada and the United States of America (McColl et al., 2009; Maharaj et al., 2018). In a study that investigated patient satisfaction with treatment for musculoskeletal conditions from a physiotherapist at primary care level, the patients indicated that they were more satisfied with the treatment from a physiotherapist than from a general practitioner in the primary care setting (Dufour, Lucy & Brown, 2014). The absence of physiotherapists in the rural primary health care setting is a problem in low-income countries, but it seems that developed nations like Canada are experiencing similar challenges (Guilcher, 2018). The absence of physiotherapists in the primary care setting drives health care expenditure as the outcomes of patients attending physiotherapy services at primary health care facilities showed a decrease in health expenditure, as they required fewer recurrent visits to manage their pain (Ludvigsson & Enthoven, 2012).

The limited time that physiotherapists are able to spend with patients in PHC Clinics makes the provision of one-to-one services undesirable, and group treatment presents an opportunity for a greater reach (Dufour, Lucy & Brown, 2014; Visagie & Swartz, 2016). The management of joint pain at PHC level by other health care professionals can affirm negative beliefs regarding the cause of pain, treatment, prognosis of symptoms, and fail to foster positivity regarding exercise and its benefits (McColl et al., 2009; Hurley et al., 2010; Thiem et al., 2013). Joint pain interventions at PHC settings should aim to provide a comprehensive approach to the treatment of joint pain to ensure that an effective treatment is provided for patients in rural South Africa (Hurley et al., 2007, 2010; Bearne et al., 2011). Self-management treatment forms an essential part of treatment in the primary health care context, with patients expecting clear explanations of the musculoskeletal management that they will be receiving (Ludvigsson & Enthoven, 2012; Dufour, Lucy & Brown, 2014). The approach of the physiotherapists in PHC clinics requires that clinical expertise be maximized by tailoring services best suited to the particular context, and changes like group treatment and self-management are effective changes (McColl et al., 2009).

The following section will explore the use of self-management as a strategy in the management of MSC. The understanding of patient education as the overarching paradigm in which self-management occurs is explored together with self-efficacy as a key predictor of future health behaviour.

2.16 Health Education

Health education is an established practice in the management of chronic diseases, it is a planned learning experience to increase patient knowledge and change patient behaviour (Kyngäs, 2003; Hansson et al., 2010; Louw, 2014). The increasing burden of chronic disease emphasises the importance of educating patients to manage their conditions, which decreases the burden on health systems and empowers the patient (Lorig et al., 1985). Efficient health education forms an essential part of a health care professional's relationships with a patient, health education empowers the patient to understand their condition; enable them to manage their condition and prevent possible complications (WHO Regional Office for Europe, 1998; Kyngäs, 2003). Health education is recommended as part of joint pain management in several comprehensive treatment guidelines for MSC (Zhang et al., 2007; Zhang, Nuki, et al., 2010; National Institute for Care and Health Excellence, 2021). The experience of joint pain is complex, and the reciprocal relationship between joint pain and psychosocial outcomes requires that the specific outcomes be deliberated with the patient to lead to a greater understanding of the management of joint pain (Hurley, Mitchell & Walsh, 2003; Hurley et al., 2018).

Traditionally health education is didactic where information is provided by the health care professional, the information relates explicitly to a specific a condition, including the pathology and the prognosis (Bodenheimer et al., 2002; Thoesen Coleman & Newton, 2005). Patients are often passive recipients of information and do not necessarily engage with the content or share their own experiences, and this tends not to produce the necessary behavioural changes required in the management of chronic conditions (Hurley, Mitchell & Walsh, 2003; Pellisé & Sell, 2009).

There is a definite shift in global health education where the education can be delivered in different mediums, including individual face-to-face sessions, group-based sessions, telephone conversations, tele-medicine, video, and even internet-based patient sessions (WHO Regional Office for Europe, 1998; Meeus et al., 2012. In rural South Africa it seems that individuals benefit most from in-person patient education. (WHO Regional Office for Europe, 1998; Meeus et al., 2012). Health education routinely forms part of clinical consultations and becomes a continuous process to communicate new information to the patient and seeks to build alliances with the patient to allow for shared decision making between health care professionals and patients (Kyngäs, 2003; Pellisé & Sell, 2009; Hansson et al., 2010). Health education is at times not a priority for primary health care practitioners due to the high patient load experienced in PHC clinics, with short consultations leaving inadequate time for health education (Kyngäs, 2003; Myezwa & Van Niekerk, 2013). The neglect of health education results in patients being diagnosed with nonspecific arthritis without suitable health education and information, leaving the patient vulnerable to fear rather than empowered to manage the joint pain (Hurley et al., 2018). The role of health education is still grossly underutilised and undervalued by some clinicians, even in contexts where there is adequate time and educational content available (Saw, 2015). Health education is inexpensive and can reach a wide audience with minimal cost and have a considerable impact on the individual (Lorig et al., 1998). There is a paucity in research on the aptitude of primary care clinicians to utilise health education in the management of joint pain, with the possibility that their input around joint pain may be archaic (Rauf et al., 2013).

Health education is foundational in improving self-efficacy, improving health knowledge and health promotion, but unfortunately, patient education does not always cause a change in behaviour of patients (Kruger-Jakins et al., 2016). During health education many factors can result in ineffective communication, and may include cultural considerations, social norms within a community, and the approach of the health care professionals in delivering health education (Denness, 2013; Kruger-Jakins et al., 2016). The credibility of the information used in health education can also detract from the purpose of helping patients understand their condition and its management, therefore this becomes the responsibility of the health professional to keep abreast with new developments within the area of MSC (Heidari & Norouzadeh, 2013).

Some patients misunderstand the goal of health education and assume the goal is just to comply with the instructions given by the health professional (Denness, 2013; Kruger-Jakins et al., 2016). This attitude might achieve changes in the short term but is not a motivator for long-term behavioural changes required with any chronic condition (Bodenheimer et al., 2002; Thorstensson et al., 2015). The compliance of the patient may be motivated by a desire to please the primary treatment provider rather than manage their symptoms (Campbell et al., 2001; Thorstensson et al., 2015).

The information used as part of health education during joint pain management can be conflicting amongst health care professionals, resulting in confusion among the patients (Hanney, Kolber & Beekhuizen, 2009). Traditionally health education regarding joint pain explained the anatomical and biomechanical changes with the aim to provide insight into the pathology associated with pain, however this method is not effective in minimising pain symptoms, and in some instances even increases fear and anxiety (Louw et al., 2011). Individuals with joint pain often believe that their symptoms are an inevitable consequence of ageing and believe there is no intervention to manage the symptoms, but health education should potentially be able to correct these views (Hurley et al., 2018).

The biomedical model of pain has some utility in the acute phases of joint pain or injury, post- or pre-surgery, but is too simplistic to explain why some people with radiographic arthritic joints are asymptomatic and others are symptomatic (Hurley, Mitchell & Walsh, 2003; Nielsen et al., 2014). Biopsychosocial approaches to joint pain are necessary for chronic pain states to provide comprehensive treatment to the patient (Bryant et al., 2014). There is evidence that chronic pain states are not simply a result of tissue damage but include other neurobiological and psychosocial states which influence the experience of pain (Diener et al., 2016). There is emerging evidence that pain is generated based on the need to protect the body from harm, and this protective drive can be modulated by an individual’s emotional state, stress, or sensitisation of the central nervous systems (Diener et al., 2016; Parker & Madden, 2020). The emerging evidence creates the need to identify the factors contributing to the pain as part of managing the pain drive and experience (Parker & Madden, 2020). The biopsychosocial model of health acknowledges that physical, social, environmental and economic factors influence how individuals perceive their joint pain (Hurley & Walsh, 2009). Therefore, rather than attempting to provide a cure for joint pain the biopsychosocial model focuses on the coping skills and adjustments to living with the consequences of joint pain (Hurley, Mitchell & Walsh, 2003).

The management of joint pain has been moving towards interventions routed in the biopsychosocial approach, where health education can be utilised to facilitate improvements in the psychosocial aspects of the individual (Hurley, Mitchell & Walsh, 2003; Nielsen et al., 2014). Information sessions need to evolve in becoming a collaborative effort between the patient and health care professional, creating an environment in which presuppositions and beliefs held by patients regarding their pain can be addressed as part of health education (Coleman et al., 2008; Louw, Nijs & Puentedura, 2017). Patients need to be able to make informed decisions regarding treatment choices, which cannot be achieved in the absence of thorough health education (National Institute for Health and Care Excellene, 2014; Hurley et al., 2018).

Topics taught in traditional health education regarding joint pain management are varied in literature, but common areas explored are pain management strategies, exercise, use of medication and analgesia, balance, and fall prevention (Meeus et al., 2012; Bryant et al., 2014). Understanding co-morbidities alongside the treatment of joint pain is a necessity, but not always included in joint pain education; therefore, the heterogeneous nature of the health education intervention brings into question the consistency and reliability of the information that is provided for joint pain interventions (Bryant et al., 2014; Kruger-Jakins et al., 2016).

Trained health professionals usually develop written material used in patient education, and the information needs to be developed and packaged to respond to the needs of individuals living with joint pain (Ottawa Panel, 2011; Yates, Jelsma & Parker, 2017). Health professionals that routinely utilise health education regarding joint pain are orthopaedic surgeons, physiotherapists, occupational therapists, and nurses, and all of these health professionals make use of leaflets, although more detailed booklets would a be preferable resource to the patients (Coleman et al., 2008; Kruger-Jakins et al., 2016). The facilitation of health education programmes can also be done by lay workers, peers or a combination of lay workers and professionals depending on the situation and the needs of the community (Coleman et al., 2010). The delivery of health education programmes by lay workers may not be as effective as clinician led programmes as patients view professionals as reliable sources of health knowledge (Hurley et al., 2010; Hutting et al., 2019). Health care professionals are also better equipped to respond to complex questions regarding the information related to the diseases, and therefore physiotherapists are ideally suited to facilitate health education in PHC clinics (Coleman et al., 2008; Bryant et al., 2014; Parker & Madden, 2020)

2.16.1 Self-management

Self-management is the regular actions taken by an individual to ensure that they manage their medical condition in the absence of a health care professional, and self-management is included in many health promotion and health education programmes (Lorig & Holman, 2003. Self-management programmes emphasise the central role of the patient in managing their disease, however this may still involve didactic instructional learning regarding disease pathology led by a health professional or lay workers (Lorig, Sobel, et al., 2001; Jonkman, 2016). Self-management is already occurring in all patients with chronic diseases, as patients make decisions regarding their health; although some decisions taken are not always positive or beneficial to the patient (Bodenheimer et al., 2002; Lorig & Holman, 2003). While some self-management decisions are not in line with best health practices, choices are made based on what the patient believes to be rational and reliable information (Campbell et al., 2001). Self-management occurs organically with patients using anecdotal experiences of family and friends to structure the management of their pain symptoms (Hurley et al., 2018). To master positive self-management actions is not simple and even in the presence of sound knowledge, individuals fail to adhere to self-management treatment plans (Saw, 2015).

The five areas of self-management skills include problem-solving, decision making, resource utilisation, forming a health care provider and patient relationship and acting (Ottawa Panel, 2011). Attitudes towards different self-management strategies are determined by the patient’s beliefs regarding the aetiology of their symptoms, and incorrect beliefs leads to further incapacitation of individuals living with joint pain (Hurley et al., 2018). Passive coping strategies like resting, avoiding activities, and relinquishing responsibility of pain control to others are not helpful self-management strategies, and drive increased pain severity and is often utilised by individuals living with joint pain (Hurley, Mitchell & Walsh, 2003). Addressing the perceptions and beliefs of a patient regarding joint pain is essential to facilitate positive health behaviour managing joint pain, and self-management programmes themselves are not expressly aimed at reducing the experience of pain but rather facilitating behavioural changes that will lead to decreased pain and disability (Hurley, Mitchell & Walsh, 2003; Crotty et al., 2009).

Self-management programmes can be structured as exclusively health education while other programmes are mixed programmes that utilise both health education and exercise as part of facilitating positive self-management behaviour (Lorig et al., 1985; Hurley et al., 2007; Skou et al., 2012). Self-management programmes can be generic, or they can be disease specific; generic programmes inform patients regarding general strategies to manage their disease, whereas disease specific programmes deal with the management of the specific disease (Lorig et al., 1998; Lorig, Ritter, et al., 2001). Self-management is not a replacement for traditional health education but is a complementary tool in the management of chronic diseases (Bodenheimer et al., 2002)

Self-management programmes happen over several weeks, some programmes run for four weeks, others for up to twelve weeks, where meetings take place on variable occasions each week (Parker et al., 2009). The self-management action an individual is required to make is dependent on their diagnosis, the chronicity of the condition, and these actions may involve taking medication, eating special diets and other complex behavioural changes which are explored in these sessions (Brady et al., 2011). Behavioural change mainly involves altering activities in line with the demands of life (Lorig & Holman, 2003). Self-management may have different goals which is dependent on the intended outcome, but the central tenant remains improved ability for the individual to manage their chronic disease state (Bodenheimer et al., 2002; Pellisé & Sell, 2009).

The Arthritis Self-Management Programme (ASMP) is a programme developed at the Standford Patient Educations Research Centre to address patients with arthritis (Lorig et al., 1985). The programme was designed to be delivered in six sessions, each two hours long, occurring once a week; and to be taught by lay individuals that were trained to present the material in a group setting. The programme has consistently shown the ability to increase patient knowledge and facilitate a change in patient behaviour (Lorig et al., 1985, 1998). Variations of the ASMP has been attempted with shortening of the programme, and all these adaptations provided favourable results (Lorig et al., 1998). The benefits of the programme were related to decrease in health care utilisation; however, pain relief did not show a considerable improvement during the course of the programme (Brady et al., 2011). The Chronic Disease Self-Management Programme (CDSMP) is adapted from the ASMP using the principle of self-management to present a generic programme (Lorig, Sobel, et al., 2001). CDSMP is presented over seven weeks, delivered for 17 hours in total and presented by two trained presenters in a group setting (Lorig, Ritter, et al., 2001; Lorig, Sobel, et al., 2001). A wide variety of topics are covered in the programme, including exercise, management of cognitive symptoms, nutrition, sleep and malaise management, use of health care resources, use of medicines, engaging with psychological states, communication with health care professionals, problem solving and decision making (Lorig et al., 1999). The programme demonstrated improvement in all study domains at one year follow up including health behaviour, self-efficacy, health status and health care expenditure (Lorig et al., 1999; Brady et al., 2011). The physical symptoms of individuals, however, did not show similar improvement from just being involved in the self-management programme (Lorig et al., 1999). Furthermore, the CDSMP was shown to be cost-effective as a management option for chronic diseases (Lorig et al., 1999).The ASMP and CDSMP interventions were used in several countries and translated into different languages with positive outcomes remaining consistent (Brady et al., 2011). The effect size (ES) of the ASMP was greatest in self-efficacy for pain management ES= 0.353 at follow up four to six months and ES 0.325 at nine to 12 months follow up (Brady et al., 2011). The CDSMP showed the greatest increase in self-efficacy for general self-efficacy ES = 0.345 at four to six months follow up and 0.204 nine to twelve months follow up (Brady et al., 2011). Self-management programmes do not necessarily have a profound effect on physical functioning and perception of disability, but the impact on the psychosocial perceptions of the individual on health (Saw, 2015). There has been evidence that there are also some clinical benefits from various programmes, including improvement in the quality of life of individuals and decreased use of health care resources (Jonkman, 2016).

Self-management programmes are about engagement with knowledge and facilitating behaviour, and they are not readily employed in most health care systems with inadequate funding directed towards implementing programmes (Briggs et al., 2018). The improvements in the psychosocial function can be complemented by a physical intervention to improve function in individuals with chronic conditions, and this can be done by physiotherapists that are available in the health care system as health education and exercise prescription is part of a physiotherapist's skill set (Hurley & Walsh, 2009; Kruger-Jakins et al., 2016; Saw et al., 2016).

2.16.2 Self-efficacy

The educational content in managing joint pain ought to consider self-management strategies to help patients improve physical functioning (Kruger-Jakins et al., 2016). Self-efficacy is related to an individual's belief that they will be able to complete tasks, and/or behaviour required to achieve a specific health goal (Bandura, 2004). Self-efficacy is predictive of health behaviour, and the elements leading to improved self-efficacy must be included as part of self-management programmes (Brady, 2011). Self-efficacy beliefs are also predictive of motivational levels, thought patterns, moods and emotional reactions, and attitudes that promote health, therefore lower self-efficacy in patients with joint pain results in greater levels of disability and an inability to manage symptoms (Focht et al., 2005; Marks, 2014). Conversely, there is a relationship between stronger self-efficacy and higher functional capacity, as well as greater ability to manage symptoms which is independent of the stage of the joint pain (Marks, 2017). Elements of self-efficacy need to be incorporated in self-management programmes to empower patients to be able to engage in the required health behaviours (Hurley, Mitchell & Walsh, 2003).

In patient education programmes, it has been noted that discussions alone do not necessarily result in increased self-efficacy, and the completion of a task helps to develop a greater confidence in individuals which will enable them to repeat the task in the future (Brady, 2011; Marks, 2014). To alter people's health beliefs by didactically instructing them is of limited value, individuals need to have first-hand experience of the benefits that are associated with movement and various coping strategies for them to make the necessary change (Hurley, Mitchell & Walsh, 2003). There are four key steps towards improving self-efficacy, which will result in behavioural change. The first step is the facilitation of task mastery, the second step is exposure to direct experiences, the third step is the encouragement towards completion of required tasks, and the fourth and final step is assistance in dealing with emotions that may hinder positive health behaviour (Lorig & Holman, 2003; Marks, 2014). Participation in programmes that facilitate positive exercise experiences, challenge erroneous beliefs about exercise, and build the individual's self-efficacy to engage in exercises that are necessary in managing joint pain (Hurley, Mitchell & Walsh, 2003). Programmes that exposed patients to task mastery assisted with improving an individual’s self-efficacy, particularly when individuals were allowed to exercise at a pace tailored to their abilities (Schoster et al., 2005).

The outcome of self-management programmes can be improved by enhancing self-efficacy, and there have been improvements noted in various programmes, including weight loss programmes whether education only programmes or exercise only programmes (Marks, 2017). The role of self-efficacy in self-management programmes cannot be treated as aside but needs to form a golden thread through the self-management interventions, where education forms a critical component, and the facilitation of exercise will add to the self-efficacy of individuals who are living with joint pain (Marks, 2014, 2017).

A case can be made for a combined approach of education and exercise, which should be considered within the context of self-efficacy. The role of exercise will now be explored in detail as part of the combined treatment programmes.

2.17 Exercise

2.17.1 Frequency and duration of exercise

Exercise is regularly recommended as a treatment strategy for joint pain, and some interventions use exercise exclusively (Bouchard et al., 2021). Exercises are prescribed to patients using the “FITT-VP” principle, which is the frequency of exercise, the intensity of exercise, the time of exercise, the type of exercise, volume of exercise and progression of exercise (American College of Sports Medicine, 2018). The modification of each of the variables in the FITT-VP can lead to varied treatment effects and outcomes for those living with joint pain (Ageberg, Link & Roos, 2010; American College of Sports Medicine, 2018). The benefits of exercise are seen at various levels of physical fitness, and individuals who are sedentary while individuals living with chronic diseases, benefit from any level of exercise which is above their sedentary lifestyle (Chodzko-Zajko et al., 2009; Bennell & Hinman, 2011; United State Department of Health and Human Services, 2018a). It is recommended that adults over the age of 18 – 64 years perform at least 150 minutes of moderate-intensity aerobic exercise a week (American College of Sports Medicine, 2018). Exercise targets can be accumulated as bouts of exercise that take place in shorter periods throughout the day, starting from 10 minutes to accumulating a once-off 150 minutes in a week depending on an individual's capacity (Duncan et al., 2010; Rivera-Torres, Fahey & Rivera, 2019). Generally, the recommendation is daily exercise of various times and intensities, which meet the minimum requirements (Thompson, 2018). Strengthening exercises should be done two to three times a week with variable sets of exercises between three to five sets and repetitions of between eight and twelve (Nevitt & Lane, 1999; Thompson, 2018; Rivera-Torres, Fahey & Rivera, 2019).

The frequency of exercise is no longer prescriptive, but the emphasis is placed on the understanding that individuals can structure the exercises into their lives to meet the recommended levels of exercise (American College of Sports Medicine, 2018). The number of days in a week or the number of sessions are not rigid, but the emphasis should be placed on ensuring that the individual performs the exercise in a manner that will yield maximum health benefits whilst ensuring the prevention and onset of overuse injuries (Susko & Kelley Fitzgerald, 2013; United State Department of Health and Human Services, 2018b).

The intensity of exercise is measured as the level on which exercises are performed, the absolute definition of intensity is the amount of energy expenditure required during an activity (Caspersen & Christenson, 1985; American College of Sports Medicine, 2018). A subjective rating that is more understandable by lay individuals is often used to describe the level of exertion. Where being able to sing during exercise is defined as low-intensity exercise; moderate-intensity exercise is where one can still talk but not sing, and during vigorous exercise it is difficult to talk (Persinger et al., 2004). The intensity at which exercise should be performed for all individuals is at moderate intensity according to the American College of Sports Medicine (2018) and the United State Department of Health and Human Service (2018b).

The duration for the exercise interventions differs a great deal and varies from six weeks to over 52 weeks; the number of exercise sessions also vary from one exercise session to two sessions in a week (Hurley et al., 2007; Skou et al., 2012; Saw et al., 2016). The magnitude of the treatment effects for pain and function increase with increased sessions of supervised exercises for up to 12 sessions (Fransen et al., 2015). The time for the exercise sessions also varied, ranging from 20 minutes to 120 minutes per session (Saw et al., 2016; Geneen et al., 2017; Barnes, Jelsma & Parker, 2018). Exercise treatment over six weeks can yield adequate positive results whilst allowing participants to take part in facilitated exercise to allow them to increase their self-efficacy in exercise (Saw, 2015; Barnes, 2016).

2.17.2 Types of exercise

Cardiovascular exercise, strengthening and flexibility exercise are the most common forms of exercise included in intervention programmes. During cardiovascular exercise activities large muscle groups work in a rhythmic manner for a sustained period of time to raise the heart rate and respiratory rate (Geneen et al., 2017). These activities can sometimes be called aerobic activities/exercises, which can be land based or aquatic activities like swimming, cycling and running (American College of Sports Medicine, 2018). Aerobic exercises can be varied and are chosen based on what is most comfortable and practical for the individuals involved (Bennell & Hinman, 2011). Large volumes of aerobic exercise are desirable for individuals with higher BMI's, and weight loss is associated with increased aerobic exercise, which in turn allows an improvement in the experience of pain (Focht et al., 2005). The aerobic exercise yielded an analgesic effect for individuals living with back pain in a similar manner for those individuals living with hip and knee pain (Hanney, Kolber & Beekhuizen, 2009; Hayden et al., 2021)

Strengthening exercises are exercises in which an increased demand is placed on skeletal muscle with the goal of increasing the strength of the group of muscles (Ageberg, Link & Roos, 2010). These activities usually require an external load to be applied to require an increased effort of the muscles, with the external force being applied with the use of free weights, resistance bands or the use of an individual's body weight (Ageberg, Link & Roos, 2010; Ambrose & Golightly, 2015). Strengthening exercises are a key component of the exercise interventions for the management of weight-bearing joint pain, and the strengthening exercises in individuals living with joint pain are guided by biomechanical principles to ensure proximal strength is achieved for improved neuromuscular control (Bennell & Hinman, 2011; Skou & Roos, 2016; Jönsson et al., 2018). Various forms of strengthening exercises have been investigated, including isometric, isotonic both eccentric and concentric, neuromuscular control and dynamic strengthening programmes, all of which have decreased joint pain

(Garber et al., 2011). For individuals who are new to strengthening exercises, two to four sets yield significant benefits in improving the strength, as opposed to six to eight sets for other individuals who are more accustomed to strengthening exercises (Garber et al., 2011). The strengthening of the hip abductors, the quadriceps muscle group, and the gastrocnemius muscles are recommended to manage lower limb joint pain (Skou et al., 2012; Thorstensson et al., 2015).

Flexibility exercises to ensure normal movement in the body, with joints retaining their ability to move through a full range of motion (Bearne et al., 2011). There are various means of doing flexibility exercises, which include dynamic and ballistic stretches. Passive muscle stretches involve statically stretching a muscle by actively contracting the antagonist muscles and applying sustained overpressure. Flexibility exercises are generally repeated two to four times, and the position should be held for 30 - 60 seconds for improvements in older adults (Garber et al., 2011; American College of Sports Medicine, 2018).

The types of exercises described above can also be found in the physical activities that individuals perform as part of their normal life (World Health Organization, 2015). Some occupations require both cardiovascular and strengthening activities as part of normal work-related duties such a builders and tree fellers (Montgomery et al., 2017). Walking and cycling as transport method or for fun and doing household chores, or gardening provide both strengthening and aerobic exercise. Therefore, the environments in which people live should be structured in such a manner that facilitates physical activity (World Health Organization, 2015).

In addition, there are other forms of exercise like yoga and Tai Chi which are also used in the management of joint pain (Hochberg et al., 2012). These are usually slow and controlled movements, which are a combination of flexibility and strengthening exercises. This mode of exercise has also yielded a decrease in pain but the decrease was less than those which included a combination of aerobic and strengthening exercises (Fransen et al., 2015).

2.17.3 Exercise interventions

There are numerous benefits to engaging in exercise, and these benefits are enjoyed by all ages and individuals with various levels of physical health (Geneen et al., 2017). The benefits of physical activity are also observed in special populations such as older people with chronic pain and people living with disabilities (Hurley et al., 2018). The overarching benefit of exercise is longevity with a decrease in early death and adding years to individuals lives (Garber et al., 2011). Inactive individuals can almost immediately see improvement in their health status when engaging in exercise (Donald & Foy, 2004, Ambrose & Golightly, 2015). Other benefits of exercise include the improved ability to do activities of daily living, improved mood, and individuals who are living with clinical depression are often prescribed exercise to source endogenous endorphins to improve the management of the condition (Bennell & Hinman, 2011; Garber et al., 2011; Ambrose & Golightly, 2015). The sleep patterns of those who participate in exercise are improved with fewer instances of waking at night and an improved ability to sleep through the night (Hurley et al., 2018).

In the management of pain and improving physical function there is no exercise modality that has been shown to be more superior to other forms of exercise (Bennell & Hinman, 2011; Kjaer et al., 2018). Individuals with weight-bearing joint pain are sometimes directed towards non-pharmacological treatment of pain such as exercise, which can provide pain relief at levels similar to those of pharmacological therapies without the potentially harmful effects of pharmacological therapies (Thorstensson et al., 2005; Hurley et al., 2007; Skou et al., 2012; Saw, 2015). A large body of research has been done to assess the impact of exercise on joint pain. The evidence is largely in favour of exercise improving all the outcome measures such as pain severity and interference, physical function, and quality of life (Ageberg, Link & Roos, 2010; Walsh et al., 2013; Fransen et al., 2015; Barnes, 2016; Geneen et al., 2017; Kjaer et al., 2018; Hayden et al., 2021). Joint pain is often a lifelong problem, and exercise needs to be performed regularly over time as the benefits of exercise respond to dosage, and the benefits of exercise also diminish with cessation of exercise (Jessep et al., 2009).

Exercise has been presented in various ways, with the options of group-based or individualised exercises (Hurley et al., 2007; Geneen et al., 2017). The demands of individual exercise sessions in managing joint pain require a large number of physiotherapists, where a group setting encourages participation and adherence by individuals only needing one physiotherapist for a group of up to 12 people (Kahn et al., 2010; Bennell & Hinman, 2011). Individualised programmes are favoured in some contexts as they allow for exercise programmes to be individually tailored and progressed based on the individual's ability

(Thorstensson et al., 2005). However, group-based exercises are best suited for a rural South African context as groups have been used in similar studies, and there are too few physiotherapists employed in health care facilities to provide individual services to a high number of patients (Estabrooks & Carron, 1999; Parker, Jelsma & Stein, 2016; Saw et al., 2016). Participants with joint pain rely on social support as part of their coping mechanism and social contexts such as groups have shown good outcomes when addressing pain, where fellow group members are able to provide modelling for one another (Taal et al., 1993; Schoster et al., 2005; Molton & Terrill, 2014).

The use of land or aquatic-based exercises has been studied contextually, and land exercises are preferable in rural Africa in the absence of aquatic facilities (Bennell & Hinman, 2011; Walsh, Pearson & Healey, 2017). The exercise could be peer-led or led by a health care professional, or the exercise could also be supervised or unsupervised with home exercise classes (Hurley et al., 2007; Coleman et al., 2010). Exercises that were led by a health professional seemed to encourage participation and increased confidence of participants. (Coleman et al., 2008). Unsupervised home-based exercise programmes are also used, but unfortunately, commitment to exercise is difficult to gauge or monitor (Fransen et al., 2015). The exercises used in an African context need to be simplistic and must not require equipment other than what is found in the home of individuals (Kruger-Jakins et al., 2016).

2.17.4 Effects of exercise on pain

The effects of exercise are beneficial for the pain experience and the psychosocial wellbeing of the individual (Coleman et al., 2010; Kjaer et al., 2018). The benefits of strengthening exercises in reducing back and knee joint pain are unequivocal, and there is evidence for a decrease in hip joint pain, albeit not as conclusive (Bennell & Hinman, 2011). The decrease in pain following participation in exercise-based programmes have illustrated that the decrease in pain severity is similar to the decrease in pain severity reported for taking analgesia. For back pain, the results of group exercises provided similar relief when compared to spinal mobilisation provided by a physiotherapist, however the exercise-based programme provided relief over a more extended period from 12 weeks up to three years (Ferreira et al., 2007; Hayden et al., 2021).

Pooled results for knee pain exercise showed a post-treatment moderate effect size of a 12-point decrease in pain severity on a scale of 0 – 100 (Fransen et al., 2015). The decrease in pain remained statistically significant at six months post-treatment of six points on a 0 – 100 scale, however the effect size was small (Fransen et al., 2015; Skou & Roos, 2017). (Skou & Roos (2017) found a mean decrease of pain intensity to be 12.4mm on the visual analogue scale of 100mm at three months, and a mean decrease of 13.7mm post-intervention in a review of the Good Life with Osteoarthritis in Denmark (GLA:D) programme. Exercise interventions generally show a decrease in pain severity of individuals living with joint pain, and the decrease is also maintained over time at three and 12 months, respectively (Fransen et al., 2015; Skou & Roos, 2016). In interventions where there was a decrease in pain relief over time, the level of relief at six months proved to be significant (Fransen et al., 2015).

2.17.5 Effects of exercise on function

The impact of exercise on physical function could be measured subjectively with self-reported outcome measures or objectively using physical function tests (Hansson et al., 2010; Thorstensson et al., 2015). In a physical function test using the 40 metres fast paced walk test a mean improvement of 2.5 second was noted in the GLA:D programme's participants (Skou & Roos, 2017). In a community based walking intervention the improvement in gait speed using the six minute walk test and the timed up and go test did not show significant improvement, between the walking only group and the self-directed group (Brosseau et al., 2012).Therefore, it seems that the effects of exercise interventions improves self-perceptions of improvement in function more than in objective measures of physical function (Hurley et al., 2007; Jessep et al., 2009; Hansson et al., 2010; Brosseau et al., 2012).

2.18 Combined interventions

The benefits of self-management programmes and exercise programmes are likely to be enhanced by providing a combined intervention (Jessep et al., 2009). In the Osteoarthritis research Society International (OARSI) guidelines, there was a stronger emphasis on the role of both health education and exercise as part of the management of joint pain (Zhang et al., 2008). In England, there was a statistically significant improvement in pain for a health education and exercise programme amongst participant 50 years and older with knee pain

(Hurley et al., 2007). A combined education and exercise intervention called Enabling Self-Management and Coping with Arthritic Knee Pain though Exercise (ESCAPE-knee pain) was initiated in the United Kingdom. The sessions consisted of a twice-weekly supervised health education and an exercise over six weeks (Hurley et al., 2007). In a peer-led, health education and exercise intervention, addressing pain in woman living with HIV/AIDS, there was no significant difference between the intervention and control groups, with both yielding a similar decrease in pain (Parker, Jelsma & Stein, 2016). A wellness programme comprising of health education and exercise for workers in the textile industry in Cape Town, South Africa, showed an improvement in pain, when compared to the control group (Edries, Jelsma & Maart, 2013). Similarly, a health education and exercise intervention, for patients between 50 and 70 years with knee OA awaiting joint replacement surgery in Cape Town and Johannesburg, showed a clinically significant effect size on pain in the intervention group compared to the control group (Saw et al., 2016). (Barnes, Jelsma & Parker, 2019) investigated health education and exercise using a pragmatic, experimental randomised control design in women 40 – 64 years with various MSC. The study results indicated improvement in quality of life for both groups but statistically significant improvement in the intervention group; in the physical function test, the improvement was statistically significant within the intervention group. The above studies were performed over six weeks, with the groups gathering once a week for health education and exercise session. The study by Hurley et al. (2007) was an exception with the group gathering twice a week, but this group did not seem to yield any additional decrease in pain symptoms compared to the other studies. The above studies provided a basis for the utility of combined interventions to be used in PHC clinics by physiotherapist facing a high volume of patients, but the findings should best only be generalised to similar populations.

Multiple studies have investigated the effectiveness of exercise on pain amongst middle aged patients living with joint pain (Saw et al., 2016; Kjaer et al., 2018; Barnes, Jelsma & Parker, 2019). The complex nature of joint pain requires effective interventions during every stage of joint pain management, and a comprehensive approach to management includes exercise, health education and lifestyle changes (Rolfson et al., 2016). Health education and exercise programmes have yielded positive results across various conditions and settings (Hurley et al., 2007; Skou et al., 2012; Edries, Jelsma & Maart, 2013; Saw et al., 2016). Simple, practical exercise regimes can be enhanced by integrating them into health education interventions, according to (Hurley, Mitchell & Walsh, 2003). As discussed earlier, combined interventions offer greater benefits as opposed to standalone health education or exercise interventions, and the combined interventions can easily be provided at primary health care settings at a cost lower than individual physiotherapy interventions for joint pain (Saw et al., 2016; Barnes, Jelsma & Parker, 2019).

The Swedish Better Management for Patients with Osteoarthritis (BOA) started in 2008 with the aim of implementing in a clinical context the recommendations of health education, exercise, and weight loss as the first-line management of OA joint pain prior to surgical management. The programme had three information sessions: the first two led by a health professional and the third by an osteoarthritis patient (Thorstensson et al., 2015). The optional exercise part was initially one-on-one exercise with the option of a supervised exercise class for six weeks, twice a week. Based on the BOA programme, the Good Life with Osteoarthritis in Denmark GLA:D was initiated in 2012 to manage hip and knee joint osteoarthritis (Skou et al., 2012). Following a similar structure as that of the BOA, two health care professionals led health education sessions and one health education session was led by a patient who had been enrolled in the programme previously, followed by twice a week exercise supervised or unsupervised for six weeks (Skou & Roos, 2016).

Both BOA and GLA:D was offered as population-wide options for the management of joint pain across both the public and private health sectors in Scandinavian countries (Thorstensson et al., 2015; Skou & Roos, 2016). There has been a large number of patient participation in both programmes, with the BOA enrolling 7500 participants; 2 339 physiotherapists and occupational therapists involved in delivering the programmes, and in GLA:D 9 827 patients were enrolled. GLA:D was piloted in 2012, and since then the number of trained physiotherapists and patients who participate increases annually (Thorstensson et al., 2015; Skou & Roos, 2017).

As can be seen from the discussion above there are numerous studies that have shown the effectiveness of combined interventions, across multiple contexts, and have demonstrated strategies for the roll-out of such programmes on a population-wide scale.

2.19 Medical Interventions

2.19.1 Surgery

In developed nations 50% of patients with joint pain are referred for surgical interventions without being referred for conservative management prior to pursuing surgery (Thorstensson et al., 2015). Where surgical management is accessible, it provides relief from pain and improved function for individuals living with joint pain (Dixon et al., 2004). The surgical management of joint pain is usually for advanced presentations of OA confirmed with radiographic imaging. Surgical management includes arthroplasties of the hip and knee joints, and lumbar fusion surgeries for those individuals living with low back pain (Bennell & Hinman, 2011; Ambrose & Golightly, 2015).

In low and middle-income countries, there are long waiting lists, sometimes in excess of five years for elective surgeries with challenges including securing theatre time in the presence of other procedures to prevent fatalities, a shortage of personnel and hospital beds (Saw, 2015; Kavalieratos, Nortje & Dunn, 2017). The postoperative outcomes of individuals who waited long periods for joint replacement surgeries were poorer compared to those individuals who received surgery timeously emphasising the need for an intermediate treatment where access to surgery is limited (Fortin et al., 2002; Saw, 2015). In Cape Town, an urban part of South Africa, waiting time for a total hip replacement (THR) and total knee replacement (TKR) can range from 90 days to 1 593 days (Kavalieratos, Nortje & Dunn, 2017). The long waiting time results in some patients becoming disinterested in having the surgery (Kavalieratos, Nortje & Dunn, 2017). In 2012, access to surgery in a tertiary hospital in Cape Town was limited, with 90 total hip replacements being done and the combined number of 250 total hip and knee replacements insufficient to meet the demand of over 2 000 procedures per annum (Dunn, 2012; Kavalieratos, Nortje & Dunn, 2017). In sub-Saharan Africa, there is greater access to surgery for individuals who use the private health system (Davies et al., 2019).

With the increasing incidence of osteoarthritis, there is an increasing need for primary joint replacement surgeries and revision surgeries (Dixon et al., 2004). There is also an increasing need for joint replacement within the African continent driven by complications of the human immunodeficiency virus which leads to avascular necrosis of the femoral head (Mulla et al., 2010; Kavalieratos, Nortje & Dunn, 2017). Evidence shows that health education and exercise prior to surgery will allow for the improvement of patient pain and self-management prior to surgery, especially for those individuals that may not have access to surgery (Saw, 2015; Kavalieratos, Nortje & Dunn, 2017).

2.19.2 Pharmacological management

Pharmacological management of joint pain is the primary means of managing joint pain by primary health care doctors and nurses (Hurley et al., 2007). The pharmacological management involves the prescription of acetaminophen as the first line analgesic, and non-steroidal anti-inflammatories (NSAIDS) as second line medicines, while tertiary pharmacological treatment includes opioid derivate medicines (Zhang, Nuki, et al., 2010; Hochberg et al., 2012). There is definite evidence for pharmacological management in reducing the pain experience, however, the decrease in pain does not necessarily translate into improved function (Hurley & Walsh, 2009). Below in Table 2 the essential drug list for the management of joint pain is provided.

Table 2 Essential drug list for the management for musculoskeletal pain

Pharmacological managements of joint pain at primary health care facilities (National Department of Health, in press)
Paracetamol, oral 1g 4-6 hourly when required at a maximum dose of 4 dosages per 24 hours Maximum dose: 15mg/kg/dose Maximum dose: 4g in 24 hours Methyl salicylate ointment, topical may provide relief
If patient responds to paracetamol reduce dose to 500mg 6 -8 hourly when required
If no response and inflammation is present: *Add* Non-steroidal anti-inflammatory medications

Ibuprofen, oral, 400mg 8 hourly with or after a meal as needed for 7 days

In high-risk patients > 65 years of age with history of peptic ulcer or on concomitant warfarin, aspirin or corticosteroids

Add

Proton Pump inhibitor

Lansoprazole, oral, 30mg daily

The prescription of acetaminophen at maximum dosage poses a threat of hepatotoxicity when taken with additional acetaminophen in other over the counter medicines, and this could be prevented by providing education when medications are dispensed (Zhang, Nuki, et al., 2010). The long-term use of NSAIDS is not without risk with complications related to the gastrointestinal system often requiring the prescriptions of positive proton inhibitors to protect the gastrointestinal system. A challenge within the PHC clinics is that there is often inadequate time to educate patients on medication use to ensure avoidable complications (Hay et al., 2006; Zhang et al., 2007). Although opioid medications are able to provide moderate pain relief their use is to be limited by the complications which outweighs the benefits (Zhang, Doherty, et al., 2010). Some patients believe that managing joint pain with medication is harmful, and these patients choose to limit the use of medication, while other patients develop a dependence on joint pain medication that are opioid derivatives, which poses a challenge, of providing analgesia as a treatment (Hurley et al., 2018).

The effect size of pharmacological therapy is often equivalent to that of exercise interventions, but the pharmacological agents present more significant side effects than those of exercise, like gastrointestinal ulcers or addiction (Golightly, Allen & Caine, 2014). The use of pharmacotherapy in joint pain is beneficial in some individuals and can be helpful if used as part of programmes that promote self-management and exercise (Skou & Roos, 2017).

2.20 Conclusion

The growing burden of musculoskeletal conditions globally and locally warrants interventions that can address this burden. The structure of the health system in South Africa makes the primary health care clinics the most opportune clinical context to respond to the burden of joint pain. This requires that non-communicable diseases, both MSC and other co-morbidities, be managed collectively. Therefore, from the literature review, a case is presented for a combined treatment approach. In the next chapter, the methodology of how such an intervention was investigated is reported.

3. METHODOLOGY

This chapter explores the method used to achieve the aim of the study. The aim of the study was to determine and compare the impact of an exercise and education intervention programme on female patients 50 - 70 years old living with weight bearing joint pain for three months or longer in the Maluti-a-Phofung health sub district receiving care at primary health care clinics.

3.1 Study Design

A single blind randomised controlled trial (RCT) was utilised for the study.

3.1.1 Research setting, study population and sampling

Maluti-a-Phofung Health Sub-district is located within the Maluti-a-Phofung Local Municipality, which is the former Basotho homeland of Qwa Qwa (Pitso, 2009). The densely populated areas are mostly Sesotho speaking, and a largely impoverished community with the triple challenges of inequality, poverty and unemployment (Statistics South Africa, 2012). Most of the citizens rely mainly on the public health care system to provide them with health care services particularly the PHC clinics (Health Systems Trust, 2013). Maluti-a-Phofung has five PHC clinics serviced by the Elizabeth Ross District Hospital Physiotherapy department. Each of these clinics are currently visited only once a month by a physiotherapist as part of a multidisciplinary team. The five clinics that receive outreach physiotherapy services are Eva Mota clinic; Bolata clinic; Phuthaditjhaba clinic; Qholaqhwe clinic and Bluegumbosch clinic. Bluegumbosch is the furthest clinic at 14 kilometres from Elizabeth Ross and the closest is Bolata clinc with seven kilometres from Elizabeth Ross. It takes two taxi trips to travel from Phuthaditjhaba, Bluegumbosch and Qholaqhwe clinic and a single taxi trip from Bolata and Eva Mota to Elizabeth Ross.

Elizabeth Ross District Hospital is located on all major public transport routes and is accessible to all patients using the clinics serviced by Elizabeth Ross District Hospital staff. The Physiotherapy department has a large gym, which was utilised for baseline measurements and the intervention.

The study population consisted of females between the ages of 50-70 years, living with weight-bearing joint pain for at least three months, that access health care on a regular basis, at least once a month, within the Maluti-a-Phofung PHC clinics that receive outreach services from physiotherapists.

Convenience sampling was used where all females living with weight-bearing joint pain for at least three months or longer and received care at a PHC clinic within the Maluti-a-Phofung health sub-district were eligible to enrol in the study.

3.1.2 Sample size

Saw et al (2016) in metropolitan areas included a total of 74 participants with 35 in the intervention group and 39 in the control group measuring pain severity and pain interference as primary outcomes. Whereas Barnes (2016) in a peri-urban context had a sample size of 42 with 22 in the intervention group and 20 in the control group. Taking into consideration practicalities as well as possible dropout rates a total sample of 108 participants was the aim for inclusion in the study, with 36 participants in the intervention group: 36 participants in the workbook group and 36 participants in the usual care group.

3.1.3 Inclusion Criteria

Females between the ages of 50 – 70 years, with pain in weight-bearing joints for three months or longer were included in the study. Individuals should have indicated their willingness to participate in an exercise programme for 30 minutes once a week and should have been cleared by the researcher for participation using the American College of Sports Medicine Health Facility Pre-exercise screening questionnaire. Individuals who indicated their willingness to participate but required medical clearance as per the questionnaire were sent for clearance to exercise by a Medical Officer at Elizabeth Ross District Hospital before inclusion in the study.

3.1.4 Exclusion Criteria

Individuals receiving treatment by a physiotherapist during the last 12 months for joint pain in the weight-bearing joints and individuals that presented with unstable co-morbidities were excluded for possible participation in the study. Co-morbidities were considered unstable if the measurements/signs for the disease(s) were outside the ranges listed in the Table 3 below for two consecutive visits at the clinic, after which the individual was referred to a medical officer for clearance to exercise. Individuals were also excluded with previous or existing neurological conditions; individuals who were confined to a wheelchair and individuals who had surgery during the last six months. In addition, individuals living with any acute trauma or injury during the last six weeks before the study were also excluded

Table 3 Common co-morbidities in South Africa (de Rooij et al., 2014)

Condition	**Ranges for exclusion**
Hypertension	Systolic blood pressure >200mmHg or diastolic >115mmHg;
Heart failure/Coronary disease	Dyspnea whilst speaking, respiratory frequency of more than 30 breaths per minutes, heart rate >110 beats per minute;
Diabetes Mellitus type 1 and type 2	Blood glucose is greater or equal to 15mmol/L or less or equal to 5 mmol/L

3.1.5 Randomization

Variables that could introduce bias needed to be stratified between the intervention, workbook, and usual care groups. Three confounding variables: body mass index, number of weight-bearing joints with pain, and age were identified and needed to be evenly allocated between the intervention, workbook, and usual care groups. For body mass index, the eligible participants were classified using the (World Health Organization, 1995) classification based on the calculation of body mass in kilograms divided by height in meters squared: with normal weight being between 18.5 - 25, overweight 25-30 and above 30 being classified as obese. BMI was calculated for each participant and factored into the randomisation. Joint pain was classified as pain in weight-bearing joints with the lower back being considered as one joint; each individual hip, knee and ankle joint considered as individual joints with the possibility of one up to seven joints with pain being identified as being painful by a single individual. Age was classified into two categories: between 50 – 60 years and 60 - 70 years old. Eligible participants who enrolled into the study were randomly divided in an intervention group, a workbook group and a control group utilising a randomisation template developed by the University of the Free State Biostatistics department.

3.1.6 Blinding

Single blinding was used in this study. Blinded research assistants, whom were all qualified physiotherapists administered the outcome measures and physical performance task battery, except for the fourth research assistant that administered the acceptability questionnaire to the participants in the intervention group. The group allocation of the participants remained unknown to the research assistants at baseline and at six weeks. Participant were informed that they were not to communicate their group allocation to the research assistant administering the outcome measures and physical tests.

3.1.7 Adherence

To encourage adherence to the programme the purpose of the study was explained to participants. The group setting allowed participants to foster relationships with one another and encouraged attendance. Short Message Service (SMS) texts and phone calls were used to remind participants of important dates for measurements during the study, including the dates for the intervention, workbook, and education groups. The researcher arranged transport for all the participants, and the transport collected the participants from their local clinic or at commuter stops along the road to Elizabeth Ross Hospital and back to the pick-up point.

3.2 Measurement tools

3.2.1 Demographic- Questionnaire

A self-developed demographic questionnaire developed by the researcher was used in this study. The information obtained included age of the patient, the current medical history of the patient, the participant's highest level of education and employment status as well as source of income. In addition, participants had to indicate the clinic which they attended, the mode of transport to the clinic and in which weight-bearing joints they experienced pain.

3.2.2 Pain

The Brief pain Inventory short Form (BPI-sf) has been used as a measurement tool for assessing pain in previous studies and allows patients to rate their perceived pain severity and how pain interferes with their function (Poquet & Lin, 2016). The questionnaire can be self-administered or completed as an interview and for this study the questionnaire was completed as an interview as the literacy of participants was unknown and interviews were deemed best to ensure consistency in the use of the questionnaire (Cleeland, 2009). The outcome measure uses a rating scale of zero to ten for the various items. The measure is scored for pain severity using the mean of items three to six where a lower score is indicative of less severe pain, and for pain interference the mean of items nine-A to nine-G where a mean of the scores above five is indicative of a greater degree of interference of pain in activities of daily living. The BPI-sf was developed primarily for the investigation of pain and interference amongst cancer patients; however, the generic outcome measure has been used in a variety of trials including those assessing chronic pain in peripheral joints (Williams, Smith & Fehnel, 2006; Poquet & Lin, 2016). The BPI-sf is reliable and has demonstrated a high test-retest reliability across a variety of conditions that causes pain with a Cronbach α of > 0.80 for internal consistency reliability (Kapstad, Rokne & Stavem, 2010; Williams & Arnold, 2011; Cleeland, 2013). The BPI-sf is available in Sesotho from the Pain Research Group and therefore the researcher did not have to translate the questionnaire for use in the current study.

3.2.2 Quality of Life

The EQ-5D-3L is a quality of life measure that has been used in previous studies assessing joint pain (Coleman et al., 2010; Saw et al., 2016). The EQ-5D-3L is a measure that was developed in order to have a simple generic measure of health for clinical appraisal. The measure can be administered as self-completion or as an interview questionnaire. For the purpose of this study the measure was used in an interview format as the literacy levels of the participants were unknown (Janssen, 2015). The EQ-5D-3L consists of descriptive systems evaluating five dimensions: mobility, self-care; usual activities, pain/discomfort, and anxiety/depression; with three levels of severity: no problem, some problem and extreme problem (van Reenen

& Oppe, 2015). The measure also includes a visual analogue scale (VAS-EQ) of perceived health state which is ranked from 0-100 with 0 indicating worst imaginable health state and 100 best imaginable health states (Janssen, 2015). Coding is indicated as a numerical level (1, 2 or 3) for each dimension. Missing data is indicated as “9” and VAS-EQ is recorded as a digit ranging from 0-100. The EQ-5D-3L measure has been found to be a valid and reliable measure of quality of life (van Reenen & Oppe, 2015). The EQ-5D-3L questionnaire is available in Sesotho from the EuroQol Research Foundation and permission was requested to use the instrument. Sesotho is the most spoken language in the Maluti-a-Phofong health Sub-district.

3.2.3 Self-Efficacy

Self-efficacy which is predictive of future health behaviour has several outcome measures, some which are disease specific and others which are generic (Brady, 2011; Wilcox et al., 2014). The Chronic Disease Self-Efficacy Scale was developed to assess the self-efficacy following self-management intervention programmes. The measure was shortened to the Self-Efficacy for Managing Chronic Disease 6-item Scale, which combines the two previously used scales. The measure covers a range of perceived abilities in various activities (Brady, 2011). For each question a number is circled, with the numbers ranging from one which is not confident at all in activities to ten which is totally confident in that specific activity. The total score for the scale is the mean for the six items. For each item a score above five shows that the person has a higher self-efficacy, whereas a score below five is indicative of a lower self-efficacy. A higher mean score indicates a high self-efficacy whereas a lower mean score indicates a lower self-efficacy. The Chronic Disease Self Efficacy Scale was found to be valid and reliable with an internal consistency ranged between 0.77 and 0.922 where their test-retest correlation scores were 0.82-0.89 (Brady, 2011). The study did not differentiate between the causes of joint pain and as such a more generic scale is more applicable in the measurement of self-efficacy. The scale has been translated into Sesotho during a PhD study following a strict forward backward translation process and cognitive debriefing (Barnes, 2016).

3.2.4 Physical Functioning

The Physical Performance Task Battery (PPTB) has been used widely to measure physical function and it uses simple everyday tasks to assess the effect of various conditions on a patient's physical function and the effect of an intervention (Simmonds, 2002; Simmonds, 2006). The PPTB has been validated across a variety of conditions including back pain, cancer and HIV/AIDS and joint pain (Novy, Simmonds & Lee, 2002; Simmonds, 2002; Saw, 2015). The PPTB has demonstrated inter-rater reliability and strong test-retests reliability and the validity of the PPTB has been tested in individuals living with joint pain (Novy, Simmonds & Lee, 2002). The PPTB has been used in both peri-urban and urban South African populations and allows for the measure to be used in a rural South African population (Saw, 2015; Barnes, 2016). Only tests appropriate for assessing weight bearing joints were used in this study as listed in Table 4 below.

Table 4 Physical Performance Task **Battery**

Task	Procedure	Measure
15 meters walking at fastest speed	Participants walk 7.5 meters turn around and walk back to the starting position as fast as the patient can. The 7.5 meters distance are clearly mark on the ground.	Seconds
15 meters walking at preferred speed	Participants walk 7.5 meters turn around and walk back to the starting position at the preferred walking speed The 7.5 meters distance are clearly mark on the ground.	Seconds
Repeated sit-to-stand	Participants sit in a chair, stand up and then sit back down and repeat after a brief rest	Seconds
Repeated trunk flexion	Participants are timed as they bend forward to the limit of their range and return to an upright position as quickly as tolerated, five times	Seconds
Sock test	Participant sits in a standard chair and puts on one loose fitting sock.	Seconds
Timed belt tie test	Participant sits in a standard chair and puts on one loose fitting sock.	seconds

Timed six-minute walk test	Participants walk as far as they can for six minutes (participants are allowed to rest during the test). A 10 meters course with one-meter intervals was marked to measure distance.	Meters

* The physical performance battery included the six-minute walk test. There are age related norms, however they were not considered as the age-related norms did not seem to be developed with sufficient detail with regards to BMI, and the pathology which would allow comparison with the participants in this study.

Interpreting the results for various activities will be based on time or distance. For the measures for time, the faster the activity is completed the better. The measures consisting of distance will indicate a better performance when the distances are further.

3.2.5 Body Mass Index

Body Mass Index (BMI) has shown a correlation with increasing prevalence of joint pain for persons with an increased BMI and using the (World Health Organization, 1995) guidelines BMI is calculated as body mass in kilograms divided by height in meters squared (Kg/m^2) (Nguyen et al., 2011; Siemons et al., 2013).

Measurements for weight and height were taken using A SECA™ 777 electronic scale with a manual stadiometer. In preparation for measurement, the scale was placed on a flat surface, and the scale was calibrated to zero. Participants were asked to remove their shoes, empty their pockets, and remove excess clothing and jewelry, and if they felt pressed, they were requested to empty their bladder. For weight, the participants were asked to stand on the center of the scale with their arms on the side and their feet together. The measurement was repeated twice to ensure accuracy, and if there was a difference, an average reading was calculated and recorded. For height, the participants were asked to step on the stadiometer with their feet together. The back of the head buttocks and heels had to touch the upright stadiometer. The participants were asked to be in Frankfort position with the centre of the ear and the lower part of the eye all in line in the horizontal plane. While participants held their breath the head plate of the stadiometer was brought down, and the measurement was taken. The procedure was repeated twice, and an average was taken if there was discrepancy between the two measurements.

The BMI computation results in a number, which would then fall in the following defined ranges of normal weight, which is between 18.5 and 25, overweight 25-30 and above 30 obese (World Health Organization, 1995). Distribution into different categories of BMI was considered as part of the randomisation.

3.2.6 Acceptability Questionnaire

An acceptability questionnaire was administered to those individuals who were part of the intervention group, participants could answer in either Sesotho or English. The self-developed questionnaire consisted of five open ended questions intended to source the view of the participants on the acceptability of the programme and would provide feedback on what participants thought was appropriate and what was deemed inappropriate during the intervention.

3.2.7 Education Booklet

For this study the information booklet (refer to Appendix K) was developed on similar studies that used the education booklets from Lorig in the Chronic Disease Self-Management Programme. The information was benchmarked on the work of Saw (2015), Barnes (2016) and further information from recently published material was used. The booklet was written in English using the new information on joint pain management. The booklet was divided into six chapters: 1) Osteoarthritis, Self-management and exercise 2) Managing common Symptoms 3) Stress Management 4) Eating Well 5) Medication and disease-related decision making and 6) continuing as a self-manager. The content was first developed into English and a translator, who is a primary school Sesotho teacher, was used to translate the information into Sesotho. Two lay people who are first language Sesotho speakers were asked to read and comment whether the information was clear and understandable. The Sesotho translation was given to a Sesotho speaking medical officer to ensure the information contained the correct medical information when translated. The book was edited following the comments of the Sesotho speaker and the medical officer. The researcher was the final editor of the Sesotho document.

3.3 Method

3.3.1 Researcher

The researcher was primarily responsible for the execution of the study including planning, data collection, and write up. The researcher applied for the necessary approvals, trained the research assistants, recruited, and screened the participants. The researcher was not involved during the completion of the questionnaires or determining of the patient’s symptoms and functionality to prevent the introduction of observer bias. The researcher trained the research assistants to ensure that they were familiar with all the outcome measures and physical tests, and that they were able to complete the outcome measures and physical tests competently and accurately. The researcher presented the intervention to the intervention group and to the workbook group. The researcher co-ordinated logistics with the research assistants to ensure that the tests were administered to the participants at a central venue at baseline and at six weeks follow up.

3.3.2 Research Assistants

A total of four research assistants (RA) were used in the study; three were qualified physiotherapists working in the Maluti-a-Phofung health sub-district, and one was an admission clerk. Research assistants one, two and four where fluent in Sesotho, research assistant three was unable to speak Sesotho and gave instructions in English and demonstrated the physical tests. Three RAs were required to administer the various outcome measures and observe the physical function tests and were trained by the researcher in the use of the outcome measures. The fourth RA was responsible for administering the acceptability questionnaire. Each RA was allocated to a specific outcome measure, for which they were responsible for administering the measurement tools during the study. Training of the RAs’ commenced once ethical approval was granted by the UFS Health Sciences Research Ethics Committee (UFS-HSD2019/0594/3007 Appendix A) and the letter granting permission to perform the study from the Free State Department of Health (Appendix B) was obtained.

The research assistants were gathered as a group to discuss the aim and objectives of the study. Each Research Assistant was provided with the outcome measures and instructions of the physical tests prior to the training so that they could familiarise themselves. At the training they were trained in the use of each of the outcome measures and physical function tests, and they had an opportunity to administer the measurement tool for the research. During the pilot study each of the research assistant was given an opportunity to administer the questionnaire for the pilot study participants. Table 5 indicates the allocation of the RA for each measurement instrument. The research assistants remained blind to the randomisation of the participants to each of the three groups. It was required of the research assistant to assist with the completion of the outcome measure and physical test at baseline and at six weeks follow up.

3.3.3 Recruitment, Screening, and consent

The recruitment of all the participants were done at three of the PHC clinics that have outreach physiotherapy services from the Elizabeth Ross District Hospital physiotherapists. The total sample of participants were recruited from three primary health care clinics, and multiple visits were made to each of the clinics to recruit participants. On recruitment days the researcher visited the respective clinics and gave a general address to the patients attending the clinic on that day. The purpose of the study, the aim and objects of the study, the inclusion and exclusion criteria were discussed in the address that was given in Sesotho. The researcher also explained the possible benefits that could possibly be derived from participating in the study. Participants who were interested were screened for eligibility by the researcher to participate in the study using the American College of Sports Medicine Health Facility Pre-participation screening questionnaire (Appendix C). Those who required medical clearance to exercise and participate in the study had the option of being sent to a Medical Officer at Elizabeth Ross District Hospital. Individuals who were eligible for participation had their contact details recorded including their name, surname and telephone number and invited to enrol in the study.

The participants had the study information explained to them by the researcher with a colleague as a third-party observer to ensure consent was informed and the participants were not coerced. The researcher explained the study information to participants in their preferred language between English or Sesotho (Appendix J). The informed consent (Appendix J) form was completed either in English or Sesotho with the assistance of the researcher to formally consent to participating in the study. To ensure that consent was properly provided, an independent witness, who is a dietician, was asked to sit in on the consent process. Participants signed the informed consent form and an independent witness signed when the participant were unable to sign.

3.3.4 Venue and transport

Elizabeth Ross District Hospital is easily accessible on most transport routes in the Maluti-a-Phofung health sub-district. The venue is sheltered and was not affected by the weather conditions. The physiotherapy gym had enough space to host an exercise and education class.

Transport, which was a minibus taxi, sourced by the researcher, collected patients from the clinic and commuted them to Elizabeth Ross Hospital. The transport was provided, at the cost of the researcher, to all participants on the days when measurements were taken, as well as weekly for the intervention groups sessions.

3.3.5 Execution

On the day of taking baseline measurements, participants who enrolled for the study were required to complete the informed consent form with the assistance of a researcher with a third-party observer present. The outcome measures and physical test were completed for all participants in a process that was facilitated by the RA's. Once the baseline assessment was completed the data was entered into a template provided by the University of the Free State Biostatistics Department for randomisation and allocation of participants into one of the three groups. The measurement days took place at baseline and at six weeks for all participants taking part in the research study.

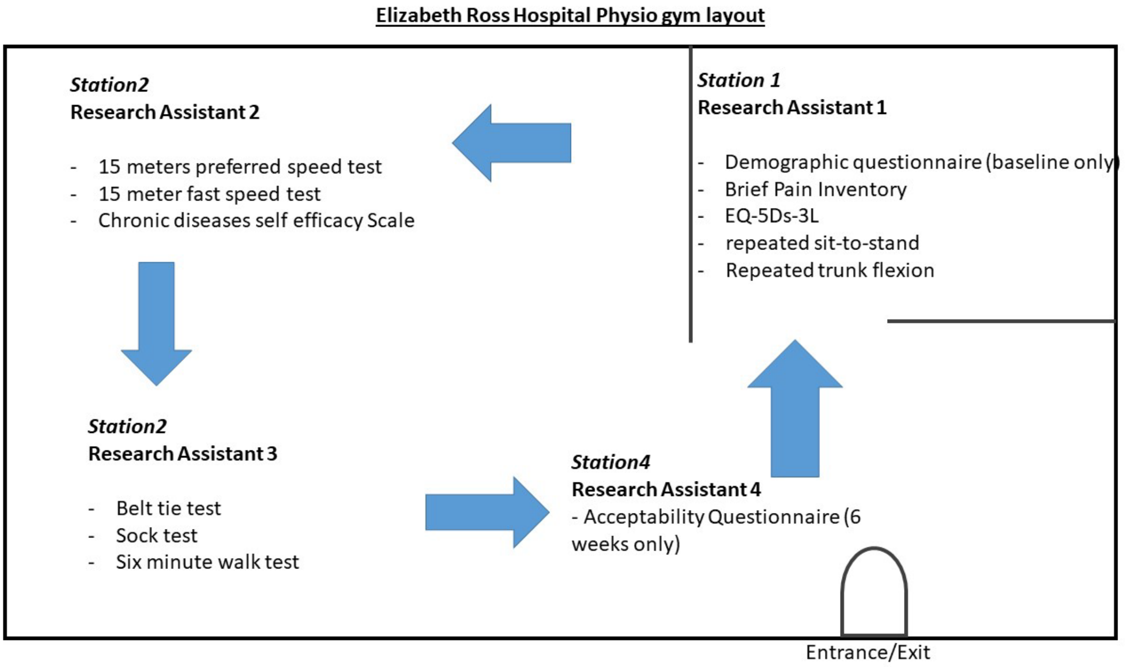

Figure 1: Layout of the research area

The gym at Elizabeth Ross Hospital was a large enough space to accommodate the various stations for the completion of measurement tools. RA 1 was responsible for the first station performing the structured interview for the demographic questionnaire, Brief Pain Inventory and EQ-5D-3L. RA 1 also completed the repeated sit-to-stand and repeated trunk flexion tests. The next station was manned by RA 2 who conducted the structured interview for the chronic diseases self-efficacy scale and two physical performance battery tests: the 15-meter preferred speed test and the 15 meter fastest walking speed test. At the final station manned by another RA 3 was the physical six-minute walk test, belt tie test and sock test. Each participant moved sequentially from the first station to the third station. The exact same format and sequencing used for baseline testing was used for the six weeks follow up testing. Please refer to the layout diagram of the research area and the responsibilities of the RAs in Table 5 below.

The acceptability questionnaire was administered by research assistant four to the participants in the intervention group only at six weeks. They were in a separate area from where all the other physical tests were performed.

Table 5 Outcome measurements and physical Test

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Questionnaire	Method of Administration	Person responsible
Demographic questionnaire (Appendix D)	Structured interview done by a research assistant	Research Assistant 1
BPI-sf (Appendix E)	Structured interview done by a research assistant	Research Assistant 1
ED-5L-3D (Appendix G)	Structured interview done by a research assistant	Research Assistant 1
CDSES-6 (Appendix F)	Structured interview done by a researcher assistant	Research Assistant 2
Body Mass Index (Part of Appendix C)	Measurement of weight and height was performed in a treatment cubicle using an electronic scale and a stadiometer. The calculation of BMI Kg/m^2 was done by the researcher.	Research Assistant 1
Acceptability Questionnaire (Appendix H)	The questionnaire was completed at the end of the six weeks via a structured interview by a research assistant.	Research Assistant 4 (Administrative Clerk)
Physical function tests (Appendix I)	Method of testing	
15 meters walking at fastest speed		Research Assistant 2

15 meters walking at preferred speed	Physical test please refer to Table 4	Research Assistant 2
Repeated sit-to-stand		Research Assistant 1
Repeated Trunk flexion		Research Assistant 1
Timed Belt Tie		Research Assistant 3
Sock test		Research Assistant 3

Timed six-minute walk test		Research Assistant 3

Participants were randomised with the assistance of a template provided by the Department of Biostatistics following baseline assessment to allow for stratification of BMI, age and number of joints with pain into an intervention, workbook or a usual care group.

3.4 Pilot Study

A pilot study was performed with the purpose of evaluating the procedure for the recruitment process, the administration, and the use of the measurement tools. The piloting of the recruitment process took place at two of the clinics (Bluegumbosch and Phuthaditjhaba) on two consecutive mornings 6th and 7th August 2019. One of the clinics (Eva Mota Clinic) was undergoing renovations during the period of the pilot study. The clinic was not operating normally and not conducive for the piloting nor the main study and was also subsequently excluded from the clinics included in the study. A general address was given to those in attendance at the clinics on the day of the pilot study. Those who were interested in enrolling in the study were invited to be screened. The screened individuals who were eligible were invited to be included in the pilot study.

In order to ensure that the provision of transport was possible the Qholaqhwe clinic was excluded as it would have exponentially increased the cost of providing transport to participants. The researcher was responsible for the financing of the study and was unable to secure external financing, and as such a decision to constraint costs was necessary.

The outcome measures were piloted with five patients that met the criteria for participation in the study. The pilot study was conducted in the same sequencing utilising the RAs as would be the case for the main study. The participants were invited back for a second week to pilot the booklet and the exercise sessions. The pilot study took place over two weeks, for piloting the measurement and the exercise and education on the participants in the pilot study. The availability of the participants could only allow for two weeks of the piloting where all the participants could attend.

The only changes made after conclusion of the pilot study were the exclusion of the two clinics as indicated above. The results of the pilot study were not included in the main study as there were no follow-up dates provided to participants.

3.5 Intervention

The intervention consisted of a six-week education and exercise programme for patients that presented with pain in their weight-bearing joints – the lower back, and/or the hips, knee and/or ankle. Both the education and exercise aspects of the programme were presented by the researcher, who is a qualified physiotherapist. The programme was modelled on a previous six-week education and exercise programme that had been performed in both a South Africa peri-urban or urban context (Edries, Jelsma & Maart, 2013; Saw et al., 2016; Barnes, Jelsma & Parker, 2018). Where previous studies only included an intervention group and usual care group the current study included an additional workbook group. The workbook group was included to test if a shorter form of the exercise and education intervention could be useful in clinics that are visited infrequently. The intervention was developed as part of a biopsychosocial model for the management of joint pain for patients who receive care primarily at primarily health care clinics. The intervention was presented in a centralised venue Elizabeth Ross District Hospital physiotherapy department. The education and exercises were presented by the researcher in Sesotho as the population is in the Maluti-a-Phofung Health sub-district is Sesotho speaking. The participants were transported by the minibus taxi driver from their clinics on a Wednesday morning to attend the education and exercise class. The exercise session lasted approximately 30 minutes per session. The researcher presented the exercise class and modelled the exercises, whilst correcting the execution of the exercises by the participants. The exercise component was aimed at improving the physical activity level of those in the intervention group. The exercise was structured to facilitate the understanding of the different categories of exercise, including cardiovascular exercise, strengthening and flexibility (see Appendix M). The participants were introduced to exercise and were encouraged to use similar exercises at home on the days that they did not attend the session with the researcher. The different types of exercise were continuously explained as the exercise were facilitated by the physiotherapist. Participants received a water break between exercises. The discussion included the highlighting that there may be some muscle soreness following exercise which is normal after exercise.

For the intervention group each week the researcher facilitated a discussion using the *"Bophelo ka Kwetliso"* booklet (appendix K). The booklet was issued to each participant, and they had a choice between the English or the Sesotho booklet. The education component lasted for approximately 45 minutes to an hour depending on discussions and contributions by participants in the group. The education component was modelled on the latest body of work on intervention for joint pain with a particular emphasis on self-management. The cornerstone of self-management is providing participants with correct health related information on the management of their joint pain. The related information is recorded in Appendix K. Participants were encouraged to read the booklet at home and those who were not literate were encouraged to involve their relatives who are able to read, to read the information to them.

A weekly attendance register was kept by the researcher and all the participants were followed up telephonically by the researcher if they failed to attend an exercise class. The reason for not attending was indicated on the data form by the researcher.

The workbook group participants were invited to attend a once off education and exercise session presented by the researcher. In the session they were offered a booklet in a language of their choosing, either Sesotho or English. The researcher led and the overview of the booklet, and discussion the heading and subsections to orientate participants on the use of the booklet. The participants were advised to read a chapter of the exercise every week over the next six weeks. Those unable to read were encouraged to work through the booklet with the assistance of family members. An exercise class was conducted by the researcher using the exercise pamphlet as a guide (Appendix M). An exercise pamphlet was issued alongside the education booklet which contained generic pictures that the participant could use as part of their efforts to improve their physical activity level. The exercise pamphlet included cardiovascular, strengthening, and stretching exercises. The pamphlet was additional to Chapter 1 on exercise in the booklet.

The usual care group was encouraged to continue with their normal care at the clinic which may have included outreach visits from Elizabeth Ross physiotherapists, and the possible physiotherapy treatment must be viewed as a confounder to the study. Physiotherapist clinic outreaches are inclusive of manual therapy, health education and exercises. There were only two clinic outreaches from Elizabeth Ross District Hospital Physiotherapy Department during the period of the study, there were outreach visits to Phuthaditjhaba and Bluegumbosch clinics. The clinic visits were done by the community service physiotherapists responsible for the respective clinic outreaches. There was no control over whether members of the usual care group attended these clinics as part of their usual care of joint pain.

3.6 Data Analysis

Data Analysis was performed by the University of The Free State Biostatistics Department. Descriptive statistics were used to describe the frequency, percentages, and medians for the numerical data per group. The data analysis analysed data between groups and data within groups at baseline and after six weeks, change between groups and within groups was also analysed. The data was not normally distributed as such the Wilcoxon signed rank or sign test was used.

3.7 Ethical Considerations

Ethical approval was obtained from the University of the Free State Health Science Research Ethics Committee (See Appendix A page172). Then permission was requested from the Free State Department of Health (see Appendix B, page 173). Communication was then sent onto the Thabo Mofutsanyana district manager and the Elizabeth Ross District Hospital acting manager informing them that permission had been granted to conduct the research. Throughout the research the Helsinki Declaration principles were observed.

Participation in the study was voluntary. Those who were interested in enrolling win the study were given a written and verbal explanation of the study so that they could make an informed decision to join the study. Some of the participant in the study may be classified as an elderly and/or impoverished which are vulnerable groups, an independent witness was asked to sit in on the consent process to ensure that participants are voluntarily choosing to participate in the study and are not coerced to enrol in the study. The right to withdraw from the study at any point during the study was communicated to the participants.

The benefits and risk of participation in the study were discussed. The risks being muscle soreness and other consequences of exercise. The benefits being decreased pain and improved physical function. It was disclosed to the patients that they could be randomised into one of three groups. The contact details of the University of Free State ethics committee were provided to the participant so that could raise any concerns directly with the university if the need arose.

Whilst information from the patients was obtained from the participants, their information was kept confidential. The participant’s personal information was only accessed by the researcher and research assistants and was not shared. The participant information was captured electronically, stored on an external hard drive which is be password protected, and locked away. The participants and the Free State department of Health will be given feedback on the findings of the results to aid service delivery and ensure physiotherapy services are supported by evidence.

The next chapter is going to be discussing the results for each of the outcome measures and physical tests. This will look at the finding between the intervention, workbook and usual care groups and the finding within each group at baseline and a six-weeks. The findings will compare groups at baseline and six weeks. The findings will be presented in tables and text.

4 RESULTS

A summary of the findings of the questionnaires including the self-developed demographic questionnaire; the Brief Pain inventory short form (BPI-sf); the EQ-5D-3L; the Chronic Disease Self Efficacy Scale (CDSES), the Physical Performance Task Battery (PPTB) and the findings from the acceptability questionnaire will be presented. The study took place in August and September 2019. In total there were 60 females that were screened for participation in the study from Phuthaditjhaba clinic, Bluegumbosch clinic and Bolata Clinic. The participation of participants throughout the study is illustrated below in Figure 2. The results are presented for the sample (n= 47) with the allocation into the intervention group (n= 16); workbook group (n = 15) and usual care group (n = 16) following randomisation. The data was not normally distributed for all three groups in all the data categories. For the study, the significance threshold for all data tests was set at $p \leq 0.05$.

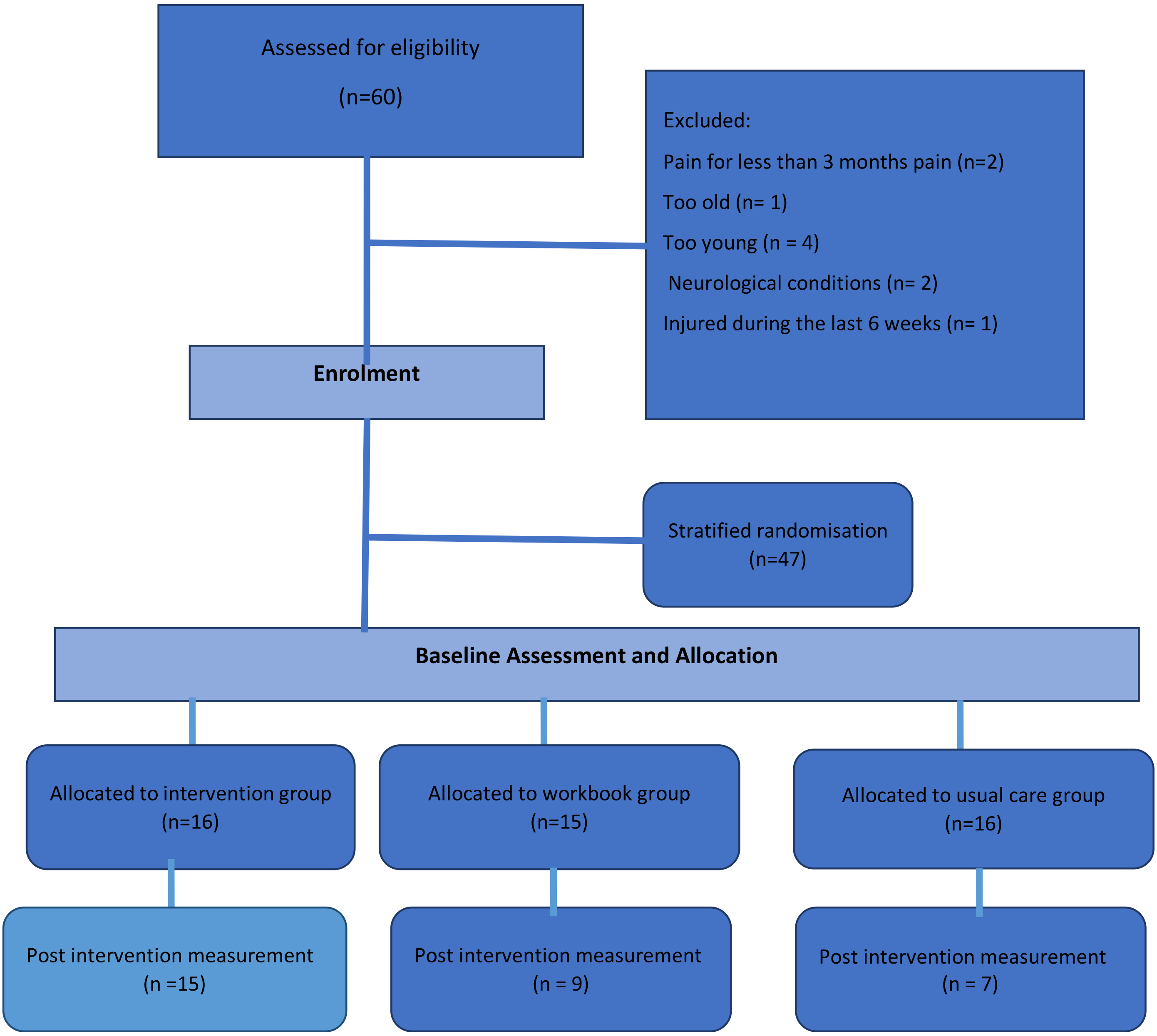

Figure 2 Participation in the study

The next figure will report on the weekly attendance of the participants throughout the study

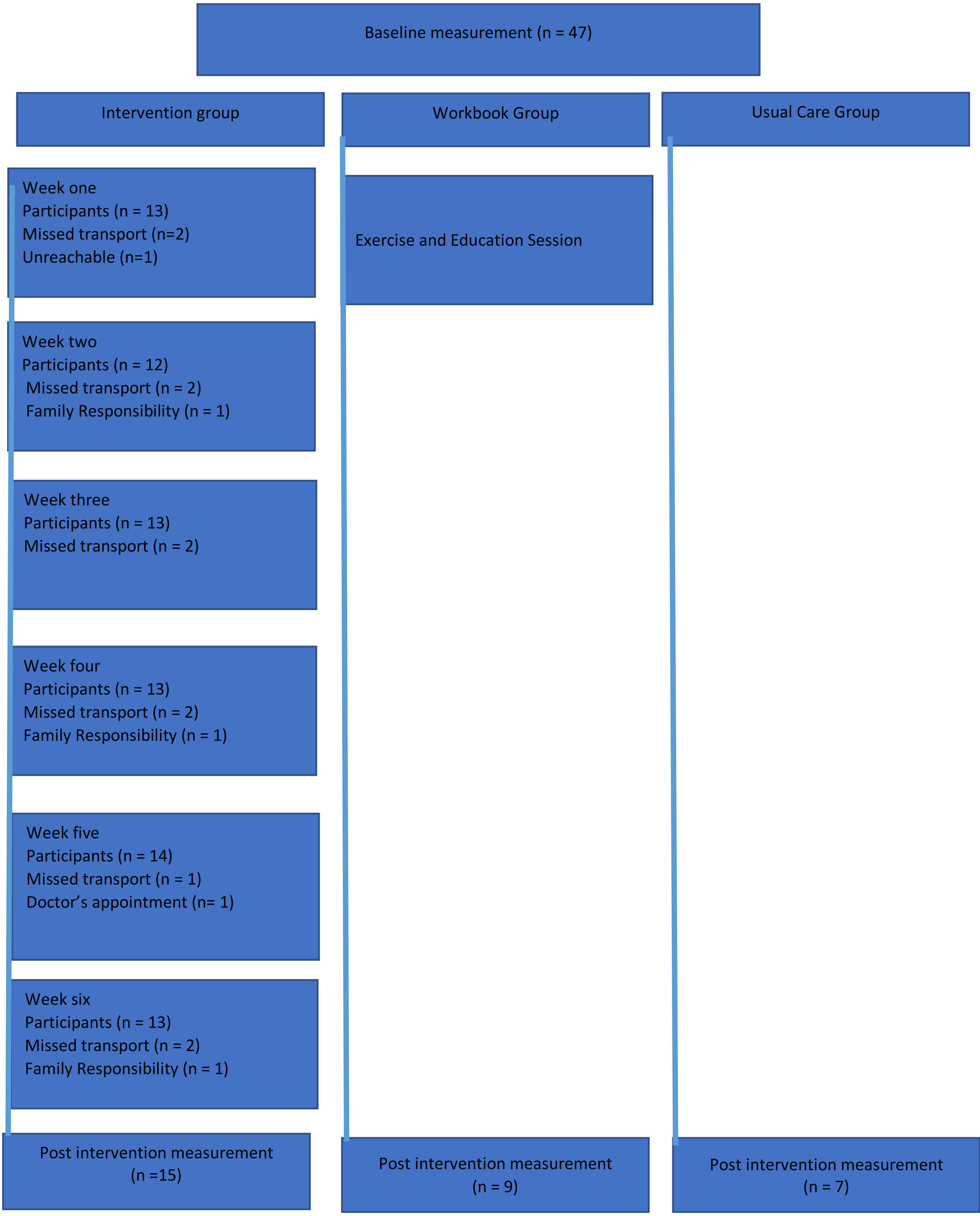

Figure 3 Weekly attendance during the trial

4.1 Demographic questionnaire

A self-developed interviewer administered questionnaire was utilised to describe the participants included in the study, the weight-bearing joints involved and associated comorbidities that the participants might have been living with. The demographic detail was only obtained at the baseline assessment.

4.1.1 Demographic Characteristics: Age; BMI and number of joints

The age distribution of participants was not normal. The median age of the participants in the intervention group was 56 years with Interquartile range (IQR: 55-63 years); the workbook group 57 years (IQR: 52-63 years) and the usual care group 61 years (IQR: 56-65 years). The age was not significantly different between the groups using the Kruskal-Wallis test (p=0.41). The median BMI for the intervention group was 32.99 (IQR 25.6 – 40.9); workbook group 35.3 (IQR 26.4 – 45.9) and usual care group 30.4 (IQR 26.5 – 38.8). There was no statistical difference between the groups for BMI (p = 0.57) using the Kruskal-Wallis Test. For all three groups the median number of joints involved was three joints (IQR 2 -4) joints. There was no statistically significant difference between the groups for number of joint involved (p=0.99) using the Kruskal-Wallis Test.

4.1.2 Demographic and living conditions

Below in Table 6 are findings of the demographic questionnaire regarding employment, educational level, source of income and mode of transportation to their PHC Clinic.

Table 6 Employment Status; highest level of education; Income Source and Mode of Transport

Variable	Categories	Intervention group (n=16)	Intervention Percentage	Workbook group (n=15)	Workbook percentage	Usual care group (n=16)	Usual care group percentage	Between Groups (Fischer's Exact Test)
Employment	Unemployed	10	62.5%	10	66.7%	6	37.5%	p =0.29
	Pensioner	6	37.5%	4	26.7%	9	56.3%	
	Self Employed	0	0.0%	1	6.6%	1	6.2%	
	^{a}ABET 3	0	0.0%	0	0.0%	1	6.3%	p=0.78

Highest level of education	Grade 2	0	0.0%	0	0.0%	1	6.3%	
	Grade 3	0	0.0%	1	6.7%	1	6.3%	
	Grade 4	1	6.3%	0	0%	1	6.3%	
	Grade 5	4	25%	1	6.67%	0	0%	
	Grade 6	2	12.5%	2	13.3%	1	6.3%	
	Grade 7	2	12.5%	2	13.3%	1	6.3%	
	Grade 8	1	6.3%	1	6.7%	2	12.5%	
	Grade 9	0	0.0%	1	6.7%	0	0%	
	Grade 10	2	12.5%	4	26.7%	4	25%	
	Grade 11	0	0.0%	1	6.1%	2	12.5%	
	Grade 12	1	6.3%	.0	0%	2	12.5%	
	Postgraduate in Law	1	6.3%	0	0%	0	0%	
	Teaching Qualification	0	0.0%	1	6.7%	0	0%	
	No Schooling	1	6.3%	1	6.7%	0	0%	
	Tertiary	1	6.3%	0	0.0%	01	0%	
Source of income	Child grant	2	12.5%	2	13.3%	1	6.35	p=0.65
	Disability grant	1	6.3%	1	6.7%	1	6.35	
	Selling food	0	0.0%	0	0%	1	6.3%	
	Foster care grant	0	0.0%	1	6.7%	2	12.5%	
	Husband salary	0	0.0%	3	20%	1	6.3%	
	Old age pension	8	50%	5	33.3%	9	56.3%	
	Social grants	2	6.3%	0	0.0%	0	05	
	[b]Stipend	0	0.0%	1	6.7%	0	0%	
	Supported by child	2	12.5%	2	13.3%	0	0%	
	Supported by family	1	6.3%	0	0.0%	0	0%	
	Temporary jobs	1	6.3%	0	0.0%	1	1%	
Mode of Transport to Clinic	Taxi	5	31.3%	2	14.3%	1	6.7%	p=0.20
	Walk	11	68.7%	12	85.7%	14	93.7%	

[a] Adult Basic Education and Training level 3; [b] Money given as small remuneration for participation in community leadership programmes

There was no statistically significant difference in employment, highest level of education, source of income and mode of transport using the Fisher's Exact Test between the groups. The majority n=26 (55.3%) of the sample population reported being unemployed. State pensions were the most common form of income with n=22 (46.8%) reporting that they were recipients of state old age pensions, and three participants (6.3%) were recipients of a disability grant. For education within the sample population n=21 (44.6%) attended grade seven or lower grades of school, n=21 individuals (44.6%) attended high school (grade eight to grade 12). Only three (6.3%) participants received education/training beyond high school and two participants (4.2%) had no schooling. The participants reported that their most common mode of transport to their primary health care clinic was walking n=37 (78.7%).

4.1.3 Health-related information

The results from the demographic questionnaire summarising the non-communicable diseases, chronic diseases and use of assistive devices are tabulated below (Table 7)

Table 7 Non-communicable disease, chronic disease and use of assistive devices

Self-reported comorbidities	**Categories**	**Intervention group (n=16)**	**Intervention Percentage**	**Workbook group (n=15)**	**Workbook percentage**	**Usual care group (n=16)**	**Usual Care Group**	**Between Groups (Fischer's Exact Test)**
Hypertension	Yes	14	87.5%	11	73.3%	9	56.3%	p=0.14
	No	2	12.5%	4	26.7%	7	43.7%	
HIV	Yes	2	12.5%	3	20%	3	18.75 %	p=0.89
	No	14	87.5%	12	80%	13	81.25 %	
Diabetes Mellitus Type 2	Yes	3	18.7%	3	20.0%	2	12.5%	p=0.89
	No	13	81.3%	12	80.0%	14%	87.5%	
Assistive Device	2 Elbow Crutches	1	6.3%		0	0	0.0%	p=0.29
	1 Elbow Crutch	1	6.3%	0	0.0%	0	0.0%	
	Tripod	1	6.3%	0	0.0%	0	0.0%	
	None	13	81.3%	15	100%	16	0.0%	

There was no statistically significant difference regarding the presence of comorbidities for hypertension, Human Immunodeficiency Virus (HIV), diabetes mellitus type 2 and use of assistive devices using the Fischer's Exact Test between the groups. Hypertension was the most common comorbidity with n=34 (72.3%) individuals living with the disease. Diabetes mellitus type 2 was reported by eight (17%) of the participants with eight (17%) also reporting living with HIV.

4.2 Brief Pain Inventory

The brief pain inventory is an interviewer administered questionnaire with nine items. Participants were asked to rate the severity of their pain in the last 24 hour including their worst pain, least pain, average of their pain and their pain now. Participants were also required to report the percentage of pain relief they experienced when using pain medication, pain interference within the last 24 hours during activities, this included interference with, walking, work, mood, enjoyment of life, relations with others and sleep. The pain severity score is calculated as the median between items three to six and for pain-interference score the median for items nine a to f on the questionnaire.

4.2.1 Pain Severity

The table below presents the results of the BPI-sf pain severity scores for the intervention, workbook group and the usual care groups at baseline and at six weeks (Table 8).

Table 8 Brief Pain Inventory-short form Pain Severity

Brief Pain Inventory	Group	Time	n	Median	Inter Quartile Range	Range	Kruskal-Wallis Test baseline between groups	Kruskal-Wallis Test after six weeks between groups
Worst pain	Intervention	Baseline	16	7	6-8	0-9	p= 0.66	p= 0.12
		After 6 weeks	15	0	0-3	0-8		
	Workbook	Baseline	15	6	2;5	0-9		
		After 6 weeks	9	5	0-7	0-8		
	Usual Care	Baseline	16	6.5	5--8	3-9		
		After 6 weeks	7	7	0-8	0-8		
Least pain	Intervention	Baseline	16	3	2,5-5	0-7	p= 0.90	p= 0.24
		After 6 weeks	15	0	0-1	0-6		
	Workbook	Baseline	15	4	2-5	0-5		
		After 6 weeks	9	3	-;4	0-5		
	Usual Care	Baseline	16	4	3-5	3-9		
		After 6 weeks	7	4	0-5	0-8		

Average pain	Intervention	Baseline	16	5	4-6	0-7	p=0.24	p=0.15
		After 6 weeks	15	0	0-2	0-5		
	Workbook	Baseline	15	4	3-5	0-6		
		After 6 weeks	9	4	0-6	0-6		
	Usual Care	Baseline	16	5	3-5	2-6		
		After 6 weeks	7	3	0-6	0-7		
Pain right now	Intervention	Baseline	16	4	0-6.5	0-9	p= 0.66	**p=0.04**
		After 6 weeks	15	0	0-0	0-6		
	Workbook	Baseline	15	5	2-6	0-9		
		After 6 weeks	9	0	0-4	0-6		
	Usual Care	Baseline	16	2.5	0;5-5	0-8		
		After 6 weeks	7	5	0;7	0-8		
Percentage pain relief using pain medication	Intervention	Baseline	16	50%	30%-60%	0-80%	p= 0.92	p=0.31
		After 6 weeks	15	0%	0%-80%	0-90%		
	Workbook	Baseline	15	50%	30%-60%	20-70%		
		After 6 weeks	9	0%	0%-70%	0-100%		
	Usual Care	Baseline	16	50%	40%-70%	30-70%		
		After 6 weeks	7	0%	0%- 0%	0-0%		

*** Intervention group (baseline n =7; after six week n = 10); Workbook group (baseline n=6; after six weeks n =10); Usual Care (baseline n =7;after six week n =4)**

Table 9 below is the summary of the BPI-sf pain severity score of the intervention, workbook and usual care groups consisting of the sum of the score for items three to six.

Table 9 BPI Severity summary

	Group	**Time**	**n**	**Median**	**Inter Quartile Range**	**Range**	**Kruskal-Wallis Test baseline between groups**	**Kruskal-Wallis Test after six weeks between groups**	**Change within groups Signed Rank Test**
BPI Pain severity	Intervention Workbook	Baseline	16	19	16,5-22	0-31	**p=0.71**	**p=0.13**	**p=0.00**
		After 6 weeks	15	0	0-9	0-27			
		Change from baseline	16	-16	-18--13	-27-11			
	Workbook Group Usual Care	Baseline	15	19	14-22	0-26			**p=0.02**
		After 6 weeks	9	17	0-18	0-24			
		Change from baseline	-9	-4	-12--1	-25-3			
	Intervention	Baseline	16	17	14-21.5	6-24			p=0.43
		After 6 weeks	7	21	0-26	0-27			
		Change from baseline	7	0	-17-8	-21-9			
the negative values in the table indicate a change									

Pain Severity summary between the groups at baselines was not significant (p =0.71) using the Kruskal-Wallis Test. After six weeks there was no significant change (p=0.13) between groups and the change in pain severity score from baseline to six weeks was also not statistically significant (p =0.12). Pain right now showed to be statistically significant (p=0.04) between intervention, the workbook and usual care groups.

Within individual groups the change from baseline to six weeks was statistically significant for the intervention group (p=0.00) and the workbook group (p=0.02) using the signed rank test. The usual care group did not have a significant change (p=0.43).

4.2.2 Pain Interference

Table 10 below is a summary of the pain interference scores of the intervention, workbook and usual care group consisting of the sum of the items nine-a to nine-g on the BPI-sf.

Table 10 Brief Pain Inventory-short form Pain interference

Brief Pain Inventory	Group	Time	n	Median	Inter quartile Range	Range	Kruskal-Wallis Test baseline between groups	Kruskal-Wallis Test after six weeks between groups
General Activity	Intervention	Baseline	16	0	0-2,5	0-8	p= 0.52	p=0.31
		After 6 weeks	15	0	0-0	0-0		
	Workbook	Baseline	15	0	0-5	0-7		
		After 6 weeks	9	0	0-0	0-8		
	Usual Care	Baseline	16	2	0-6	0-9		
		After 6 weeks	7	0	0-0	0-9		
Mood	Intervention	Baseline	16	0	0-0.5	0-9	p= 0.97	p=0.11
		After 6 weeks	15	0	0-0	0-0		
	Workbook	Baseline	15	0	0-5	0-8		
		After 6 weeks	9	0	0-0	0-7		
	Usual Care	Baseline	16	0	0-0.5	0-8		
		After 6 weeks	7	0	0-7	0-8		
Ability to walk	Intervention	Baseline	16	1	0-3,5	0-9	p= 0.79	p=0.36
		After 6 weeks	15	0	0-0	0-0		
	Workbook	Baseline	15	2	0-7	0-8		
		After 6 weeks	9	0	0-0	0-5		
	Usual Care	Baseline	16	0	0-3	0-9		
		After 6 weeks	7	0	0-0	0-7		
Normal work	Intervention	Baseline	16	2	0-5	0-8	p= 0.83	**p=0.02**
		After 6 weeks	15	0	0-0	0-0		
	Workbook	Baseline	15	2	0-6	0-10		
		After 6 weeks	9	0	0-0	0-7		
	Usual Care	Baseline	16	2	0-6,5	0-9		
		After 6 weeks	7	0	0-7	0-10		
	Intervention	Baseline	16	0	0-0	0-4	p= 0.19	p=1.00
		After 6 weeks	15	0	0-0	0-0		

Relations with other people	Workbook	Baseline	15	0	0-0	0-0		
		After 6 weeks	9	0	0-0	0-0		
	Usual Care	Baseline	16	0	0-0	0-3		
		After 6 weeks	7	0	0-0	0-0		
Sleep	Intervention	Baseline	16	0	0-0	0-7	p= 0.82	p=0.37
		After 6 weeks	15	0	0-0	0-0		
	Workbook	Baseline	15	0	0-6	0-9		
		After 6 weeks	9	0	0-6	0-10		
	Usual Care	Baseline	16	0	0-0	0-10		
		After 6 weeks	7	0	0-0	0-2		
Enjoyment of life	Intervention	Baseline	16	0	0-0	0-5	p=0.62	p=0.37
		After 6 weeks	15	0	0-0	0-0		
	Workbook	Baseline	15	0	0-0	0-8		
		After 6 weeks	9	0	0-0	0-9		
	Usual Care	Baseline	16	0	0-3	0-8		
		After 6 weeks	7	0	0-0	0-5		

Table 11 indicates means scores of the BPI-sf pain interference for the intervention, workbook, and usual care groups

Table 11 Means of Pain interference

	Group	**Time**	**n**	**Median**	**Inter Quartile Range**	**Range**	**Kruskal-Wallis Test baseline between groups**	**Kruskal-Wallis Test after six weeks between groups**	**Change within groups Signed Rank Test**
BPI interference	Intervention Group	Baseline	16	5,5	0-16	0-46	**p=0.79**	**p=0.02**	**p=0.00**
		After 6 weeks	15	0	0-0	0-0			
		Change from baseline	15	-5	-17-0	-46-0			
	Workbook Group	Baseline	15	9	0-21	0-40			**p=0.04**
		After 6 weeks	9	0	0-0	0-47			
		Change from baseline	9	-9	-15-0	-32-3			
	Usual Care	Baseline	16	5.5	2-18	0-55			p=0.06
		After 6 weeks	7	0	0-14	0-34			
		Change from baseline	7	-6	-21-0	26-0			

The was no significant difference between the three groups at baseline (p=0.79) in pain-interference using the Kruskal-Wallis Test. There was a significant change (p=0.02) in the BPI-sf-Interference score for normal work at measurement after six weeks.

Within the groups there was a significant change in pain interference in the intervention group (p=0.00) and workbook group (p=0.04). There was no significant difference for the usual care group (p=0.06).

4.3 Chronic Diseases Self-Efficacy Scale (CDSES)

The Chronic Disease Self-Efficacy Scale is a six items questionnaire to assess self-efficacy in various chronic disease and is a generic questionnaire. Patients were required to report on a numerical rating scale of one to ten, where one is not confident at all and ten is very confident, how confident they are to perform a certain activity. The perception of confidence is reported covering managing fatigue, managing physical discomfort, and emotional distress, symptoms from other health problems, other health conditions and pharmacological treatments.

Table 12 is the finding of the CDSES at baseline and six weeks for the intervention, workbook and usual care groups

Table 12 Baseline CDSES

Item	**Group**	**n**	**Median**	**Inter Quartile Range**	**Range**	**Kruskal-Wallis Test baseline between groups**	**Kruskal-Wallis Test after sIx weeks between groups**
Confidence to manage fatigue	Intervention	16	7.5	5-10	4-10	p=0.27	**p=0.02**
		15	9	8-10	5-10		
	Workbook	15	6	5-8	3-10		
		9	7	6-9	4-9		
	Usual Care	16	7.5	6-9	2-10		
		7	7.5	6-8	5-10		
Confidence to manage physical discomfort	Intervention	16	7	5-9	2-10	p=0.34	**p=0.03**
		15	8	8-10	5-10		
	Workbook	15	6	4-8	2-10		
		9	7	6-7	6-10		
	Usual Care	16	6.5	5-9	2-10		
		7	6	4-8.5	4-10		
Confidence to manage emotional distress	Intervention	16	8	4-10	2-10	p=0.31	**p=0.00**
		15	8	8-10	7-10		
	Workbook	15	5	3-8	0-10		
		9	7	7-7	4-9		
	Usual Care	16	6.5	4.5-9.5	3-10		
		7	7	3.5-8	3-10		
Confidence to manage symptoms of other health problems	Intervention	16	7.5	5-95	3-10	p=0.06	**p=0.05**
		15	8	7-10	5-10		
	Workbook	15	5	3-8	1-9		
		9	6	4-8	3-9		
	Usual Care	16	7	5.5-8.5	2-10		
		7	6.5	5-9	4-10		
Confidence in self-management to	Intervention	16	10	7-10	5-10	p=0.13	**p=0.04**
		15	9	7-10	6-10		
	Workbook	15	8	5-9	1-10		
		9	8	8-9	5-10		

reduce need to see doctors	Usual Care	16	9	7-10	3-10		
		7	6	4-8	3-10		
Confidence in non-pharmacological management	Intervention	16	8	7-10	2-10	p=0.10	p=0.06
		15	10	8-10	7-10		
	Workbook	15	7	2-9	1-10		
		9	9	7-9	3-10		
	Usual Care	16	8	6.5-10	1-0		
		7	7.5	4-9	2-10		

At baseline there was no statistically significant difference between the three groups using the Kruskal-Wallis Test. After six weeks there was a statistically significant difference between the groups for confidence in managing fatigue (p=0.02), in managing physical discomfort (p=0.03), in managing emotional distress (p=0.00), managing symptoms of other health problems (p=0.05), in self-management (p=0.04) using the Kruskal-Wallis Test.

Table 13 below is the means of the CDSES at baseline and six weeks for the intervention, workbook, and usual care groups.

Table 13 Means CDSES

Item	**Group per items**	**n**	**Median**	**Inter Quartile Range**	**Range**	**Kruskal-Wallis Test between groups**
Baseline Chronic disease mean	Intervention group	16	45	34;56	26;60	p=0.15
	Workbook group	15	39	28;43	13;56	
	Usual Care	16	42	33;53	25;60	
6 weeks Chronic Diseases Self Efficacy Scale	Intervention group	15	51	47;58	40;60	**p=0.13**
	Workbook group	9	44	39;47	28;54	
	Usual Care	8	40	26;50	24;60	

The change within groups for the mean of CDSES for the intervention group was 6 (IQR-2-20); for the workgroup group the median was 10 (IQR 1-14) and for the usual care group the median was -2.5 (IQR -11-0). The change within the intervention group (p=0.02) and the workbook group (p=0.04) was statistically significant the change in the usual care group was not statistically significant (p=0.44).

4.4 EQ-5D-3L

The EQ-5D-3L is a generic tool to assess health related quality of life. The EQ-5D-3L has five dimensions, mobility, self-care, usual activities, pain and discomfort, anxiety, and depression. Participants can indicate three levels beings, no problems, some problems, or extreme problems. There is also a visual analogue scale with an indicator of 0-100 where 0 indicates worst health state and 100 best perceived health states, please see Table 15.

Table 14 below presents the findings of the quality of life scores using EQ-5D-3L statistical significance within groups at six weeks for the intervention, workbook and usual care groups. The table also present findings for the statistical significance at baseline, six weeks and between the groups.

Table 14 EQ-5D-3L

EQ-5D-3L Item	**Group**		**Time**	**n**	**p-value (Within-groups) (McNemar' Test)**	**p-value (Between group) Fishers Exact Test**
Mobility	Intervention group		Baseline	16	p = 0.01	Baseline: p = 0.44
			After 6 weeks	15		
	Workbook group		Baseline	15	p = 0.03	
			After 6 weeks	9		After 6 weeks: p = 0.21
	Usual care group		Baseline	16	p=0.15	
			After 6 weeks	7		
Self-Care	Intervention group		Baseline	16	p = 0.04	Baseline: p = 0.07
			After 6 weeks	15		
	Workbook group		Baseline	15	p= 1.00	
			After 6 weeks	9		After 6 weeks: p = 0.22
	Usual care group		Baseline	16	p=0.31	
			After 6 weeks	7		
Usual Activities	Intervention group		Baseline	16	p = 0.03	Baseline: p = 0.34
			After 6 weeks	15		
	Workbook group		Baseline	15	p=0.04	
			After 6 weeks	9		After 6 weeks: p = 0.07
	Usual care group		Baseline	16	P=1.00	
			After 6 weeks	7		
Pain and Discomfort	Intervention group		Baseline	16	p =0.00	Baseline: p = 0.25
			After 6 weeks	15		
	Workbook group		Baseline	15	p=0.00	
			After 6 weeks	9		After 6 weeks: p = 0.10
	Usual care group		Baseline	16	P=0.16	
			After 6 weeks	7		
Anxiety and Depression	Intervention group		Baseline	16	p = 0.12	Baseline: p = 0.64
			After 6 weeks	15		
	Workbook group		Baseline	15	p=0.13	
			After 6 weeks	9		After 6 weeks: p = 0.22
	Usual care group		Baseline	16	p=0.32	
			After 6 weeks	7		

There was no statistically significant difference between the groups in each of the items for the EQ-5D-3L at baselines, neither was there a statistically significant difference between the item scores for each of the groups after six weeks in any of the dimensions.

There was a statistically significant difference in the Visual Analogue scale for the EQ-5D-3L within the intervention group (p=0.00). There was a statistically significant (p=0.02) difference between groups for the VAS see Table 15.

Table 15 presents the finding of the score of the visual analogue scale of the EQ-5D-3L of the intervention, workbook and usual care group at baseline and six weeks

Table 15 Visual Analogue Scale (VAS) EQ-5D-3L

		n	**Median**	**Inter Quartile Range**	**Range**	**Change within group**	**Kruskal-Wallis Test at baseline between groups**	**Kruskal-Wallis Test After 6 weeks Between groups**
Intervention group	Baseline	16	60	55-75	50-90	**p=0.00**	p=0.79	**p=0.02**
	After six weeks	15	90	85-90	60-95			
	Change from baseline	16	25	7.5-30	0-40			
Workbook group	Baseline	15	60	50-80	40-90	p=0.13		
	After six weeks	9	70	70-90	50-97			
	Change from baseline	9	10	020	-10-57			
Usual care group	Baseline	16	60	50-80	40-90	p=0.34		
	After six weeks	7	70	70-80	50-9			
	Change from baseline	7	10	-10-20	-10-20			

Table 16 below presents the findings of the EQ-5D-3L index scores for the intervention, workbook and usual care groups at baseline and six weeks

Table 16 EQ-5D-3L Index score

		n	**Median**	**Inter Quartile Range**	**Range**	**Change within groups (Signed Rank Test)**	**Kruskal-Wallis Test at baseline between groups**	**Kruskal-Wallis Test after 6 weeks between groups**
Intervention group	Baseline	16	0.79	0.64-0.830	0.56-1	**p=0.00**	p=0.38	p=0.16
	After six weeks	15	1.0	1-1	0.84-1			
	Change from baseline	16	0.21	0.09-0.0.32	0-0.04			
Workbook group	Baseline	15	0.73	0.73-0.83	0.69-1	**p=0.00**		
	After six weeks	9	1.0	1-1	0.85-1			
	Change from baseline	9	0.26	0.16-0.26	0.16-0.32			
Usual care group	Baseline	16	0.83	0.77-0.84	0.59-1	p=0.07		
	After six weeks	7	1.0	0.74-1	0.64-1			
	Change from baseline	7	0.14	0.01-0.16	-0.09-0.4			

The index score between groups was not statistically significant at baseline (p=0.38) or after six weeks (p=0.16). The change within groups was statistically significant for the intervention group (p=0.00), the workbook group (p=0.00) and was not statistically significant for the usual care group (p=0.07)

Physical Performance Task battery

The physical performance task battery is used to measure physical function of simple everyday tests. The Simmonds Functional tests included a total of nine tests of which two were omitted as the study was investigating weight-bearing joint pain only. The tests included two walking tests over 15 meters, one at preferred speed and another at fastest walking speed. The test included a repeated trunk flexion and repeated sit-to-stand, a timed belt tie, a sock test and a timed six-minute walking test. All tests were measured for time except for the six-minute walk test which was a measure of distance in meters.

Table 17 presents the findings of the physical performance battery task battery for the intervention, workbook, and usual care groups.

Table 17 Physical performance task battery

Activity	**Group**	**Time**	**n**	**Median**	**Inter quartile Range**	**Range**	**Signed Ranked Test within groups**	**Kruskal-Wallis Test baseline between groups**	**Kruskal Wallis Test after 6 weeks between groups**	**Kruskal Wallis Test change between groups**
15 meters fastest walking speed	Intervention Group	Baseline	16	14.92	11.4-1.61	10.54-35.34	**p=0.00**	p=0.86	p=0.70	p=0.31
		After 6 weeks	15	12.23	11.80-15.31	9.75-24.27				
		Change from baseline	15	-1.65	-3.46—0.08	-11.07-1.63				
	Workbook Group	Baseline	15	14.6	12.61-15.81	9.9-32.87	p=0.09			
		After 6 weeks	9	13.51	12.13-15.78	10.67-17.24				
		Change from baseline	9	-1.6	-2.14-0.42	-2.8;1.43				
	Usual Care	Baseline	16	14.18	11.85-16.18	11.08-20.18	p=0.74			
		After 6 weeks	8	13.39	12.34-15.46	11.21-18.03				
		Change from baseline	8	0.065	-1.87-1.15	-3.56-1.91				
15 meters preferred walking speed	Intervention Group	Baseline	16	17.21	16.14-23.36	13.31;48.40	**p=0.00**	p=0.46	p=0.48	p=0.08
		After 6 weeks	15	15.28	14.44-17.17	11.55;24.31				
		Change from baseline	15	-2.65	-7.83-0.87	-24.09-1.13				
	Workbook Group	Baseline	15	16.97	14.90-19.00	11.33-28.99	p=0.35			
		After 6 weeks	9	14.67	14.15-18.58	12.25-20.60				
		Change from baseline	9	-0.71	-2.67-0.32	-4.36-2.77				

	Usual Care	Baseline	16	17.47	15.45-19.73	11.51-22.66	p=0.38			
		After 6 weeks	8	16.2	15.18-18.08	13.95-20.46				
		Change from baseline	8	-0.59	-2.81-0.98	-3.82-1.75				
Repeated sit-to-stand	Intervention Group	Baseline	16	42.69	30.04-62.62	8.06;236.44	p=0.52	p=0.85	p=0.48	p=0.82
		After 6 weeks	15	48.35	43.2-63.52	27.8;124.39				
		Change from baseline	15	17.93	-23.82-27.88	-112.05-40.9.				
	Workbook Group	Baseline	15	49.5	25.85-;78.07	9.28-122.3	p=0.07			
		After 6 weeks	9	58.17	53.1-78.83	23.1-7016.00				
		Change from baseline	9	11.84	8.11-13.82	-23.99-69.47				
	Usual Care	Baseline	16	39.90	29.01-60.39	17.26-153.46	p=0.95			
		After 6 weeks	8	61.44	31.33-85.63	17.25-183.88				
		Change from baseline	8	-8.52	-11.64-29.70	-57.66-78.36				
Repeated Trunk flexion	Intervention Group	Baseline	16	8.74	8.46-10.19	0.92-19.12	**p=0.00**	p=0.29	p=0.08	**p=0.04**
		After 6 weeks	15	7.48	6.42-8.06	5.78-11.73				
		Change from baseline	15	-1.95	-2.77—0.66	-7.39-6.73				
	Workbook Group	Baseline	15	9.9	8.88-13.73	4.6-56.35	**p=0.00**			
		After 6 weeks	9	8.13	7.78-8.68	5.98-9.68				
		Change from baseline	9	-2.9	-4.10—2.15	-8.57—0.89				
	Usual Care	Baseline	16	10.37	8.96-12.67	7.00-28.23	p=0.25			
		After 6 weeks	8	8,29	7.95-10.38	7.06-14.03				

		Change from baseline	8	-1.01	-1.79-0.35	-4.78-3.02				
Timed Belt Tie	Intervention Group	Baseline	16	10.36	8.67-14.52	5.72-70.91	**p=0.00**	p=0.80	p=0.37	p=0.16
		After 6 weeks	15	7.6	4.91-9.02	3.62-14.17				
		Change from baseline	15	-4.8	-6.54;0.57	-13.17;2.8				
	Workbook Group	Baseline	15	8.97	8.79-11.34	5.86-17.53	**p=0.00**			
		After 6 weeks	9	8.11	7.04-9.24	5.49-14.77				
		Change from baseline	9	-1.81	-2.4-;-0.70	-9.91-3.34				
	Usual Care	Baseline	16	10.77	8.08-13.12	0.41-21.13	p=0.25			
		After 6 weeks	8	8.52	6.88-9.33	5.42-12.02				
		Change from baseline	8	-2.35	-3.41-0.11	-5.47-2.89				
Sock Test	Intervention Group	Baseline	16	8.88	6.37-10.91	0.51-18.78	p=0.12	p=0.95	p=0.92	p=0.59
		After 6 weeks	15	7.43	4.95-10.98	2.9-15.95				
		Change from baseline	15	-1.2	-2.17-0.61	-7.8-2.39				
	Workbook Group	Baseline	15	7.54	4.61-15.95	3.52-29.28	p=0.09			
		After 6 weeks	9	6.04	4.76-11.14	2.5-19.23				
		Change from baseline	9	-2.87	-4.38—0.21	15.74-3.83				
	Usual Care	Baseline	16	7.94	7.07-10.45	4.18-13.44	p=0.38			
		After 6 weeks	8	7.41	6.07-;9.53	5.42-12.02				
		Change from baseline	8	-1.34	-2.5-1.29	6.98-2.84				
		Baseline	16	333	300-392.5	165;-440	**p=0.00**	p=0.49	p=0.15	p=**0.01**

Timed 6-minute walk test	Intervention Group	After 6 weeks	15	395	336-440	250-538				
		Change from baseline	15	66	28-98	-53-205				
	Workbook Group	Baseline	15	360	298-410	124-480	**p=0.00**			
		After 6 weeks	9	427	410-438	325-516				
		Change from baseline	9	55	36-94	-4-140				
	Usual Care	Baseline	16	383	300-412	220-930	p=0.74			
		After 6 weeks	8	349	307-394	280-451				
		Change from baseline	8	-7	-50-30.5	-510-.0;60				

There was no significant difference between the three groups in all the physical tests at baseline measurements. There was a statistically significant difference in change after six weeks for the repeated trunk flexion (p=0.04) and for change in the timed six-minute walk test (p = 0.01) between groups using the Kruskal-Wallis Test.

For changes within the groups there was a statistically significant difference in the baseline and after six weeks for the intervention group for the 15 meters fastest walking speed (p=0.00); 15 meters preferred walking speed (p=0.00); repeated trunk flexion (p=0.00) timed belt tie (p=0.00) and timed six-minute walk test (p=0.00). The statistically significant changes in the workbook group were for; repeated trunk flexion (p=0.00); timed belt tie (p=0.00) and timed six-minute walk test (p=0.00).

4.5 Acceptability Questionnaire

The acceptability questionnaire is a self-developed questionnaire composing of five open ended questions that seeks to assess the appropriateness of the exercise programme and the booklet as experienced by the intervention group.

Table 18 presents the findings of the acceptability questionnaire for the intervention group after six weeks.

Table 18 Acceptability Questionnaire

1. What did you enjoy and find as a good thing about the education and exercise programme?	
Responses	**Frequency of response**
I enjoy the exercise	n=5
I had lots of pain now I have less pain	n=3
I feel healed	n=6
Being given the understanding that exercise the best medication	n=2
My body wasn't good now it's better	n=4
I still have pain, but I no longer limp	n=5
I am now able to do house chores since being in the programme	n=6
Being given information about what to before going to the hospital	n=1
Learnt how different medications work in the body	n=3
To learn how to make decisions to manage pain	n=2

I don’t feel ill anymore	n=2
When I wake up, I don’t have pain when I wake up	n=1
I don’t use the same amount of pain medication that I did previously	n=5
I felt that was more relaxed emotionally	n=3
I was able to sleep better	n=1
I wish I could have learnt about this programme earlier, perhaps my health would not have deteriorated	n=2
I really enjoyed the discussions we had in the group	n=1
I am able to work in my garden again	n=2
I exercise with my grandchildren, and they think if fun, but I know my benefit	n=3
2. What did you not like about the exercise and education programme?	
I don’t like that it has to end	n=5
I was happy with everything	n=9
3. What would you change about the exercise and education programme?	
There is nothing I would change	n=9
I am satisfied with the programme	n=6
4. What would you add to the exercise and education programme?	
Those who haven’t experienced great relief to continue in exercise	n=1
I would love other people to be added	n=8
Stomach exercises and weightless exercises	n=1
I wish that at the end we could continue maybe once or twice a week with exercise	n=9
Do more running on the road to run for longer period of time	n=2
I would be happy to be given any new information	n=1
I would like it to be rolled out at the clinics.	n=1
To have a group that can continue at least once a month	n=2
To play some ball sports together that could be so much fun	n=1
Open it up to people who don’t use clinics	n=2
5.What did you think about the education booklet	
I was not able to read it due to not having glasses	n=1
I liked it, it’s full of helpful information and helped with how to care for one’s health	n=5
I liked the information on various topics that were new to me.	n=6
Mine is full of notes and thoughts I wrote down	n=1
I enjoyed the information on how to eat for my health condition	n=3
I am going to use it to be able to help my sister who is 79, who was too old for the study, with the content	n=1
Reminded me of the things I needed to do when I am at home	n=6
Helped me learn about weight loss	n=1
The book was helpful about how to understand my medication	n=2

When my children read for me, I understood the need for regular exercise	n=2
I really enjoyed the stress management discussion	n=1

The most common response on what was positive is that the participants in the intervention group enjoyed the exercises. They reported they felt that participation in the programme had healed them and that they no longer walked with a limp. There were no recommended changes across the board with participants reporting satisfaction with the programme. The participants expressed the desire that the programme should be opened to additional participants. The booklet was said to be useful by participants who learnt new information from the booklet, and they reported that the booklet allowed them to be able to remind themselves of information they may have forgotten.

The following section will discuss the implication of these results for the impact of joint pain, self-efficacy, quality of life and physical function for clinical practice and considering available literature.

5. DISCUSSION

5.1 Discussion outline

This study aimed to determine the impact of a six-week exercise and education intervention on pain in females between the ages of 50 and 70 years who are living with weight-bearing joint pain for three months or longer in the Maluti-a-Phofung health sub district and who receive their care primarily from primary health care clinics. The main finding is that health education and six-weeks of exercise for 30 minutes resulted in a change in the participants pain severity and pain interference scores for those in the intervention and workbook groups. The self-efficacy of the participants using the CDSES indicated a statistically significant improvement of self-efficacy in the intervention group when compared to participants in the workbook and usual care groups. The quality of life of individuals improved by participating in the intervention programme, which was corroborated by the acceptability questionnaire completed by participants taking part in the intervention group. There was an improvement in the physical function of the intervention and workbook groups, including the six-minute walk test. The improvement in physical function corresponds to the improvement noted in the subjective outcome measures.

5.2 Demographics

The intended number of participants to be recruited in the study was 108, however the response was not favourable despite various presentations on recruitment days, n=47 enrolled at baseline. The population for this study was specific to females between the ages of 50 – 70 years. In their study, Barnes, Jelsma & Parker (2018) also experienced a similar challenge in recruiting participants, despite having a marginally broader age category for participating in their study. The poor response to the invitation to participate could be because of the demographic of clinic attendees on presentation days. This could be influenced by the clinic arranging specific days for specific conditions (Igumbor et al., 2012; Visagie & Swartz, 2016). Individuals outside the prescribed age responded to the invitation for enrolment in the study even though the invitation address specified the age of potential participants, and these individuals could not be included in the study sample. Saw (2015) recruited patients from an orthopaedic surgical waiting list, the individuals on the waiting list had shown interest in resolving their joint pain, despite this n=42 enrolled in the study from n=281 who were invited to participate in the study.

Jackson (2017) stated that South African women have a stoic position towards joint pain even in the presence of “chronic pain” as per the three months or longer definition of the current study, some of these women did not use analgesia to manage their pain symptoms. This might have affected their willingness to address their pain, and their negative experience in PHC clinics of joint pain not being prioritized may have left prospective participant apathic to enrol in this study (Visagie & Schneider, 2014; Jackson, 2017). In the current study, the individuals who responded to the invitation for enrolment all had severe levels of pain as per the finding of the BPI-sf pain severity score, with the intervention group experiencing m= 19 IQR (16.5 - 22); workbook group m=19 IQR (14-22) and usual care group m=17 IQR (14-21.5) level of pain. The pain experienced by these individuals remained largely unaddressed by the health care professionals who attended to the patients in PHC Clinics.

The specificity of the inclusion criteria is consistent with the prevalence of joint pain as discussed in section 2.10 and section 2.11, and it has been observed in literature that joint pain is likely to affect a large number of clinic goers within the inclusion criteria (Parker & Jelsma, 2010; Copley et al., 2013). Despite the small number of participants who enrolled in the study, the data illustrated that there is a burden of joint pain which remains unmanaged within female (section 2.7) clinic attendees aged 50 -70 (section 2.6). The exclusion of individuals younger than 50 years of age and those older than 70 years of age could have limited a potentially larger sample size. However, the exclusion of the older participant is supported by the findings of (Siemonsma et al., 2018) that elderly people experience a greater degree of physical functional decline and experience more severe psychological distress. There was a need in this study to ensure that prospective participants could participate in an exercise programme (de Luca et al., 2019; Kamerman et al., 2020).

In the current study, the majority of participants n=29 (62%) was obese (BMI > 30) as per the definition for the classification of obesity at randomisation, 10 (21%) were classified as being overweight (BMI = 25 – 30), while only 8 (17%) were classified as normal weight (BMI 18,5 – 25). The findings revealed a median BMI of the intervention group was 32.99 (IQR 25.6 – 40.9); workbook group 35.3 (IQR 26.4 – 45.9) and the usual care group was 30.4 (IQR 26.5 - 38.8. The study by Saw (2015) investigating and education and exercise intervention in people 50 -

70 found that the mean BMI was 35.79 (SD = 8.81) in her study sample. In the Barnes et al (2019) study investigating an education and exercise programme in women, 40 – 64 found a median of obesity was 37.2 and IQR (31.8-41.39). The statistician general of South Africa in (2016) found that 68% of South African women are overweight or obese, and one in five of South African women have a BMI of greater than 35, this study found that BMI in the study participants was similar to that of other South African women. Being overweight or obese has shown an association with increased risk of joint pain and worse severity of joint pain in individuals who already experience joint pain (Messier et al., 2011; Okifuji & Hare, 2015). In the current study 39 (83%) of participants were overweight or obese, and the findings of the current study are consistent with literature indicating that joint pain is exacerbated with an increased BMI, and individuals with increased BMI are likely to experience severe weight-bearing joint pain compared to individuals with normal BMI's (Rogers & Wilder, 2008; Plotnikoff et al., 2015; Duclos, 2016; Sallehuddin et al., 2018). Barnes, Jelsma & Parker (2018) in their study noted that there was no change in BMI of participants within six week of an exercise and education intervention, and the possible reason stated by the authors for this finding was an ineffective dosage of exercise to effect a change in BMI (Barnes, 2016). The (American College of Sports Medicine, 2018) guidelines suggest that the recommended levels of physical activity for adults 18 -64 year of age of 150 minutes of exercise results in moderate weight loss, where physical activity greater than 225 minutes to about 420 minutes a week results in weigh loss of about five to seven-and-a-half kilograms, the duration in which the weight loss would take place was not described. Weight loss is a product of change in energy intake and energy expenditure where the energy expenditure is greater than the energy intake (American College of Sports Medicine, 2018). The change in energy intake has greater effect on weight loss compared to energy expenditure but prescribing dietary guidelines leading to weight loss as part of the management of joint pain was outside the scope of practice of the researcher (American College of Sports Medicine, 2018). It was not within the scope of the current study to change the BMI of participants although body mass management was discussed as part of the health education (Appendix K chapter4) provided to participants in the intervention group and was in the booklet provided to those in the workgroup group. The discussion included general information similar to what is discussed in the American College of Sports Medicine (2018) guidelines on how to manage weight such as

to limit energy intake, to make healthier food choices and how to increase levels of physical activity.

Obesity and being overweight are significant risk factors of developing non-communicable diseases, people with joint pain who are obese often present with co-morbidities to their joint pain (Dean & Söderlund, 2015; Williams et al., 2018). It was hypothesised that the increased BMI of the participants in this study would mean the participants would also present with non-communicable diseases alongside their joint pain, like what was found in the participants of other studies investigating joint pain interventions (Saw, 2015; Barnes, 2016). It is also likely that these participants who were recruited from PHC Clinics were making use of the PHC clinics as part of their management for their non-communicable disease, and as such, there would be an over representation of non-communicable disease in the study population (World Health Organisation, 2015; Gaziano et al., 2017; Jongen et al., 2019). In the current study, hypertension was the most prevalent non-communicable disease with 72.3% (n=34), the prevalence in the study population was higher than what was found in the Barnes study (2016) where 63% of the sample had hypertension. Barnes (2016) has a slightly younger populations 40 -65 and hypertension prevalence is higher in older people which can explain the difference in the prevalence between the two studies (Buford, 2016). The prevalence of hypertension in the study was significantly higher than the populations prevalence in South Africa according to the World Health Organisation (2015) which is 27.4% for men and 26.1% for females, this difference could be attributed to demographics of the participant and the fact that participants were regular clinic users for chronic diseases at the PHC clinics.

Twenty-five percent of participants, (n=12) were HIV positive which is consistent with the community prevalence of HIV in South Africa for females which is 24.1% for females from data collected by the Human Science Research Council in a national population-based household survey in 2012 (Mabaso et al., 2019). HIV is a communicable disease, and it is an important comorbidity to consider when addressing pain amongst women in the PHC clinical settings, the role out of anti-retroviral treatment has increased the live expectancy of people living with HIV, and it has been observed in previous research studies that people with joint pain may also be living with HIV as a comorbidity (Parker, Stein & Jelsma, 2014a). The pain prevalence of people living with HIV is reported to be as high as 60.8% and chronic pain prevalence 48% (Parker, Jelsma & Stein, 2016; Gaziano et al., 2017; Mabaso et al., 2019).

These were prevalence rates where pain was present for longer than six months, and these populations presenting with joint pain and HIV will need to understand the disease process of both HIV and joint pain (Parker, Jelsma & Stein, 2016; Jackson, 2017). People living with HIV can have both HIV associated pain and joint pain, differentiating between them requires clear education on the presentation of both types of pain (Parker, Stein & Jelsma, 2014b; Jackson, 2017). The relationship between HIV associated pain and joint pain has been described by Adizie et al. (2016) where it was reported there is often an underlying rheumatic disease as the driver of joint pain amongst people with HIV, and not primary joint pain as discussed in this study. The multifactorial nature of HIV associated pain means that the educational content of joint pain interventions needs to address information specific to HIV associated pain and how it can confound joint pain (Parker, Jelsma & Stein, 2014a). The management strategies for joint pain and HIV-associated pain includes similar management tools such as health education and exercise, and previous research has shown that people living with HIV who participated in studies where health education and exercise were utilised were able to manage their pain better after the study was completed (Jackson, 2017; Parker, Jelsma & Stein, 2017).

DM2 prevalence of the study participants was n=8 (17%), which was similar to the pooled prevalence of DM2 in a South African systematic review performed in 2021 which was 11.07%-19.95% (Pheiffer et al., 2021). The prevalence of DM2 in the current study was also higher than the prevalence that was reported in the Free State province in 2012 and 2013 where the prevalence was found to be 11%, in a study looking into the risk profiles for diseases of lifestyle (Van Zyl et al., 2012). Obesity is the most common driver of DM2 and approximately 69% of people who are living with DM2 are undiagnosed, the implication of which is that some of the participants in the current study may have undiagnosed DM2 (Pheiffer et al., 2021). According to Peric et al. (2015) DM2 means that joint pain being experienced can be as a result of pain related to DM2 complications, as 50% -80% of people with DM2 experience pain, this pain can be overlooked as contributors to joint pain in obese and overweight populations (Peric et al., 2015). The common sites of pain in people with DM2 in a Serbian study analysing pain revealed that the upper leg and lower leg were the common sites of pain which includes the hips, knees and ankles which were the joint considered weight-bearing joints in the current study (Peric et al., 2015). The presence of pain related to

DM2 is a variable that needs to be known in order to be considered in the management of joint pain in the presence of comorbidities (Peric et al., 2015; Kluding et al., 2016). It is important that individuals with joint pain in the lower limbs be screened for DM2 to exclude the disease as a driver of pain. The screening of DM2 in the study population was beyond the scope of this study, yet literature reveals DM2 may be a variable that confounds joint pain particularly in individuals who have higher BMIs (Chentli, Azzoug & Mahgoun, 2015; Kluding et al., 2016).

The discussions on NCDs were well received in the current study as was reported in the responses in the acceptability questionnaire, and it was noted by the researcher that the content of the weekly discussions allowed the participant to have their questions regarding NCDs answered. Visagie & Schneider (2014) reported that patients often wanted their questions concerning their health conditions answered, and that patients in PHC clinics were dissatisfied with health education they received (Lalken & Mash, 2015). The reseachers asked the question whether the nurses practicing in PHC clinics are suitably trained for health education in the multimorbitiy of joint pain and NCDs. This lack of skill is likely to detract from the ability to transfer self management skills to patients they treat. In the present study, the intervention group may have experienced health education provided by the researcher as empowering and aiding self-management which could substantiate why they found the discussions helpful. Coetzee, Giljam-Enright & Morris (2020) argued that additional training of nurses on the role of the physiotherapist in aiding self-management could increase referral of patients to these services, thus allowing physiotherapist to use interventions similar to this study to respond to the multimorbidity of joint pain and NCDs.

5.3 Educational and employment status.

The majority of the sample n=26 (55%) was unemployed and (40%) of the sample n=19 was pensioners dependent on a state income. The age of eligibility to receive a state old age pension in South Africa is 60 years, and it stands to reasons those participants 60 years and older in the current study would be recipients of old age state pension (Ralston et al., 2015). The state pension has been pivotal to keeping many households out of abject poverty, especially where joint pain could impede the ability to participate meaningfully in work and other income generating activities (Dubihlela & Dubihlela, 2014).

In the sample n=26 (55%) of the participants had an educational level of grade 9 or lower, two individuals had no formal education, and only two participants had been educated beyond matric. In a study determining the risk factors associated with chronic diseases and musculoskeletal pain in a township in Cape Town, the majority of participants in the study (58%) indicated being educated up to secondary school or less (Britz, 2019). Barnes, Jelsma & Parker (2018) in their sample indicated that 60% of their intervention group and 64% of their control group, who were PHC clinic users, had an education level only up to secondary school level. (Lee et al., 2021) suggest that low educational levels are associated with poor understanding of health education material which can lead to persistent pain or more severe experiences of disability. The Department of Higher Education and Training reported that in South Africa, for adults 20 years and older, 12.1% of the population nationally, and in the Free State 14.9% of individuals had not completed grade seven (Khuluvhe, 2021). Education is deemed as important for comprehension of health education material, where educational levels are lower, people prefer oral health education as opposed to written health education (Coetzee, Giljam-Enright & Morris, 2020; Baumeister et al., 2021). Oral communication allows information to be communicated simply to those who do not understand medical jargon which can be misunderstood in written health education material (Coetzee, Giljam-Enright & Morris, 2020; Baumeister et al., 2021). Oral health education context also allows for clarity seeking questions to be asked where patients require further explanations and this aids comprehension and satisfaction with health education material (Kruger-Jakins et al., 2016; Coetzee, Giljam-Enright & Morris, 2020; Tavakoly Sany et al., 2020; Baumeister et al., 2021).

The income status amongst the study participants is consistent with their educational levels as there is an association between educational status and income potential (Stryzhak, 2020). Individuals in this study sample are from a low socioeconomic background, and PHC clinics provide free services, likely attracting those who cannot afford fee paying services (Dayal, 2010; Maillacheruvu & Mcduff, 2014). According to Maillacheruvu & Mcduff (2014) and Malakokane et al. (2020) those individuals with medical aid or those individuals who can afford to pay prefer to make use of private health care so they can avoid inconveniences like long waiting times and fractured services in the PHC clinics.

The lower level of literacy means that health education material needs to be presented in a manner which will be understandable to patients, creating a challenge to ensure that health education material is suitably translated from English into vernacular languages (Boateng et al., 2020). In the current study, Sesotho was the language used to provide the health education, albeit that the content was developed in English by the researcher and then translated into Sesotho by a Sesotho junior schoolteacher. The appropriateness of vernacular language booklets and treatment is emphasised in the literature, this is to ensure the information is able to give an understanding of pain and management strategies (Boateng et al., 2020; Parker & Madden, 2020). The understanding of pain in health education material requires that authors of such material to give considerations to the cultural nuances of communication that will aid participants develop a confidence to manage their pain (Shaikh, Bentley & Kamerman, 2013; Parker & Madden, 2020). The primarily scientific conceptions of health in a setting where the worldview may not be exclusively composed of the western epistemology can lead to the health education being misunderstood or dismissed by individuals with joint pain (Shaikh, Bentley & Kamerman, 2013). The secondary challenge is the linguistic ability of physiotherapists working in primary health care where their inability to speak the local language results in fragmented or incomplete health education (Shaikh, Bentley & Kamerman, 2013; Coetzee, Giljam-Enright & Morris, 2020). The researcher has observed from personal experience that community service physiotherapists lack the cultural insight, and they communicate with older individuals in an inappropriate manner to encourage engagement with health education material, an issue identified by Mostert-Wentzel, Frantz & Van Rooijen (2013). Whilst community service physiotherapists possess the training to act as community physiotherapist, they spend only a year in their community service placements which is insufficient time to develop the socio-cultural insights of how to communicate health information effectively, a skill which can be developed with time spent in communities (Mostert-Wentzel, Frantz & Van Rooijen, 2013). Therapeutic alliance between patients and clinicians is important for pain management, where the perception of the quality of the care received by patients influences the extent to which they have confidence that their pain can be managed (Babatunde, MacDermid & MacIntyre, 2017a). Ineffective communication can prejudice individuals with low educational levels to experience severe consequences of joint pain, and health care professionals need to ensure that their communication skills are suitable help individuals with low education levels understand their pain and NCDs (Lanitis et al., 2015; Coetzee, Giljam-Enright & Morris, 2020).

5.4 Attendance and attrition

There were 47 participants that participated in the study and at post intervention measurement after six week 16 participants (nine usual care; six workbook group and one intervention group) did not attended, mostly from the usual care group. Weekly attendance in the intervention group was satisfactory, when compared to a United Kingdom study where the attendance at exercise sessions was 56% (Finnegan et al., 2015). The attendance in the current study was higher at n=12 (75%) being the lowest attendance. Barnes (2016) in her study had regular attendance with n=18 (81%) being the lowest number of attendees at the weekly exercise class. Contrary to the findings, Jackson (2017) had 65% attendance as the largest number of attendees and 38% the least number of attendees over the six weeks. The variability in attendance in these studies could be attributed to their respective research settings. Barnes’ study was in a peri-urban clinic which was accessible as it was the clinic the patients regularly used, and Jackson ‘s study was in a rural context where access to the central venues required incurring a travel cost (Barnes, 2016; Jackson, 2017). Participants in the intervention group mentioned in the acceptability questionnaire that the benefits of participating in the intervention programme were a significant motivator for attendance. The main reason for non-attendance in this study was missing the transport, both during the study and on the measurement days, even while the transport was provided at the cost of the researcher. This serves to affirm that exercise and rehabilitation programmes should be implemented at primary health care clinics, as opposed to centralized venues, which would add a transport burden on the participants, individuals that use PHC clinics often walk to the PHC clinics (Barnes, 2016).

The attendance in the intervention group could have been aided by the group context and the consequent social support that occurs when participating in a group (Farrance, Tsofliou & Clark, 2016). Group settings in older populations presents benefits toward improving attendance and help to foster relationships between participants, preventing social isolation which is a psychosocial consequence of joint pain (Farrance, Tsofliou & Clark, 2016; Komatsu et al., 2017). Komatsu et al. (2017) found that relationship building in exercise group was related to the health problems that the participants had in common. The intervention group in the study illustrated that groups are a is helpful context for providing joint pain treatment because of the added benefits of the group dynamics (Farrance, Tsofliou & Clark, 2016; Komatsu et al., 2017).

The attendance could have also been aided by the rapport that developed between the researcher and the participants in the intervention group. The therapeutic alliance formed has significant implications for facilitating self-efficacy to manage the pain and for the participant to follow through with the interventions.

In the acceptability questionnaire, the participants expressed a desire to have other people they know enrolled into a programme followed during the research study. This further illustrated the earlier assertion that although the study population was small, there are larger numbers of individuals with joint pain that would benefit from a programme like that of the study.

5.5 Pain

Pain a major cause of disability and activity limitation, and the consequence of persistent pain extend beyond the physical limitation into the psychosocial consequence of joint pain (Hurley, Mitchell & Walsh, 2003; Willett et al., 2021). The findings of the current study revealed that amongst the study participants the median number of weight-bearing joint pain sites was three joints, and the most common areas of joint pain was the knees, the ankles, back and then hips. The median number of joint pain sites in this study was consistent with findings of joint pain studies that most individuals presented with multiple joint pain sites (Parker, Jelsma & Stein, 2014b; Barnes, 2016; Britz, 2019). However, the literature indicated a significantly lower prevalence of ankle joint pain, the occurrence of ankle pain in this study could be accounted for by undiagnosed diabetes which leads to pain in the lower leg (Copley et al., 2013; Peric et al., 2015; Kluding et al., 2016; Britz, 2019). Barnes et al. (2018) found that the back and knee joints were the most common joint pain site with even amongst individuals with multisite pain. The finding of multisite join pain is consistent with what was expected amongst the PHC clinics users and provides direction that planning for management of joint pain in PHC clinics should be directed toward multisite joint pain (Finney et al., 2017).

The finding of multisite joint pain illustrates that the biomedical approach using only analgesia as the primary means of managing pain symptoms is not responsive to the biopsychosocial sequalae of joint pain (de Luca et al., 2019). The persistence of a biomedical approach to manage joint pain in PHC clinics creates a challenge when patients present with multisite joint pain which requires a more robust approach inclusive of more than analgesia (National Department of Health, in press; Walsh, Pearson & Healey, 2017). The biomedical approach aims to cure pathology within a single site of joint pain and is unlikely to be responsive to the needs of the patients with multisite joint pain, and the limited capacity of physiotherapist working to treat the large numbers of individuals presenting at PHC clinics make this approach undesirable (Walsh, Pearson & Healey, 2017). The extensive body of work on the utility of exercise and health education in community settings warrants that exercise and education interventions form part of the primary response to joint pain, shifting the response from biomedical towards a biopsychosocial among all health professionals who manage joint pain in the PHC Clinics (Mostert-wentzel, Frantz & van Rooijen, 2013; Babatunde, MacDermid & MacIntyre, 2017b). A shift in Denmark was observed, with an increasing uptake of the GLA:D programmes that is also being disseminated to other countries, the GLA:D has been positively received as an important tool for joint pain (Skou & Roos, 2017; Davis et al., 2018). Clinical researchers have been at the forefront of championing interventions they have found to be effective for joint pain management, and these programmes are of value to both the health systems and to patients (Skou & Roos, 2017; Davis et al., 2018). There is a need in the South African health system that physiotherapists embrace new management strategies as part of their management tools, tools that allow them to respond to the musculoskeletal burden which often presents as multisite pain (Tadyanemhandu et al., 2016; Leahy, Chipchase & Blackstock, 2017).

5.6 Pain severity and Pain interference

The main finding of the current study is that within a six-week period of health education and exercise there is a decrease in pain severity scores in the intervention group and workbook groups, from baseline to six weeks. The intra group change in pain severity was statistically significant in the intervention and workbook group from baseline to six weeks. At baseline assessment the pain severity score was severe in the intervention, workbook and usual care group and there was no statistical difference between the three group's pain severity scores. The change in the pain severity scores between groups was not statistically significant. This is not a unique finding with other studies having similar findings as was discussed section 5.2. Parker, Jelsma & Stein (2016) whilst investigating the management of pain in women living with HIV found that there was a decrease in pain severity and interference, but the findings were not statistically significant. The change in pain severity and pain interference scores were not statistically significant between groups. However, the intervention and workbook groups experienced significant change in the pain severity and pain interference score, which is of importance in clinical practice, and similar programmes could be added to the tools health care professionals can use to bring about pain relief (Parker, Jelsma & Stein, 2016).

Participation in the exercise and health education programme provided greater relief in pain severity score of the intervention group as compared to those in the workbook group and the usual care groups. This also included a statistically significant difference between the intervention group, workbook group and usual care group on the item of “pain right now” in favour of the intervention group which illustrated a change in pain that was able to be reported immediately. These finding are consistent with previous research in the South African context using exercise and health education in the management of joint pain (Edries, Jelsma & Maart, 2013; Jackson, 2017; Barnes, Jelsma & Parker, 2018).

The pain severity at baseline can allow one to reasonable deduce that despite regularly attending a PHC clinic the participants’ joint pain remained unaddressed, and this is a cause of concern as pain can be a primary motivator for people seeking care from clinics, as indicated by a study in the Eastern Cape finding that 50% of clinic attendees had been motivated by pain (Igumbor et al., 2012).

The items on use of medication provided some interesting insight into the relationships of pain and pharmacological pain management amongst clinics users. Although the understanding of numeracy could have presented a challenge in responding to pain relief when reporting medication use as a percentage change. Less than 50% of the participant reported analgesia use at baseline, this could be attributed to the clinics not having pain medication available, a regular occurrence within primary health care clinics and may also contribute to patients not relaying on pain medication as a pain management strategy (Hodes et al., 2017). Coetzee, Giljam-Enright & Morris (2020)) commented that persistent pharmacological treatment of joint pain communicated to patients that there was nothing that could be done for their pain, this perception can explain reluctance to use pain medication.

The change in the pain severity was expected, as this was found by others with similar interventions using health education and exercise for joint pain (Edries, Jelsma & Maart, 2013; Barnes, Jelsma & Parker, 2018). Saw (2015), in her randomised control trial of exercise and education intervention for people awaiting joint replacement surgery, found that people aged 50 – 70 in the intervention group with OA showed a decrease in pain severity after participating in the programme. Their pain severity scores at baseline for both intervention and control groups were reported as the mean =6.53 SD 2.29; at six weeks within group difference of m=2.44; SD 2.24 and at six months mean=2.24 (Saw, 2015). When group exercise interventions for joint pain were investigated against individualised interventions, in people aged 18 – 75 years, with non-specific low back pain there is a marginally greater decrease in pain relief for individualised interventions of one point a numeric rating scale of zero to ten (O'Keeffe et al., 2020). The finding of a marginally greater change doesn't warrant the use of individualised interventions in rural health care contexts where there is limited capacity, and where group interventions are suitable for providing joint pain interventions with empirical evidence to support the use of groups (Barnes, Jelsma & Parker, 2019; Coetzee, Giljam-Enright & Morris, 2020).

In this study, the change in the pain severity score and the pain interference score in the intervention group and the workbook groups are corroborated by similar findings in the EQ-5D-3L where a change in pain was reported, and in the acceptability questionnaire where the intervention group participants reported an improvement in wellbeing,

There was no x-ray confirmation of joint pathology in the study participants, and it should be noted that the joint pathology on an x-ray would not have changed the structure of the study intervention. It is unlikely that individuals with joint pain would be sent for x-rays when reporting joint pain at PHC clinics, and confirmation of joint pathology would not change the usual approach of treatment of joint pain in PHC clinics (Visagie & Schneider, 2014; Makanjee, Bergh & Hoffmann, 2015). The biopsychosocial approach to manage joint pain was helpful as there was an overwhelmingly positive response in the acceptability questionnaire that the intervention group participants "felt healed". However, this might have been a way of expressing the benefit of participation in the health education and exercise programme.

The booklet given to the intervention and workbook group was reported as useful in aiding understanding pain by the intervention group, but unfortunately the views of the workbook group were not asked. The positive findings from the intervention group are consistent with the increasing body of work stating that understanding one's pain creates a basis to manage the experience of pain (Diener et al., 2016; Louw et al., 2016). The lack of pain knowledge can affect the experience of pain severity, where the archaic understanding that pain is primarily a product of tissue damage can itself be a driver of pain severity, a view commonly held by patients and health care professionals (Parker & Madden, 2020). The understanding of pain as exclusively a product of tissue damage can affect the individual's emotional and psychological state which can lead to higher levels of pain perceptions which are not necessarily related to the tissue damage (Parker & Madden, 2020; Ryans et al., 2020). The emerging pain understanding requires that health care professionals responding to multisite pain explore a broader range of contributors to pain, and this will allow for a comprehensive management to joint pain (Blyth et al., 2019; Parker & Madden, 2020). The intervention in this study led to the change in the pain severity and pain interference scores of the intervention group thus illustrating that the education component of combined interventions can help decrease the pain severity experience through improved pain understanding.

The experience of the researcher is that the use of rating scales in clinical practice yielded varying degrees of comprehension. It is questionable whether the pain severity and pain interference rating scales appropriately conceptualises pain measurement in a manner consistent with the rural community's understanding of pain. The socio-cultural explanations of pain may not be adequately translated from English into local vernacular languages, and the tools of assessment may be inappropriate to fully understand and assess pain experiences (Shaikh, Bentley & Kamerman, 2013). It is possible that rural communities understanding of pain maybe broader than what is communicated from a western scientific understanding of pain , and this is acknowledged in the biopsychosocial understanding of pain (Thabede, 2008; Orhan et al., 2018). The unique experience of pain in rural African communities is multimodal, which includes cultural and religious beliefs systems, this ought to be factored into the presence of pain, as such there could be a likelihood to tolerate higher pain severities which is consistent with the pain severity score at baseline assessment (Nortjé & Albertyn, 2015; Jackson, 2017). The rural community's understanding of pain can be dismissed as lack of education and not attributed to the same validity as western-scientific understandings (Orhan et al., 2018).

The current study concurs with existing evidence that joint pain can effectively be managed through education and exercise (Edries, Jelsma & Maart, 2013; Skou & Roos, 2017). The significance of the findings of the current study are that the exercise and health education intervention can augment pain severity and interference in rural populations, a context where the biopsychosocial implication of pain are inclusive of more complex psychological and social constructs which may be different from urban and peri-urban populations (Erdemoglu & Koc, 2013; Nortjé & Albertyn, 2015).

5.7 Self-Efficacy

Health education is fundamental to assist individuals with chronic diseases to manage their symptoms and is linked to self-efficacy, which is predictive of health behaviours toward self-management (Zamani-Alavijeh et al., 2019). The baseline self-efficacy between the groups was not statistically significant for any of the items together although the overall self-efficacy in the study population was higher than anticipated (Marks, 2017). It was expected that there would be a lower level of self-efficacy due to the absence of joint pain education programmes in PHC clinics and the severe joint pain found in the pain severity scores (Mirmaroofi et al., 2019; Degerstedt et al., 2020). Degerstedt et al. (2020) argues that the higher self-efficacy in populations where a lower self-efficacy was to be expected could be due to those individuals having not experienced the consequence of severe joint pain similar to what was found in the pain inference scores. In a longitudinal study on the effect of self-efficacy on physical activity there was a clear increase in physical activity levels following participation in the study (Degerstedt et al., 2020).The improved self-efficacy decreased a year after enrolling in the programme, which could suggest that the benefits on self-efficacy may not be sustained in the long term for participants in the intervention group (Degerstedt et al., 2020).

Participants in the intervention group showed a statistically significant difference on items one to five of the chronic disease self-efficacy scale between the intervention, workbook, and usual care groups, and item six did not show a statistical difference: (1)confidence managing symptoms related to fatigue (2) confidence managing physical discomfort (3) managing emotional stress (4) managing symptoms or other health problems (5) confidence completing activities and task to manage health condition and decrease reliance on doctors (6) confidence managing activities other than taking medication to manage illness interference.

Self-efficacy is predictive of health behaviour and those with higher self-efficacy will likely adopt positive health behaviours, it is therefore likely that participants in the intervention and workbook group could better manage their joint pain and NCDs as a result of their improved self-efficacy (Marks, 2017; Mirmaroofi et al., 2019). Although the baseline of self-efficacy was higher than expected self-efficacy amongst the participants, those in the intervention and workbook group participants experienced the benefit of higher self-efficacy. This means that rural-dwelling individuals could be supported through health education and exercise programmes to improve their self-efficacy in managing their joint pain (Degerstedt et al., 2020). The presentation of topics related to chronic diseases was helpful, this empowered the participants to be able to ask clarity seeking questions where gaps in their knowledge existed or where information contradicted beliefs that they held.

The item five response was not as pronounced in its change as the other items on the self-efficacy scale. This leaves the question of whether the patients felt empowered to enact activities that decreased dependence on health care professionals. This can be due to the perception that health care professionals are an authority figure on whom your health depends, as opposed to partners in managing an individual's health care needs (Zamani-Alavijeh et al., 2019). The interaction with health care professionals could be impeded by language barriers or the provision of inappropriate information from the health professionals (Visagie & Schneider, 2014; Ned, Cloete & Mji, 2017). Patients often do not have the privilege of choosing which health professional provides them with care, thus hampering a therapeutic alliance between health professionals and patients and impeding confidence activities that will decrease dependence on health professionals (Visagie & Schneider, 2014; Komatsu et al., 2017). The staff shortage within the public health system often results in a tense and combative relationship between health professionals and patients, and this combative relationship is complicated as patients view health care professionals as experts on whom they depend on (Dube et al., 2017; Coetzee, Giljam-Enright & Morris, 2020). Self-management actions require a collaborative relationship between health professionals and their patients, and health professional should instil confidence in the patient's ability to manage their health conditions and aid self-efficacy (Dube et al., 2017).

The PHC clinic context is fraught with many challenges including time constraints and insufficient staff, these are often used as explanations as to why health care professionals do not adequately communicate and empower patients (Visagie & Schneider, 2014; Zamani-Alavijeh et al., 2019) . Whilst it can be understood that health care professionals are facing pressures due to lack of staff and time, not empowering patients detracts from creating positive interactions with health care professionals which can decrease trust in the health care professionals and the services they provide (Degerstedt et al., 2020).

The health education and exercise programme utilised in the current study again affirms the strategy of improving self-efficacy by presenting health education material and allowing the completion of tasks (Marks, 2014; Degerstedt et al., 2020). This study showed that workbook-based health education and exercise has the potential to increase self-efficacy. The improvement in self-efficacy amongst the intervention group can be attributed to the programme providing direct responses to questions that individuals had but continue to go unanswered in the ordinary course of PHC clinic care and exposure to exercise (Coetzee, Giljam-Enright & Morris, 2020). In the acceptability questionnaire, the participants came out strongly to affirm the utility of the health education booklet, and even though the participants had low levels of education, the health education booklet given to the intervention group was of value to them. Barnes (2016) suggested that the education booklet used in her study could be less voluminous in written information and could employ the use of infographics and diagrams to make the material more accessible to individuals with lower levels of education. The balancing of providing adequate material for the booklet and not making the booklet voluminous was challenging and was further complicated by a need to translate the English material into Sesotho. Barnes (2016) did not provide specific detail into what the volume of the health education material should be when providing health education to people with low educational levels. The work of interpreting the booklet itself was of value in that it adds to the scarce body of literature of pain in Sesotho. The need for access to contemporary health promotional material in PHC clinics in the spoken languages of community is affirmed in the positive responses in the acceptability questionnaire (Parker et al., 2012). The booklet allowed the patients access to health education material that would not be available in resource-constrained environments. This contrasted with anecdotes from family and friends whose information lacks credibility and is not seen as trustworthy by people with joint pain (Abrahams et al., 2019).

Facilitated exercises exposed individuals to the positive experience, which improved self-efficacy (Hansson et al., 2010; Jönsson et al., 2018). Improving self-efficacy should then be an integral part of the development of exercise and health education programmes which ensures that the programmes have exposure, repetition, and mastery to allow participants to experience the behaviour and improve confidence in completing those activities (Brady, 2011; Marks, 2014). The improvement of participants' self-efficacy in the current study provides valuable data for the importance of health education and exposure to exercise in managing joint pain alongside other chronic diseases in the primary health care settings.

5.8 Quality of life

Quality of life was measured using the EQ-5D-3L, and the perception of quality of life in the study findings were unsurprising in that individuals with joint pain are said to have a decreased quality of life, particularly those in lower socio-economic circumstances (Ackerman, Bennell & Osborne, 2011; Finney et al., 2017). The median value of the visual analogue scale (VAS) of perception at baseline was 60 IQR (55-75) for the intervention group, 60 IQR (50-80) for the workbook group and 60 IQR (50-80) for the usual care group. This was similar to the findings in (Barnes, Jelsma & Parker, 2019), where the median VAS score was 60 IQR (50-70) for the intervention group at baseline and 50 IQR (50-50) for the control group at baseline. In this study, the intervention groups' participation led to a statistically significant change (p=0.00) in the median VAS score of 90 IQR (85-90). Barnes (2016) found that the VAS score for people without joint pain was 80, the improvement in the VAS outcome of this study's intervention was to levels similar to the VAS of people without joint pain.

There was no statistical difference between the groups on any of the items of the EQ-5D-3L at baseline and after six weeks. However, there was a statically significant change of the mobility items in both the intervention group (p=0.01) and the workbook group (p=0.03). There was a statically significant change for the self-care item (p=0.04) and usual activities (p=0.03) for the intervention group. There was a statistically significant change for the pain item for the intervention group (p=0.00) and the workbook group (p=0.00). The only item without a statistically significant change was the anxiety and depression item. The item of anxiety/depression did not yield a statistically significant change in a study by Saw (2016), it was questioned whether the concepts which are ambiguous when translated into vernacular languages could have influenced the outcome (Saw, 2015). This question by Saw provides a suitable explanation for why there may not have been a change on the item even in this study.

The rating on the visual analogue scale was statistically significant between the group in favour of the intervention group (p=0.02), and for the change within the intervention group (p=0.00). Barnes, Jelsma & Parker (2019) found no statistical difference of any of the items between the intervention and the control group however, there was significant improvement within the intervention group which is consistent with what was found in the current study. The improved pain severity score and pain interference score make it likely that the participants would view their quality of life as improved as pain is associated with poorer quality of life (Finney et al., 2017). The programme in the current study showed an important increase in perception of quality of life for the participants in the intervention group, which was anticipated. However, the improvements in the perception of quality of life of the workbook group were not expected. Previous research has shown statistically significant improvement in the EQ-5D-3L scores of the intervention group and not control groups of exercise and health education interventions (Hansson et al., 2010; Jönsson et al., 2018). The improvements in the quality of life of the workbook group provides a basis to use health education in the form of a booklet and once-off facilitated exercise to improve the quality of life of participants where health outreaches can be done infrequently.

The intervention group's participants improved perception of quality of life is an important finding for managing joint pain particularly in rural PHC clinic contexts where there are limited clinical approaches supported by empirical evidence (Visagie & Schneider, 2014; Visagie & Swartz, 2016). The biopsychosocial nature of pain requires an intervention that manages the psychosocial aspects of pain, leading to an improved quality of life even when the pathology that causes joint pain cannot be managed surgically (Fioratti et al., 2020). Joint pain management programmes show improvements in quality of life together with the improvements in the pain severity score and pain interference scores, and this illustrates that exercise and health education programmes can mediate joint pain and the psychosocial consequences (Hurley, Mitchell & Walsh, 2003; Garnaes et al., 2021).

The programme's ability to provide an improvement in the perception of quality of life is important, especially when there are poor prospects of surgical management in the form of arthroplasties. (Kavalieratos, Nortje & Dunn, (2017), in a study investigating waiting time for joint replacement surgery in the Western Cape, found a variable waiting time from 90 to 1593 days, but there is no literature on waiting time for joint replacement surgery in the Free State. The rural context suggests the waiting time many be longer than the period in the Western Cape. This study illustrates that the patient's quality of life can be improved with conservative interventions when there is very little chance that patients can undergo joint replacements surgery.

5.9 Physical function

Participation in the programme resulted in immediate benefits in the participants' physical function in the intervention group and workbook group. Whilst there was no statistically significant difference for any of the physical tests between the groups at baseline and at six weeks, there was a statistically significant change in physical function outcomes for the workbook group from baseline to six weeks for repeated trunk flexion (p=0.04) and for the timed six-minute walk test (p=0.01). For intra group change, there was a statistically significant difference for the intervention group in the preferred walking speed (p=0.00), the fastest walking speed (p=0.00), repeated trunk flexion (p=0.00), timed belt tie (p=0.02) and timed six-minute walk test (p=0.00). (Saw, 2015), in her study found a statistically significant improvement of the timed six-minute walk test (p=0.01) with an improvement of 70m for the knee pain sub-group, however the same was not found for participants with hip OA. In this study, the median change in the distance of the timed six-minute walk test was 66m. The outcomes of the six-minute walk test were not compared to the age-related norms for six-minute walk test because the norms were not generalisable to the study populations. The change in mobility corroborated the improved mobility items of the EQ-5D-3L. Walking is considered an area of importance in managing joint pain in a population that uses walking to access health care. The improvements in the physical performance task battery are significant for providing a basis upon which the participants can use exercise for managing joint pain and NCDs.

Despite an encouragement to continue with exercises at home there was no objective means of monitoring the implementation of exercise programmes amongst the intervention group nor the workbook group, and this was a problem in similar studies that found improvement in physical function (Barnes, 2016; Rivera-Torres, Fahey & Rivera, 2019). (Argent, Daly & Caulfield, 2018) suggest that non-compliance with home exercise rates are between 30% -

50% which, are likely to be greater in already sedentary populations. The increase in physical activity in the intervention group seems to have yielded positive results even if there was non-compliance at home.

Other studies investigating the impact of exercise and health education on physical function had varying degrees of improvements in physical function, and the improvement in physical function is of clinical significance in increasing confidence of participants to exercise and allowing participants experience the benefit of exercise (Skou & Roos, 2017; Bouchard et al., 2021). In the intervention group, their improvement in physical function is likely to be attributed to their participation in the once-a-week exercise class. It has been suggested that any increase in physical activity levels for sedentary individuals will be beneficial to their physical function (Asar et al., 2020; Bouchard et al., 2021). The improvements in the workbook group could be as a result in their participation in unsupervised exercise. However, without objective data or self-reported data, the researcher cannot state what resulted in the improvement in outcomes of the workbook group (Argent, Daly & Caulfield, 2018).

The improvement in physical function of the intervention group can also be attributed to external factors that encourage an increase in physical activity, of which social support and modelling are crucial (Vader et al., 2020). The group context for the intervention allowed people with similar joint pain and chronic diseases to provide social support that encouraged a common pursuit for improved function (Argent, Daly & Caulfield, 2018; Jönsson et al., 2018). The cultural appropriateness of the programme also played a significant role as the programme was delivered in Sesotho by a researcher familiar with the cultural context, and methods of communication and listening could have aided uptake and participation in the physical activity component leading to improved function (Wallis et al., 2013; Conn et al., 2014).

The improvements in physical function can encourage patients to improve their physical activity levels, which can be done in incremental levels to ultimately reach the WHO recommendation on physical activity (Argent, Daly & Caulfield, 2018; Rivera-Torres, Fahey & Rivera, 2019). The improvement in physical function means that activities of daily living can be accomplished with greater ease in the presence of physical impairments.

In the acceptability questionnaire there was a desire expressed that the programme should continue so that participants could continue with their exercises. However, the ability to continue with the exercise programmes as a part of meeting the physical activity guidelines at clinics would be impractical as this is not the exclusive role of physiotherapy in the PHC clinics (Myezwa & Van Niekerk, 2013; Dizon et al., 2018). There are alternative options like Golden Games, which is a programme in the Department of Social Development to encourage healthy ageing in which individuals can enrol, albeit that these programmes are not specifically designed to manage joint pain, it does encourage participation in physical activity (Jordan, 2009).

Whilst the six-week health education and exercise programme did not result in changes in BMI, improvement in physical function can further encourage increased levels of physical activity, possibly resulting in weight loss (American College of Sports Medicine, 2018; Bouchard et al., 2021). The improvement in self-efficacy allows the researcher to infer that there is potential for participants in the intervention group to continue in physical activity as they have been exposed to exercise and have been given the means of how to go about exercising.

5.10 Acceptability

The comments amongst the intervention group participants suggest that the intervention is acceptable and that they would encourage others to enrol in such programmes, perhaps providing an opportunity for peer-led exercises. It is likely that the programme responded directly to their joint pain needs which made the programme more acceptable, and exposure to exercise is a necessity to undo commonly held beliefs that exercise will exacerbate pain and that exercise is for young people (Gay et al., 2016). Patients seek to understand their health conditions, and the fact that the programme included health education material related to NCDs and joint pain resulted in participants reporting that they learnt information not previously known (Visagie & Swartz, 2016; Coetzee, Giljam-Enright & Morris, 2020). The response from the intervention group was that similar programmes would be welcomed and would be acceptable in the form in which it was presented. Barnes (2016) reported the responses to the acceptability questionnaire in her study was consistently positive and there was an emphasis on the cultural acceptability aiding participation in the classes.

5.11 Strengths

The strength of the programme utilised in the study is that it provides additional empirical data that joint pain interventions for weight-bearing joint pain can result in significant improvement in pain severity, in self-efficacy, perceptions of quality of life and physical function in rural populations. The results of the intervention followed the CONSORT guidelines for randomised controlled trials. The presentation of the entire programme by a qualified physiotherapist who is able to speak Sesotho was a strength of the study. It is rare that clinical health services are provided by a language speaker of an indigenous language, who understands the cultural nuances of the community in which they practice and was an important strength of the study. This study unlike many other studies included a workbook group which provided a basis for the utility of such an intervention in remote rural areas where PHC clinics outreaches by physiotherapist are once a month or less. In the absence of multidisciplinary teams and clear guidelines for the management of joint pain there is an opportunity for individuals with joint pain to receive easily reproducible interventions for joint pain based on the intervention in this study. The translation of the health education booklet on joint pain into Sesotho illustrated the potential of suitably translated material to be effectively communicated and to help patients understand their health conditions. The use of vernacular language and the ability of the researcher to present material in the language was a strength that cannot be gauged.

The trial was a single blind randomised control trial that ensured that the research assistants collecting the data were blinded to the allocation of each participant into a group at baseline and follow up measurement days. The randomisation process is described in the methodology see section 3.3.3.

5.12 Limitations

A weakness of the study was only piloting the study over two weeks instead of three weeks, where the first week was the piloting of the measurement procedures and week two was the piloting of the education and exercise classes. During the pilot study there was unfortunately limited availability of pilot study participants for the third week. The third week would have allowed for further education and exercise testing and response to exercise in the previous week.

A further limitation of the study was the sample size of the study. There was a small sample which was dived into three groups which does not allow for generalisation of the findings even in similar socio-economic settings. The small sample size also has implications for the statistical analysis in that the sample made the power of the analysis more difficult. The participants lost to follow up at six weeks was a significant weakness where an already small sample was decreased even further despite SMSs that were sent as reminders and transport that was provided.

The use of a numerical rating scale does bring into question the reliability of the responses as numeracy in rating pain may not be appropriate in rural context, as has been previously discussed. In the Maluti-a-Phofung context the numeric rating scale have not been used by the researcher in clinical practice as numeric scales often confuses patients due to variable levels of numeracy and literacy. The choice of measurement tools to assess pain, self-efficacy and quality of life used in the study was made on of the basis of their availability in Sesotho and having been validated for use in Sesotho speakers. However, these numeric rating scales although available in Sesotho are a challenge in populations with low education levels where the comprehension of numerical scales is variable. The worldview and framing of pain need to be conversant to the perspective in rural communities and in descriptors more commonly used by rural communities.

The impact of co-morbidities particularly DM2 and HIV were not adequately planned for in the study. There was no screening for DM2 which could be a confounder of pain. There was an omission of HIV specific information in the information booklet which is important amongst PHC clinics users. This chronic disease will likely be present in populations with joint pain that present in clinics and comprehensive care for such individuals requires that these variables be suitably catered for.

The usual care group was required to attend clinics where they may have been given the usual physiotherapy service at the clinics, and this could have been a potential cofounding variable which was not controlled or planned for during the study. The attendance or non-attendance of physiotherapy services at PHC clinics should have been followed up by the researcher and reported for the duration of the study for participants in the usual care group.

A further weakness was the measurement only taking place at baseline and after six weeks, where measurement should have continued at long term intervals perhaps at three months, six months, and 12 months to understand the impact of the study on participants' joint pain, quality of life and self-efficacy longitudinally. This is viewed as a weakness as participants are required to apply the lessons from the intervention in the long term particularly as there is very little hope of joint replacement surgeries. The six-week duration of the intervention was a period that similar studies used with an impact on joint pain. The six-week duration was seen as practical and if clinically implemented this would allow individuals with joint pain who have no other options to enrol in a programme that could be beneficial to them.

The levels of physical activity between the exercise and health education days were not monitored for the intervention group and the workbook group. Therefore, the implementation of exercise at home remains unknown. A diary documenting the use of the booklet and an exercise diary should have been kept ensuring that patients are engaging in exercise.

The acceptability questionnaire was administered to the intervention group and not the workbook group which is another weakness of the study. The experiences of those in the workbook group on the appropriateness of the programme would likely be different from the view of those in the intervention group. The workbook group requires self-motivated exercise and lack the group dynamic could have contributed to the improvements in the intervention group. The workbook group's acceptability responses would assist to gauge the potential to use a health education booklet and once off exercise class where clinic visits could be infrequently due to their remote location.

5.13 Recommendations:

The current management of joint pain in the primary health care setting is insufficient to meet the needs of individuals living with joint pain. The finding of this study should be presented to the district director and physiotherapy service managers to discuss how this intervention can be implemented amongst the 31 PHC clinics in the Maluti-a-Phofung health sub-district.

The exercise and health education programme should be considered as an intervention to be rolled out as part of the services offered when doing PHC clinic outreach visits.

There is a case to be made in the Maluti-a-Phofung Health sub-district to propose a weekly PHC clinic visit as opposed to less frequent visits to allow the implementation of a six-week exercise and education programme. The various physiotherapy departments in rural areas should consider moving from exclusively using individualised treatment approaches to also using group-based treatments when doing outreach to PHC clinics particularly when managing joint pain. There is an opportunity to develop health education and exercise intervention programmes based upon various studies that have already been done in the South African context including the current study.

The workbook group procedure requires further investigation for the utility of such an intervention in contexts where it is not possible to do outreaches more regularly. There is an opportunity to investigate the workbook procedure to understand facilitate and barrier of such an intervention and the acceptability of such an intervention.

This study emphasises the need for physiotherapists and other health care professionals to familiarize themselves with new emerging knowledge on the biopsychosocial nature of pain. Joint pain interventions that embrace biopsychosocial approaches provide the insight needed to help clinicians working in rural South Africa to understand the concepts of pain as they exist in these communities. There needs to be strengthening of a multisite join pain approach during the training of physiotherapist at undergraduate level, and in the professional development for physiotherapists already working in primary health care clinics. Whilst there is work being done to increase pain understanding, there needs to be a merger between what is understood in the western scientific concepts of pain and the concepts of pain that exist in rural areas. Continuous professional development of health care professionals which includes developing communication skills and empowering physiotherapist to act as facilitators for peer-leaders of exercise programmes is highlighted by the findings of this study.

The roll out of the exercise and health education programme should use the GLA:D programme as model to investigate whether the training of health care professionals working in rural area regardless of clinical categories could be part of the response to the ever-increasing joint pain burden faced in South Africa. The GLA:D programme is used in first world counties that have insured universal health coverage, and as South Africa moves toward universal health care coverage in the form of the National Health Insurance the implementation of the GLA:D model could offer a method by which exercise, and health education programmes can be rolled out. There should be research studies undertaken to identify which format these exercise and health education programmes should adopt within the South African public health context. The South African public health context is diverse in human resources, access to service and funding of services. This may require prior work to improve availability of physiotherapist in the public health sectors and rural areas. The South African public health system continues to experience a shortage of physiotherapist. In the Free State province adequate budgets needs to be made available to fill vacant posts. The filling of these posts could mobilise physiotherapist into the PHC clinic context to implement various physiotherapeutic interventions including health education and exercise programmes. The fiscal austerity, because of mismanagement, incompetent administrators and corruption in both National and Free State departments of Health may hamper the employment of additional physiotherapists.

5.14 Future Research

Pain is complex and the understanding and language of pain must be described more thoroughly in the eleven South African languages and the associated cultural groups. There should be research into the understanding and attitudes toward pain as they exist in different communities. The biopsychosocial nature of pain requires that biological explanations of pain be better merged with the social-cultural understanding of pain which exist organically amongst rural communities. There is room to further develop material in vernacular languages that provides and explanation of pain which can be developed alongside academic linguists.

A longitudinal study over five years needs to be undertaken to be able to fully describe the journey that people with weight-bearing joint pain will take within the public health care system once they have participated in exercise and health education interventions.

There is an opportunity to roll out exercise and health education interventions as a multisite study, firstly in areas where people speak Sesotho so that the existing material can be used. The number of participants can be increased and then rolled out into other linguistic-cultural groups in South Africa. There are several language groups and provinces where health education and exercise interventions have not been done and this study should be reproduced in those communities not as randomised controlled trials as evidence of the utility of the programme already exist, but to describe the outcome of the programmes in those communities. The material should also be translated into various linguistic-cultural groups as part of developing a way of communicating emerging pain knowledge.

The participants expressed a need for an ongoing exercise programme, and therefore further research is needed on the practicality of community orientated exercise and health education programmes for long term participation.

5.15 Policy

Clinical research is important to develop the capacity of the health system to provide treatments that have empirical data. The development of a policy is the way in which the research finds clinical expression. Exercise and health education are important and practical interventions for joint pain. Physiotherapists are trained towards the facilitation of group exercise interventions, and the training of physiotherapist should also include transferring facilitation skills to individuals who are identified to facilitate peer led exercises. The continued shortage of physiotherapist in the public health sector limits the implementation of novel responses by physiotherapist to the public health burden in South Africa (Ned, Cloete & Mji, 2017; Narain & Mathye, 2019).

The South African Society of Physiotherapist and institutions that train physiotherapists need to adopt an advocacy role in ensuring that government does not neglect the physiotherapy profession in their policies, including the envisaged National Health Insurance white paper which discussed rehabilitation services generally but not physiotherapy specifically (Myezwa & Van Niekerk, 2013; South African National Department of Health, 2017).

The current framework of health services in the public health sector does not prioritize the musculoskeletal needs of South Africans and needs to be changed through discussion with legislators and government officials. The public health sector has also faced the scourge of corruption which has led to budget constraints, and to counteract these challenges active citizenry and lobbying of politicians and legislators must be prioritized amongst the professional bodies to ensure accountability of provincial and national Departments of Health. As part of this activism the professional bodies should start monitoring staffing vacancies across all provinces and districts and provide information on the availability of physiotherapists in the public sector. The collaboration of professional bodies and civil advocacy groups working within rural areas should continue with efforts to ensure appointment and retention of staff.

6. CONCLUSION

The increase in prevalence rates of joint pain require of physiotherapists, who are first-line practitioners, to manage joint pain utilising interventions based on empirical data and the biopsychosocial approach. Education and exercise intervention has been shown to be beneficial in the urban and peri-urban context, but the impact of such interventions on rural populations for joint pain amongst Sesotho speakers had been not yet been established. The objectives of the study were to determine and compare the impact of a six-week exercise and health education programme on pain severity and interference using the Brief Pain Inventory short form. To determine the impact on quality of life using the EQ-5D-3L, on self-efficacy using the Chronic diseases self-Efficacy Scale. To determine the impact on a physical performance task battery to assess the impact on function, and to determine the acceptability using a self-developed questionnaire.

A randomised controlled trial inclusive of three groups, an intervention group that attended weekly exercise and health education sessions, a workbook group that had a once off health education and exercise contact session and a usual care group. The recruitment was disappointing with fewer patients participating in the study where it is known that there is a high prevalence of joint pain amongst clinic attendees. The workbook group introduced an element that has not been investigated previously the findings of which would add to the existing information on studies where there were intervention and control groups only. The methodology and data of the workbook group provides early insight that this could be an alternative method of providing joint pain treatment to remote PHC clinics, but this form of joint pain treatment should be tested more vigorously.

The study found weight-bearing joint pain amongst women in the age group 50 – 70 years rarely presents as pain in one joint, but rather presents in multiple sites and is often accompanied by NCDs such as hypertension and DM2. The longevity of patients with HIV requires that HIV be included amongst the likely co-morbidities that exist in this population. The biopsychosocial approach recognises that joint pain must be managed alongside the management of chronic diseases. Whilst there was not statistically significant difference in the pain score between the intervention, workbook, and usual care groups at baseline and at six weeks, the intervention and workbook group has statistically significant change in their pain severity and pain interference scores. The impact of relief from pain was expected in line with what other researchers found when implementing similar programmes in urban and peri-urban contexts. The pain severity and interference score improvements of the workbook group were surprising but is the initial step to making a case for alternative forms of the exercise and health education programmes for joint pain. The workbook groups finding of the current study will require further exploration. The time may have arrived to roll out the programme to a larger population and obtain a larger pool of data to understand the true impact on pain severity and pain interference scores.

A patient’s wellbeing is subject to the social and cultural understanding of health, and joint pain and non-communicable diseases can lower a person’s perception of their quality of life, and the inability to exercise may affect the perception of quality of life. The intervention group in the study experienced an improvement of their quality of life, the reason for improvements in quality of life is likely related to the relief of pain severity and pain interferences.

The responses to the acceptability questionnaire shed light that the exercise and health education programme were culturally appropriate and positively received by the participants. Therapeutic alliance which was not measured in the programme may have been a contributor through the alliance formed between the participant and the researcher as the programme progressed. The health education booklet which was valuable to the participants as a complementary tool in addition to the facilitation of the educational component of the study.

Physical activity is a primary tool in the management of joint pain through structured exercise but also forms part of the management of non-communicable diseases. The intervention group experienced the benefits of exercise as part of the intervention, and this was observed in the improvement of physical function and notably the six-minute timed walk test.

The implementation of a six-week health education and exercise programme at primary health care clinics has the ability to provide pain relief which is one of the most significant reasons individuals attend clinics. The impact of the pain relief is of clinical importance in an environment where joint pain is not prioritised. The programme provides important evidence that an exercise and health education programme can be implemented in rural communities at primary health care clinics. This study has illustrated that physiotherapy services can effectively use education and exercise programmes to service PHC clinic users. The biopsychosocial framework of pain has been shown to be an effective framework for physiotherapist to use to respond to the holistic well-being of patients with joint pain

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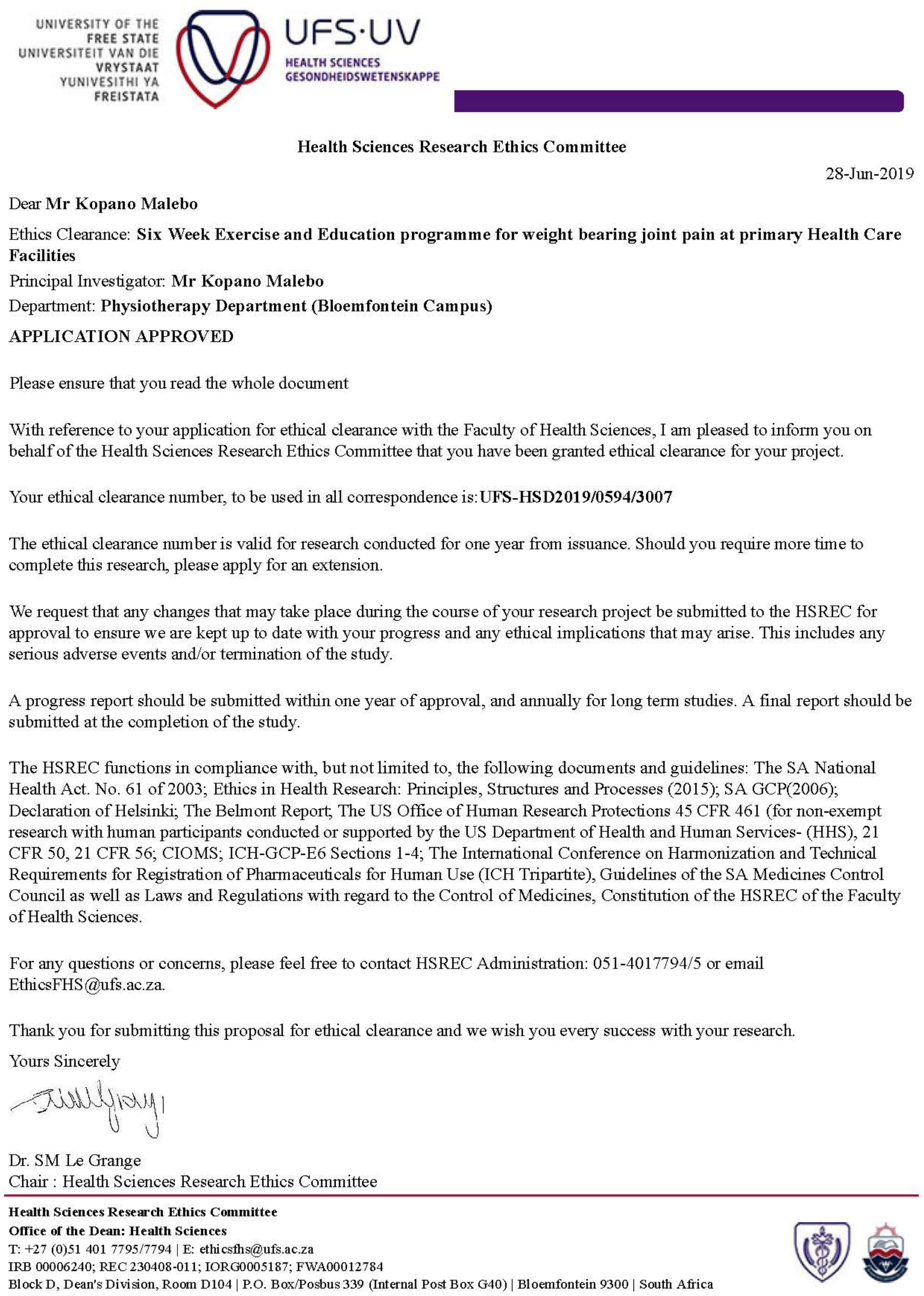
8. APPENDICES

Appendix A Ethics Approval letter



UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

Health Sciences Research Ethics Committee

28-Jun-2019

Dear **Mr Kopano Malebo**

Ethics Clearance: **Six Week Exercise and Education programme for weight bearing joint pain at primary Health Care Facilities**

Principal Investigator: **Mr Kopano Malebo**

Department: **Physiotherapy Department (Bloemfontein Campus)**

APPLICATION APPROVED

Please ensure that you read the whole document

With reference to your application for ethical clearance with the Faculty of Health Sciences, I am pleased to inform you on behalf of the Health Sciences Research Ethics Committee that you have been granted ethical clearance for your project.

Your ethical clearance number, to be used in all correspondence is: **UFS-HSD2019/0594/3007**

The ethical clearance number is valid for research conducted for one year from issuance. Should you require more time to complete this research, please apply for an extension.

We request that any changes that may take place during the course of your research project be submitted to the HSREC for approval to ensure we are kept up to date with your progress and any ethical implications that may arise. This includes any serious adverse events and/or termination of the study.

A progress report should be submitted within one year of approval, and annually for long term studies. A final report should be submitted at the completion of the study.

The HSREC functions in compliance with, but not limited to, the following documents and guidelines: The SA National Health Act. No. 61 of 2003; Ethics in Health Research: Principles, Structures and Processes (2015); SA GCP(2006); Declaration of Helsinki; The Belmont Report; The US Office of Human Research Protections 45 CFR 461 (for non-exempt research with human participants conducted or supported by the US Department of Health and Human Services- (HHS), 21 CFR 50, 21 CFR 56; CIOMS; ICH-GCP-E6 Sections 1-4; The International Conference on Harmonization and Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH Tripartite), Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines, Constitution of the HSREC of the Faculty of Health Sciences.

For any questions or concerns, please feel free to contact HSREC Administration: 051-4017794/5 or email EthicsFHS@ufs.ac.za.

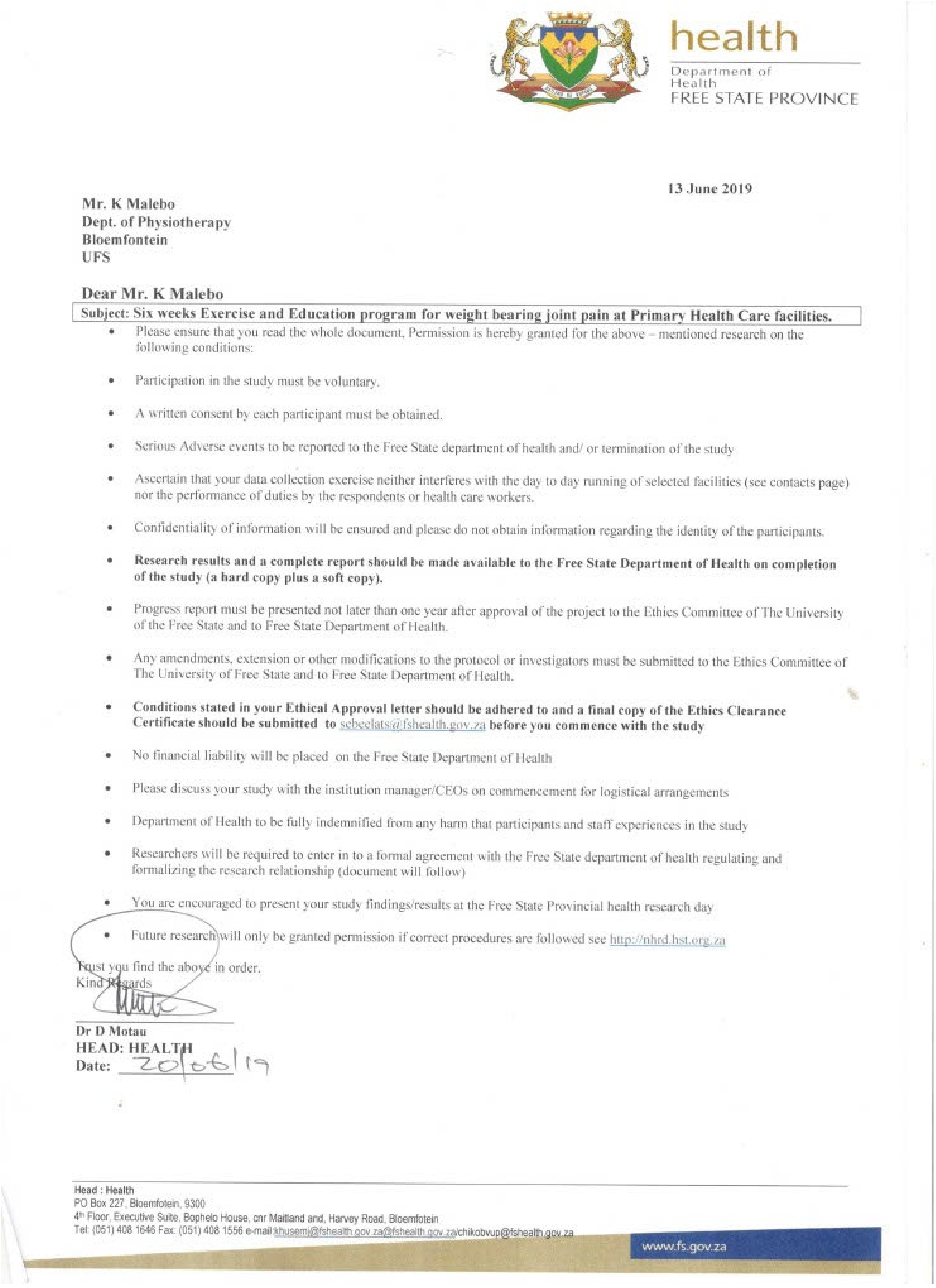
Thank you for submitting this proposal for ethical clearance and we wish you every success with your research.

Yours Sincerely

Dr. SM Le Grange
Chair : Health Sciences Research Ethics Committee

Health Sciences Research Ethics Committee
Office of the Dean: Health Sciences
T: +27 (0)51 401 7795/7794 | E: ethicsfhs@ufs.ac.za
IRB 00006240; REC 230408-011; IORG0005187; FWA00012784
Block D, Dean's Division, Room D104 | P.O. Box/Posbus 339 (Internal Post Box G40) | Bloemfontein 9300 | South Africa

Appendix B Free State Department of Health Approval



health
Department of
Health
FREE STATE PROVINCE

13 June 2019

Mr. K Malebo
Dept. of Physiotherapy
Bloemfontein
UFS

Dear Mr. K Malebo

Subject: Six weeks Exercise and Education program for weight bearing joint pain at Primary Health Care facilities.

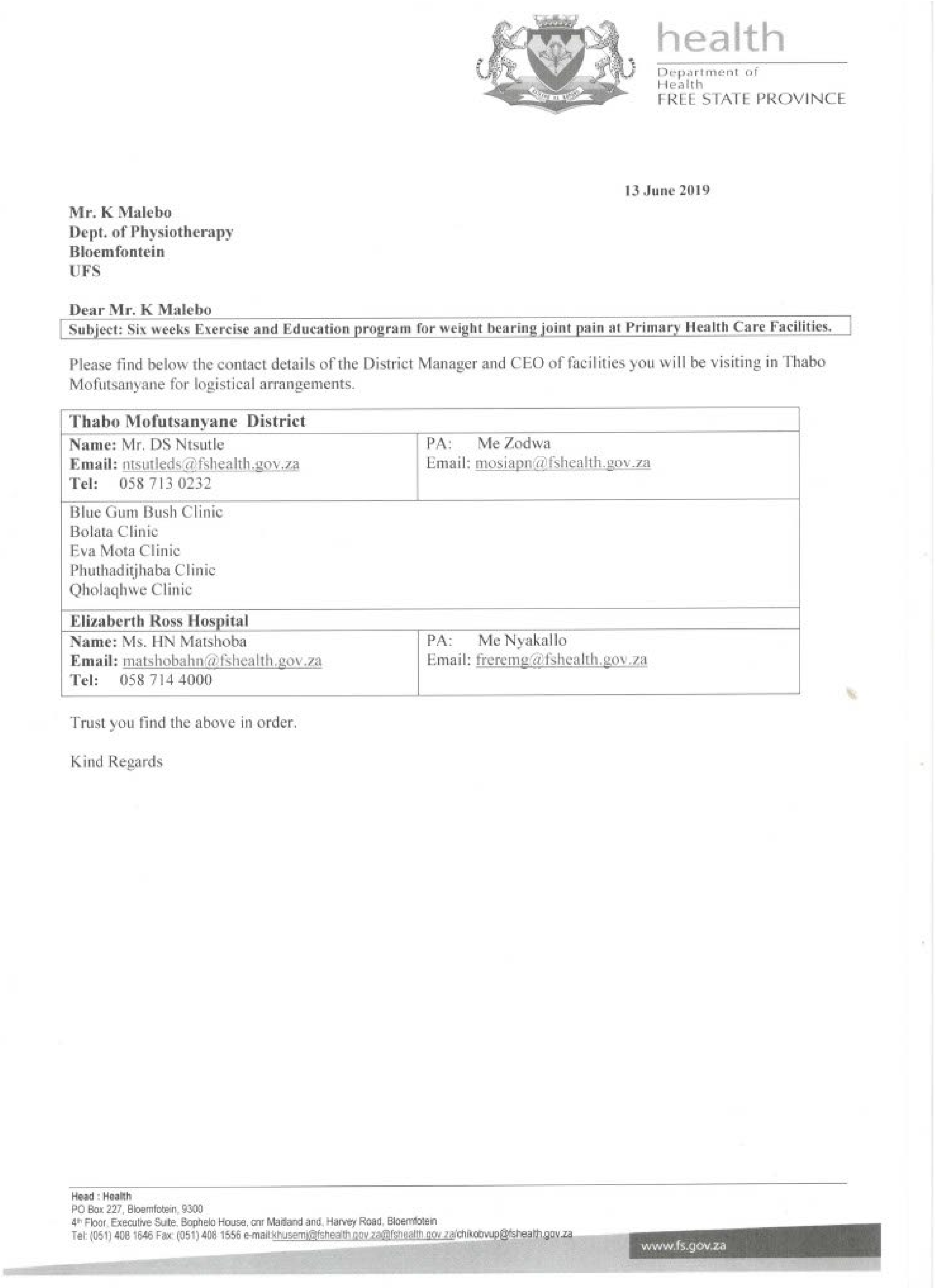
- Please ensure that you read the whole document, Permission is hereby granted for the above – mentioned research on the following conditions:
- Participation in the study must be voluntary.
- A written consent by each participant must be obtained.
- Serious Adverse events to be reported to the Free State department of health and/ or termination of the study
- Ascertain that your data collection exercise neither interferes with the day to day running of selected facilities (see contacts page) nor the performance of duties by the respondents or health care workers.
- Confidentiality of information will be ensured and please do not obtain information regarding the identity of the participants.
- **Research results and a complete report should be made available to the Free State Department of Health on completion of the study (a hard copy plus a soft copy).**
- Progress report must be presented not later than one year after approval of the project to the Ethics Committee of The University of the Free State and to Free State Department of Health.
- Any amendments, extension or other modifications to the protocol or investigators must be submitted to the Ethics Committee of The University of Free State and to Free State Department of Health.
- **Conditions stated in your Ethical Approval letter should be adhered to and a final copy of the Ethics Clearance Certificate should be submitted to** sebeelats@fshealth.gov.za **before you commence with the study**
- No financial liability will be placed on the Free State Department of Health
- Please discuss your study with the institution manager/CEOs on commencement for logistical arrangements
- Department of Health to be fully indemnified from any harm that participants and staff experiences in the study
- Researchers will be required to enter in to a formal agreement with the Free State department of health regulating and formalizing the research relationship (document will follow)
- You are encouraged to present your study findings/results at the Free State Provincial health research day
- Future research will only be granted permission if correct procedures are followed see http://nhrd.hst.org.za

Trust you find the above in order.
Kind Regards

Dr D Motau
HEAD: HEALTH
Date: 20/06/19

Head : Health
PO Box 227, Bloemfotein, 9300
4th Floor, Executive Suite, Bophelo House, cnr Maitland and, Harvey Road, Bloemfotein
Tel: (051) 408 1646 Fax: (051) 408 1556 e-mail:khusemj@fshealth.gov.za@fshealth.gov.za/chikobvup@fshealth.gov.za

www.fs.gov.za



health
Department of
Health
FREE STATE PROVINCE

13 June 2019

Mr. K Malebo
Dept. of Physiotherapy
Bloemfontein
UFS

Dear Mr. K Malebo

Subject: Six weeks Exercise and Education program for weight bearing joint pain at Primary Health Care Facilities.

Please find below the contact details of the District Manager and CEO of facilities you will be visiting in Thabo Mofutsanyane for logistical arrangements.

Thabo Mofutsanyane District	
Name: Mr. DS Ntsutle **Email:** ntsutleds@fshealth.gov.za **Tel:** 058 713 0232	PA: Me Zodwa Email: mosiapn@fshealth.gov.za
Blue Gum Bush Clinic Bolata Clinic Eva Mota Clinic Phuthaditjhaba Clinic Qholaqhwe Clinic	
Elizaberth Ross Hospital	
Name: Ms. HN Matshoba **Email:** matshobahn@fshealth.gov.za **Tel:** 058 714 4000	PA: Me Nyakallo Email: freremg@fshealth.gov.za

Trust you find the above in order.

Kind Regards

Head : Health
PO Box 227, Bloemfotein, 9300
4th Floor, Executive Suite, Bophelo House, cnr Maitland and, Harvey Road, Bloemfotein
Tel: (051) 408 1646 Fax: (051) 408 1556 e-mail:khusemj@fshealth.gov.za@fshealth.gov.za/chikobvup@fshealth.gov.za
www.fs.gov.za

Appendix C Screening questionnaire:

Screening Questionnaire:

1. How old Are You?

2. For how long have you have knee pain?

3. In which leg and joint do you have knee pain?

4. Are you able to understand spoken Sesotho?

To make sure that you are able to exercise we need to ask you a few questions. These will help us to determine if you should be cleared by a doctor to exercise or if it is safe to do so?

History:

Have you had? *Mark if the patient has had anyone of the following, if yes the patient has had one. Stop the interview and thank the patient for their time.*

heart attack	Cardiac Catheterization coronary
Angioplasty	Heart valve disease
Heart Failure	Congenital heart Disease
Heart Transplantation	

Screening Questions

Do you have diabetes?

If yes, is it controlled by medication? If no stop the interview and thank the patient for their time they are not eligible

Do you have hypertension?

If yes, is it controlled by medication? If no stop the interview and thank the patient for their time they are not eligible

If the patient answered yes to two or more to the following questions of these questions please end the interview.

Do you have burning or cramping in your legs when you walk short distances

Do you experience chest discomfort with exertion?

Do you experience unreasonable breathlessness?

Do you experience dizziness, fainting, blackouts?

Are you pregnant?

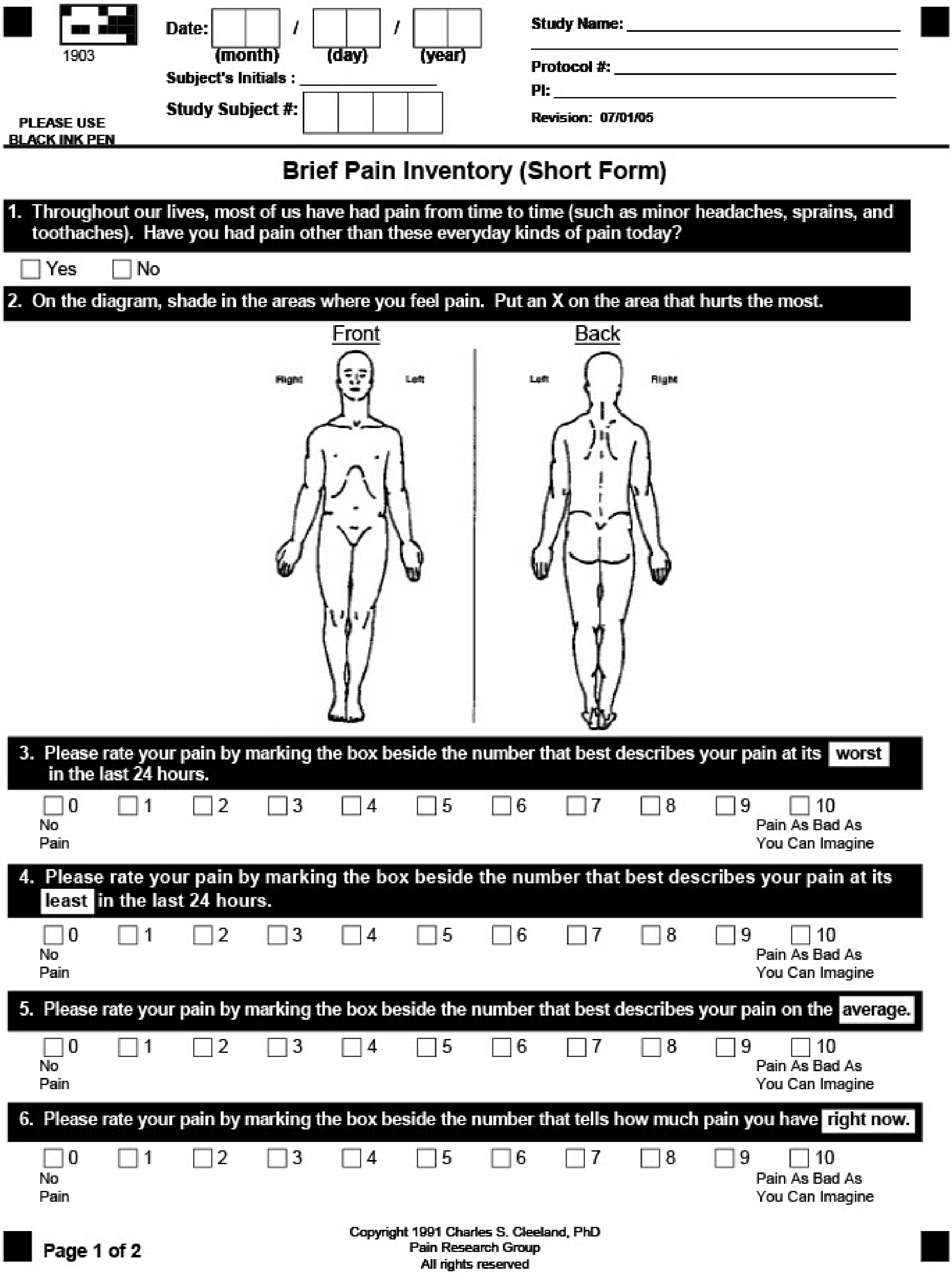
Appendix D Demographic Questionnaire:

Questionnaire to be completed with the patient and the primary health care clinic folder.

DEMOGRAPHIC		
Code:	Venue:	Date completed:
Group:	Date of Birth: 19……/……../	Sex:
Employment Status: ○ Unemployed ○ Employed ○ Self employed Highest Level of Education …………………………………… ……………………………………	Income Source: ○ Old age pension ○ Disability grant ○ Salary ○ Other If other specify. ……………………………………….	Usual primary Health care clinic ……………………………………………. Transport to clinic Taxi ; Walk; hired Car; Private care
Height =………………… Weight =………………… BMI (kg/m^2) = ………..	Village or area home is situated: …………………………………………….. Contacts: Cellphone 1………………………….. Cellphone 2…………………………..	
Medical Information		
Affected Joint(s) 1………………………… 2………………………… 3………………………… 4…………………………..	Assistive Devices ○ Walking Stick ○ 1 Crutch ○ 2 Crutches ○ Walking Frame Other ………………………… …………………………………..	Other Illnesses ○ Diabetes/sugar disease ○ Hypertension/high blood ○ Heart Problems ○ HIV/AIDS Others ………………………………………………… ………………………………………………..
Medication Name:……………………….. Dosage:…………………….. Name:……………………….. Dosage:…………………….. Name:………………………..		

Dosage:………………………. Name:………………………... Dosage:………………………. Name:………………………... Dosage:………………………. Name:………………………... Dosage:……………………….		

Appendix E Brief Pain Inventory -short form



1903

PLEASE USE BLACK INK PEN

Date: ☐☐ / ☐☐ / ☐☐
(month) (day) (year)

Subject's Initials : ____________

Study Subject #: ☐☐☐☐

Study Name: ____________

Protocol #: ____________

PI: ____________

Revision: 07/01/05

Brief Pain Inventory (Short Form)

1. Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprains, and toothaches). Have you had pain other than these everyday kinds of pain today?

☐ Yes ☐ No

2. On the diagram, shade in the areas where you feel pain. Put an X on the area that hurts the most.

Front

Right Left

Back

Left Right

3. Please rate your pain by marking the box beside the number that best describes your pain at its **worst** in the last 24 hours.

☐ 0 No Pain	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10 Pain As Bad As You Can Imagine

4. Please rate your pain by marking the box beside the number that best describes your pain at its **least** in the last 24 hours.

☐ 0 No Pain	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10 Pain As Bad As You Can Imagine

5. Please rate your pain by marking the box beside the number that best describes your pain on the **average.**

☐ 0 No Pain	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10 Pain As Bad As You Can Imagine

6. Please rate your pain by marking the box beside the number that tells how much pain you have **right now.**

☐ 0 No Pain	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10 Pain As Bad As You Can Imagine

Page 1 of 2

1903

PLEASE USE
BLACK INK PEN

Date: ☐☐ / ☐☐ / ☐☐
(month) (day) (year)

Subject's Initials : ______________

Study Subject #: ☐☐☐☐

Study Name: ______________________________

Protocol #: ______________________________

PI: ______________________________

Revision: 07/01/05

7. What treatments or medications are you receiving for your pain?

8. In the last 24 hours, how much relief have pain treatments or medications provided? Please mark the box below the percentage that most shows how much relief you have received.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
No Relief										Complete Relief

9. Mark the box beside the number that describes how, during the past 24 hours, pain has interfered with your:

A. General Activity

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

B. Mood

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

C. Walking ability

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

D. Normal Work (includes both work outside the home and housework)

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

E. Relations with other people

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

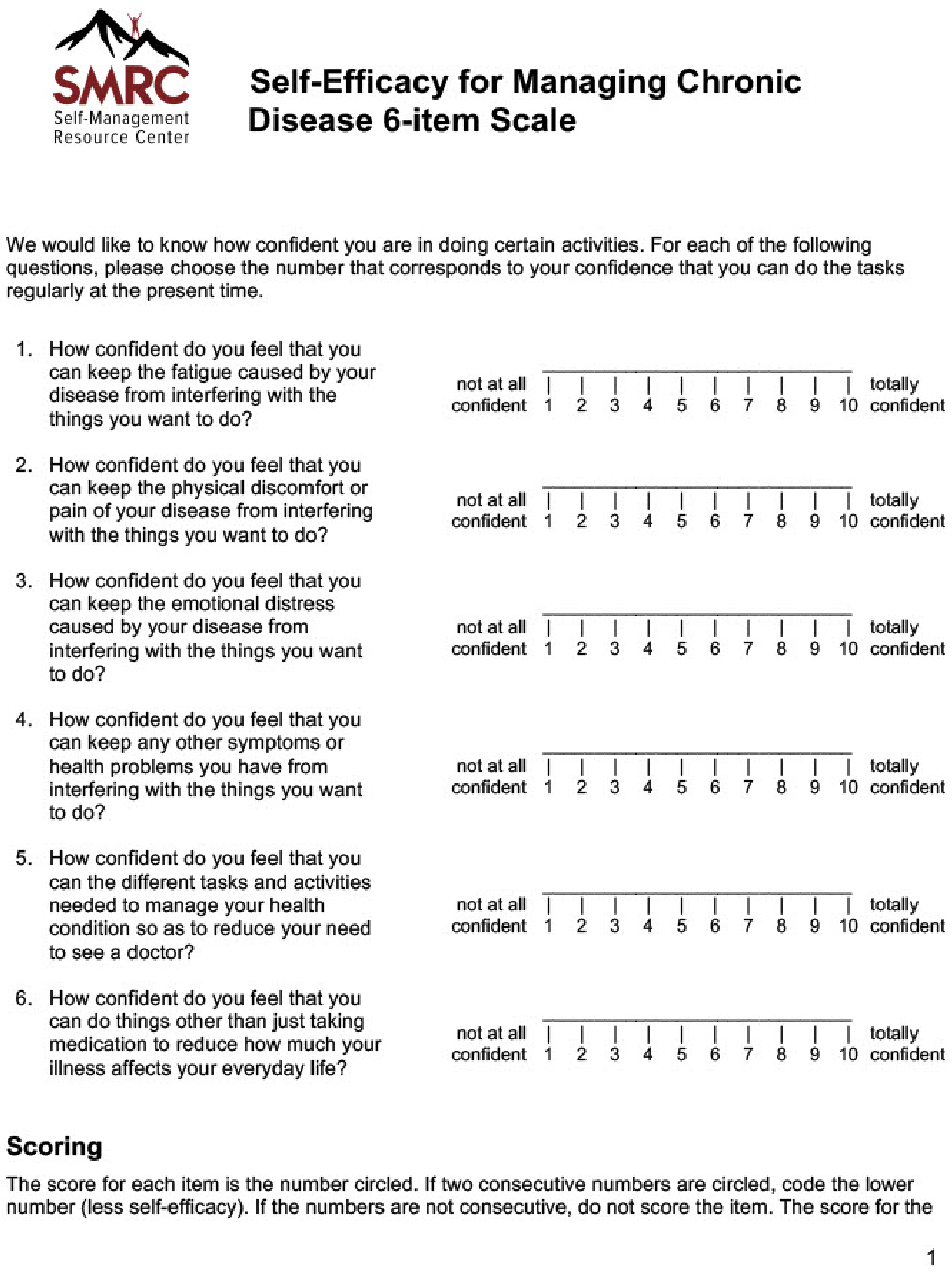
F. Sleep

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

G. Enjoyment of life

☐ 0 Does Not Interfere ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Completely Interferes

Appendix F Chronic Disease Self Efficacy Scale



SMRC
Self-Management
Resource Center

Self-Efficacy for Managing Chronic Disease 6-item Scale

We would like to know how confident you are in doing certain activities. For each of the following questions, please choose the number that corresponds to your confidence that you can do the tasks regularly at the present time.

1. How confident do you feel that you can keep the fatigue caused by your disease from interfering with the things you want to do?

   not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident

2. How confident do you feel that you can keep the physical discomfort or pain of your disease from interfering with the things you want to do?

   not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident

3. How confident do you feel that you can keep the emotional distress caused by your disease from interfering with the things you want to do?

   not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident

4. How confident do you feel that you can keep any other symptoms or health problems you have from interfering with the things you want to do?

   not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident

5. How confident do you feel that you can the different tasks and activities needed to manage your health condition so as to reduce your need to see a doctor?

   not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident

6. How confident do you feel that you can do things other than just taking medication to reduce how much your illness affects your everyday life?

   not at all confident 1 2 3 4 5 6 7 8 9 10 totally confident

Scoring

The score for each item is the number circled. If two consecutive numbers are circled, code the lower number (less self-efficacy). If the numbers are not consecutive, do not score the item. The score for the scale is the mean of the six items. If more than two items are missing, do not score the scale. Higher number indicates higher self-efficacy.

Characteristics

Tested on 605 subjects with chronic disease

No. of Items	Observed Range	Mean	Standard Deviation	Internal Consistency Reliability	Test-Retest Reliability
6	1-10	5.17	2.22	.91	NA

Source of Psychometric Data

Stanford/Garfield Kaiser Chronic Disease Dissemination Study. Psychometrics reported in: Lorig KR, Sobel, DS, Ritter PL, Laurent, D, Hobbs, M. Effect of a self-management program for patients with chronic disease. *Effective Clinical Practice*, 4, 2001,pp. 256-262.

Comments

This 6-item scale contains items taken from several SE scales developed for the Chronic Disease Self-Management study. We use this scale now, as it is much less burdensome for subjects. It covers several domains that are common across many chronic diseases, symptom control, role function, emotional functioning and communicating with physicians. For internet studies, we add radio buttons below each number. There are 2 ways to format these items. We use the format on this document, the other is shown on the web page. A 4-item version of this scale available in Spanish.

References

Lorig KR, Sobel, DS, Ritter PL, Laurent, D, Hobbs, M. Effect of a self-management program for patients with chronic disease. *Effective Clinical Practice*, 4, 2001,pp. 256-262.

Self-Management Resource Center
711 Colorado Avenue
Palo Alto CA 94303
(650) 242-8040
smrc@selfmanagementresource.com
www.selfmanagementresource.com

Appendix G EQ-5D-3L

EQ-5D-3L

Health Questionnaire

English version for the UK

(Validated for Ireland)

By placing a tick in one box in each group below, please indicate which statements best describe your own health state today.

Mobility

I have no problems in walking about ☐

I have some problems in walking about ☐

I am confined to bed ☐

Self-Care

I have no problems with self-care ☐

I have some problems washing or dressing myself ☐

I am unable to wash or dress myself ☐

Usual Activities *(e.g. work, study, housework, family or leisure activities)*

I have no problems with performing my usual activities ☐

I have some problems with performing my usual activities ☐

I am unable to perform my usual activities ☐

Pain / Discomfort

I have no pain or discomfort ☐

I have moderate pain or discomfort ☐

I have extreme pain or discomfort ☐

Anxiety / Depression

I am not anxious or depressed ☐

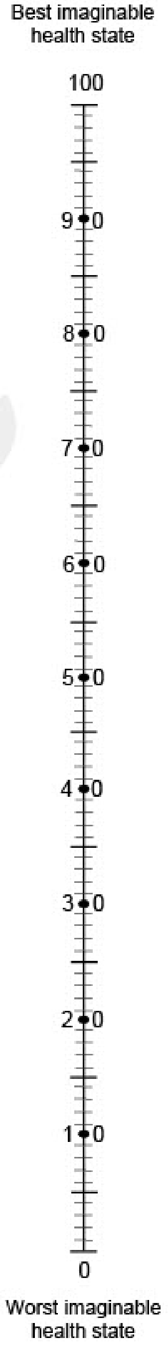
I am moderately anxious or depressed ☐

I am extremely anxious or depressed ☐

To help people say how good or bad a health state is, we have drawn a scale (rather like a thermometer) on which the best state you can imagine is marked 100 and the worst state you can imagine is marked 0.

We would like you to indicate on this scale how good or bad your own health is today, in your opinion. Please do this by drawing a line from the box below to whichever point on the scale indicates how good or bad your health state is today.

Your own health state today



Appendix H Acceptability Questionnaire

Acceptability questionnaire for patients with Chronic Pain and co-morbidities:

- This questionnaire aims to assess the acceptability of the intervention programme composed of exercise and educations
- The view of participant between 50-70 years is sought, and perspective on how they experienced the intervention. This questionnaire is voluntary, and you are not forced to participate, you can chose not to participate or abstain from a specific a question. The questionnaire is confidential, and no participant's names will be identifiable.

Instructions:

Provide open and honest views:

1. Group

Demographic information		
Code:	Venue:	Date completed:
Group:	Date of Birth: 19……/……../	Sex:
1. What did you enjoy and find as a good thing about the education and exercise programm?		
2. What did you not like about the exercise and education programme?		

3. What would you change about the exercise and education programme?
4. What would you add to the exercise and education programme?
5. What did you think about the education booklet?

Appendix I Physical Battery of Tests

Physical Battery of Test		
Code:	Venue:	Date completed:
Group:	Date of Birth: 19……/……../	Sex:
Test Name	Instructions to the patient	Recoding
15 Meters walking at fastest speed	Participants walk 7.5 metres turn around and walks back to the starting positions as fast as the patient can	……Seconds
15 meters walking at preferred speed	Participants walk 7.5 metres turn around and walk back to the starting position at the preferred walking speed	……..Seconds
Repeated sit-to-stand	Participants sit in a chair, stand up and then sit back down repeat after a brief rest	………Seconds
Repeated Trunk flexion	Participants are timed as they bend forward to the limit of their range and return to an upright position as quickly as tolerated, five times	……Seconds
Timed Belt Tie	Participants sits in a standard chair and wrap a standard bandage approximately 1 metre long	……Seconds

	around their waist and tie it in front of you.	
Sock test	Participant sits in a standard chair and puts on one loose fitting sock.	……Seconds
Timed six minute’s walk test	Participants walk as far as they can for six minutes (participants are allowed to rest during the course of the test).	……Metres a

Appendix J informed consent English and Sesotho

Study Information and Informed Consent

Six week exercise and Education programme for weight bearing joint pain at Primary Health Care facilities.

I Kopano Malebo am a Physiotherapist working at Elizabeth Ross District Hospital and I am also a Master's Student at the University of the Free State. I am interested in finding out whether a six week exercise and education program for joint pain in your lower limb joints and back done at a primary health care clinics will make a difference to your pain and daily life. I want to know if explaining to you information will make you feel like you can manage your pain, In order to answer these questions and come up with a way of caring for patients as the clinics we ask you to commit to taking part in this study for six weeks and its follow ups.

I have asked you to join this study because you have had joint pain in your lower limb of back for more than three months and it has not resolved with all the treatments that you have put into place so far.

In this study we will need for you to come first for a measurements before we begin the program. We will ask you to answer a few questions about your health, pain and you feelings on managing your pain. This will be asked by someonewho will help you fill in the information.

There will be physical tests that you are required to complete. All these tests involve walking for a short distance and also getting up from a chair .The physical test and the interview questions should take 45 minutes to an hour to complete. Whilst this is a long time it is important that we get all the information as accurately as possible. The information that you provide will be used to help draw conclusions when the study is completed. However no one will be able to know your name or other personal information, it will only be used by the research and the results will be reported anonymously

After this first visit you will be placed in one of three groups. The rehabilitation group, workbook group or the usual care group. You will have equal chance of being in either one of the groups.

If you are in the rehabilitation group you will be asked to come back to Elizabeth Ross Physiotherapy Department once a week for two hours for six consecutive weeks. On a Tuesday, Wednesday or Thursday from 11:00 – 13:00. The course will include discussions on joint pain, diet and other health-related information aimed at helping you cope better with your pain. There will be some exercises that we will do together as part of the program. In the group people will share personal information and you will be asked a sign a document pledging that you will not share people's information outside this group. At the last session you will be asked to answer the questions again and do the physical tests again. This will be repeated again six weeks after the study.

If you are in the workbook group we will provide you with the information booklet after the measurement have been taken. We will have one day when we explain the information booklet to you and how it works. You will then be expected to use the information booklet at home to get more information on joint pain and how to do exercises as explained.

If you are in the control group you will continue with your usual care. You can continue with treatment that you are receiving from the clinic. You will be asked to return to answer the questions and do the hysical tests after six weeks.

There will be no payment for participating in the study. However arrangement will be made by the researcher to get transport from your home or closest clinic to the hospital and back on all the measurement day and the day on which you attended the rehabilitation classes.

Participating in this study could result in you coping better with your pain. You will also learn information of a variety of subjects related to your pain and also it will allow learn to exercises so that you can do it on your own.

We will make sure that we minimize any risk that may results from the exercise which will be led by a qualified physiotherapist. Exercise is known to cause some muscle soreness a few days after taking part in the exercise, especially in people who do not usually exercise. It is our desire that participation in the study will benefit you but we cannot say that for certain until the study is complete to the very end. Should you experience more pain during the course you will be assessed and advised whether it is safe to continue or if you should stop taking part in the course.

The results from the study will be made available to you once the study has been complete. The information gathered will be used to guide people working in similar environments as ours on how they could approach other patients with long term joint pain

If you are in the study, all you other health care appointment will continue as normal even if you are allocated to the course. Participation in the study is completely voluntary, nothing bad will happen if you chose not to participate in the study. If you do take part in the study you are allow to stop at any time and you are allowed to refuse to answer certain questions. If you have questions you are allowed to contact me or my supervisor. You are also to contact the University of the Free State Health Research Ethics committee if you want to know more about your rights as research participant.

Yours Sincerely,
Kopano Malebo
Physiotherapist
Elizabeth Ross district Hospital
058 718 4048

Dr Roline Barnes
Physiotherapy Department
University of the Free State
051 401 1069

University of the Free States Health Science Research Ethic Committee
Mrs Mare Marais Head of Ethics Administration
Faculty of Health sciences
051 401 7795

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Dear Participant

I have read or the information that provide information on the study: **Six week exercise and Education programme for weight bearing joint pain at Primary Health Care**

We hope that this research will help health professionals better understand whether a six week exercise and education course on lower limb joints and back pain help people better cope with the pain. All questionnaire will be anonymous and records will be kept strictly confidential.

You are welcome to contact the investigator, Kopano Malebo 058718 4048 or the supervisor Dr Roline Barnes 051 401 1069 for further information on the research and on your rights as a participants in the research study. This research is voluntary and refusal to participate or decision to withdraw at any time will involve no penalty or loss of benefit to you.

I, …………………………………………………………. Have read and understood the information sheet. I have had all my questions satisfactorily answered. I understand what is required of me and I have chosen, willingly, to participants in the study. I know that I am to continue with all my other treatments as per usual, and I am to honour all other appointment as per usual. I am not being coerced into forced to take part in the study, and I know that I have the right to withdraw from the study at any time and I have the right to refuse to answer specific questions. I know there will be no negative consequences f-or withdrawing from the study. I have been provided with the details I need in order to contact the investigator. I give consent to the researches to interview me and to peruse my health records. I agree to attend the course for six weeks and the measurement days

………………………………………..	……………………………………………
Participant	Date
………………………………………..	……………………………………………
Wittiness	Date
………………………………………..	……………………………………………
Researchers	Date

Kwetliso le thuto ya dibeke tse tsheletseng bakeng sa menonyeletso e ka tlase ha boima e etswang diklinking tsa selehae

Nna Kopano Malebo, ke sebetsa kele mosebetsi wa tsa bophelo bo botle e otlollang masapo le mesifa sepetleleng sa Elizabeth Ross. Hapa ke moithuti a etsang Master's in physiotherapy sekolong se seholo sa University ya Free State. Ke maikemisetsong a ho fumana kapa ho etsa dipatlisiso ka dibeke tse tsheletseng tse mabapi leho etsea kwetliso le dithuto ka monolonyetso, ka tlase ha boima, e tla etsetswa dikllinking, ho hlisa phethoho bohlokong boo o nang lebona le bophelo bo botle. Ke nka lakatsa ho thusa hore obe le sebete le tsebo e napahelng etla o thusa ka bohloko ba hao. Leho o thusa kapa ho nka dikhato tse nepaheng tsatlang ho fokotsa bohloko boo onang le bona. Mme rele basebeletsi batsa bophelo, leho nka boikarabello rele ditliniki bakuding ba rona retla kopa o nke karolo thutong tsena tsa dipeke tse tsheleng, hapa leho etsa dipatlisiso ka morao ho bakudi.

Re o kopile o nke karolo mona hobane ona le bohloko ba manolonyetso menonyeletso e ka tlase ha boima ho feta kgwedi tse tharohape mohlomomg ka mora diteko tse ngata, hose phetoho e bonahalang.

Pele oka qala kwetliso ena o hloka re etse dipatlisiso tsa bokgoni ba hao

. Hape o arabe dipotso tse mmalwa tse amanang le bophelo ba hao, hohloko le maikutlo a hau ntlheng ya kalafo ya hao. Dipotso tsena ditla botswa ke motho a tla o thusa ho ngola dikarabo.

Retla etsa diteko tse amanang le mmele. Mme tsona ke ho tsamaya ka maoto,ho phahama setulong o tsamae nako e khutshwane. Teko ena le diopotso tse ding ditla nka feela nako ya mashome a mane a metso e mehlano kapa nako esa feteng hora. Leha nako e bonahala ele ngata, ho bohlokwa hore re fumane dintlha tse nepahetseng. Mme seo rese fumaneng ka mora diteko, setla re thusa ho etsa diqeto tse nepahetseng ka mora diphuputso. Ha bohlokwa ho bolella bakudi hore mabitso a bona hana ho sebediswa mona, ba keng sa tshireletso ya bona.

Ka mora diteko, otla bewa ha hara e ngwe ya dihlopha tsena, ya hlokomelo e tlwaelehileng le ya sehlopha sa kwetliso, ba tla sebedisa buka hae. O tlaba le monyetla wa ho nka karaolo ho e ngwe ya dihlopha tsena.

Ha ole karolo ya sehlopha se kwetlisong,otla lokela hotla Sepetlele sa Elizabeth Ross Lefapheng la Physiotherapy ha ngwe ka beke, kwetliso etla nka hora tse pedi ka labobedi, laboraro kapa labone ka hora ya leshome le motso o mong ho isa horeng ya pele sebakeng sa dibeke tse tsheletseng. Kwetlisong retla bua hape ka bohloko ba manolonyetso,dijo le tse ding tse amanang letsa bophelo bo botle ho thusa ka bohloko ba hao.Re tla etsa hape leho etsa dikwetliso tsa mmele mmoho ele karolo ya kwetliso kapa kalafo ya rona. Ka hara dihlopha tsena tsa rona batho batla arolelana makunutu,mme retla kopa hobe le tokomane eo batho ba tlang ho e tekena ele ho sereletsa ditaba tsa batho ba sehlopheng.

Bekeng yaho qetela, otla botswa dipotso tseng ding hape, ebe o etsa le diteko tse ding tsa mmele. Sena setla phetwa hape ka mora beke tse tsheletseng Ha ole karolo ya sehlopa se sebedisang bukana ya hae o tla bitswa o tlo fuwa bukana me o fuwe tlhakisetso ya hore e sebediswa jwang hae. Mme hotla lebelwa hore o e sebedise hae ho tseba tse ngata leho etsa boikwetliso.

Ha ole karolo ya sehlopha sa hlokomelo e tlwaelehileng, otla tswela pela ka kalafo ya hao e tlwaelehiling,mme o tswele pele ka ho ka kalafo eo o e fumanang klinikeng. Otla kopuwa ho khutla hape ho araba dipotso tse ding le ho etsa diteko tsa mmele ka mora dibeke tse tseletseng

Kwetliso ena ke mahala,feela sehlopha setlo nka karolo setla batlelwa koloi tsa baeti hore a fihle sepetele. Koloi e tla ba lata hae kapa kliniking e ba e sebedisang hotla matsatsing a diteko le hot la kwetlisong

Ho nka karolo mona hotla o thusa haholo ka lokisa bohloko bo teng. Hape otla ithuta ka dithuto tse fapaneng tse amanang le bohloko, hape otla ithuta ho ikwetlisa otlo o tsebe ho di etsa hao sole mong.

Retla etsa bo nnete ba hore hao etsetse di ntho tsetla o lematsa hare etsa kwetliso tsa mmele, mme kwetliso tsenatsa mmele ditla etswa ke physiotherapist. Ka mao ho ikwetlisa hwa mmele wa hao otlaba bohloko matsatsi a mmalwa, haholo ho batho ba qalang ho kwetlisa mmele ya bona. Ke tabatabelo ya rona hore sehlopha sena se fumane thuso e khethehile empa ha rena bo nnete bo phethahetseng dipatlisisong tsena ho fihlela kwetliso ya rona e fedile.

Ha okaba le bohloko bo fetang ba pele nakong ena bosa feleng hape, retla etsa diteko tse ding. Mme haeba ho hlokahala, otla iswa sehlopheng sana se hlokomelong e tlwaelehing. Ho nka karolo ke ho tswa ho wena, o ka tsa habe o ikutlwa ho sa hloke o tswella pele. Ha o nka karolo o ka hana ho arba dipotso tse ding. Ha o batla o tseba tse ding o ka botsa o mokamedi waka dithutong. O ka founela le batho ikarabelang Research ka tsele e nepahetseng eleng *University of the Free State Health Ethics committee*

Ka Nnete,

Kopano Malebo

Physiotherapist

Yours Sincerely,
Kopano Malebo
Physiotherapist
Elizabeth Ross district Hospital
085 718 4048

Dr Roline Barnes
Physiotherapy Department
University of the Free State
051 401 1069

University of the Free States Health Science Research Ethic Committee
Mrs Mare Marais Head of Ethics Administration

Faculty of Health sciences
051 401 7795

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Ho Motho a Nkang Karolo

Ke badile tlhaloso ya patlisiso e tlo etswa: *Six week exercise and Education programme for weight bearing joint pain at Primary Health Care*

Re tshepa hore phuputso ena etla thusa basebeletsi ba tsa bophelo ho utluisisa hore kwetliso ena ya beke tse tsheletseng ya kwetliso ya mmele , dithuto tsa bohloko ba manolonyetso eka tlase ha boima le ho thusa batho ho phela le bohloko hantle. Dipotso tsohle ditla ba lekunutu.

O ka founela motho a etsang phuphutso, Kopano Malebo 058 718 4048 or mookamedi wa hae phuphutsong Dr Roline Barnes 051 401 1069 ho fumana tlhaloso engwe le ditokelo tsa hao jwalo ka motho a nkang karolo. Ho nka karolo ho tswa ho wena, mme hose nke karolo kappa ho fetola maikutlo ha hona hoba le ditla morao.

Nna, ……………………………………………….. Ke se ke badile tlhaloso tsohle, mme ke dipotso tsaka arabile ka tsela e kgotsofatsang. Ke utlwisisa seo ke lokelang ho se etsa mme ke nkile karalo hoba ke batla. Ke utlwisisa hore ke lokela ho ya ho ditshebeletso tse ding ka tlwaelo. Ha kea hatellwa ho nka karalolo, mme ka tseba hore nka itokolla nko engwe le engwe. Kea tseba hore nka hana ho araba diposto tse ding. Kea tseba hore ha hona hoba le ditla morao ha ke ka itokolla. Ke filwe hore nka bua le mang ha kena le dipotso,Ke fana ka tumello yohle hore baka sebedisa tsohle tse amanang le bokudi baka. Ke dumela hore ke tla nka karolo beke tse tsheletseng le hotla matsatsing ohle a diteko.

………………………………………..	…………………………………………….
Motho a nka karolo	Letsatsi
………………………………………..	…………………………………………….
Paki	Letsatsi
………………………………………..	…………………………………………….
Motho a Phuputsang	Letsatsi

Appendix K Bophelo ka Kwetsliso Booklet

**Cover Page*

“Bophelo Ka Kwetliso” Education and exercise to manage our pain

This booklet made in such a way to help you manage your pain and learn more about how you can learn to manage your pain. This booklet is meant to be used and not just for having or putting on the side table. This will be used in our groups as we discuss and learn together. It is important that we learn from one another and sharing your understanding of joint pain and experience of managing your pain can be helpful to other group members. We also will encourage you to use this book as a starting point to begin to learn to set goals and make decisions on your health.

We have learnt form similar studies that used similar information that if you commit yourself and participate there can be great benefits for your health.

Education Content		
Week	**Title**	**Content**
Week One	What is Joint pain	What is joint pain and common causes of joint? Chronic versus Acute pain Consider Self-Management exercise and its benefits
Week Two	Understanding and managing joint pain	Managing pain at home Assistive Devices Goals setting
Week three	Stress	What is stress Stress management techniques Managing relationships
Week Four	Keeping Healthy	Chronic diseases Steps to a healthier lifestyle
Week Five	Medication	Medicine Pain Medicines

		The Analgesics ladder
Week Six	Problem Solving Action plan for the future	Decision Making Continuing positive health behaviours

What is a Pain?

Pain in an unpleasant feeling that can be from our emotions or from being hurt somewhere on the body pain and is most often described in that way. Pain is a normal experience for people and is important for surviving. Pain cannot be measured in the standardized way; how bad it is can only be described by the person feeling the pain. This is the reason why people with the same injuries will not experience the same kind of pain. The experience of that pain can even take a different length of time to heal even if people had the same injury. Most people think that pain is directly linked to the health of soft tissues in the human body and pain, even though there has been lots of proof that pain is not linked directly to the health of human tissue. The way we are taught about pain is not helpful for people who have had pain for a long time.

The feeling of pain is not as simple as most people think. The experience of pain is a complex involving different parts of the nervous system, this is the system in the body that allows us to feel, and for the brain to give instructions to the rest of the body. There are three different parts to the system. It is the brain, the spinal cord and the nerves in our arms and legs. The nervous system sends messages from the arms and legs to the brain through the spinal cord, and the messages are sent to the arms and legs from the brain in a similar way.

Acute pain: Pain that come soon after you have hurt a part of the body in some way. What happens is that the body sends messages to the brain that you are hurt and that you need to protect that part of the body so that it can heal. Following tissue damage the body begins a healing process that involves sending more blood and other bodily fluids to that area of the body. That can usually experience as swelling or inflammation.

Chronic pain: This is pain that last for a longer period than what it usually takes for a part of the body that is injured to heal. Chronic pain is not simply that tissue has not healed for a long time but is a more complex process that involves changes the way pain messages are sent and interpreted from the parts that is injured, through the spinal cord and the brain. The pain messages can change in such a way that the amount of feeling to that is needed to send a message as pain is very low, and that the brain allows more space to listen to that message of pain.

Common Joints with pain and their structures

The knee Joint

Knee joint is actually a part of the body made up of three joints. The main joint is between to big bones: the shin called the tibia, and the thigh bone called the femur. This joint is called the tibiofemoral joint. There is also a joint between the big shine bone called the tibia, and the smaller shin bone called the fibular. The joint is called the superior tibiofibular joint because it is the joint that closer to the top. These bones also have another joint close to the ankle. The last joint is between the thigh bone femur and the kneecap called the femoral - patellar joint. Inside the joint and around the joint there are soft tissue called ligaments. Ligaments which join bone with bone. There are four major knee ligaments on the outside of the joint and inside the joint. There is a surface at the end of the bones that make it smooth so that the bones can move with ease called cartilage, on the shin bone at the top has special cartilage called the *Meniscus.* Inside the knee joint a bit of fluid that makes it possible for the joint to move freely. Movement is important for the health of the joints; it allows the nutrients the knee needs for health to move in and out of the knee. There are lots of muscles that around the knee joint: that is the big thigh muscles at the front of the knee are attached with a tendon to the shin bone, and at the back we have the hamstring muscles that attached onto the shin bone, the calf muscle about the back of the knee, they attach onto the thigh bone.

The Hip Joint made hip of the thigh bone and of the pelvis. This hip joint is sometime referred to as a ball and socket joint. The thigh bone has a part close to the joint called the neck of the thigh bone. On the pelvic bone the joint or the socket is lined with cartilage and is called the *acetabulum*. There are ligaments that surround the hip joint. There are lots of groups of muscles that helps to form hip joint. At the back we have the muscles of the buttocks, in from we have the thigh muscle and muscles from inside of the thigh.

The back and neck are part of the backbones which is made up many bones called "vertebra" and those vertebrae are separated by discs fibre which are jelly tissues. The back is composed of three different areas with 33 bones in total. The seven neck bones, 12 bones in the chest area and 5 in the lower back and 5 at the lower back to form the sacrum and the 4 that form the coccyx. There are also little joints on the vertebra called facet joints. There are ligaments that run the length of the entire back. There is a ligament in between the spinous processes at the back of the vertebra. There are many muscles that are part of our back. Big muscles that move the back and other muscles which provide stability to the back muscles. There muscle span forms the lower back all the way into the neck.

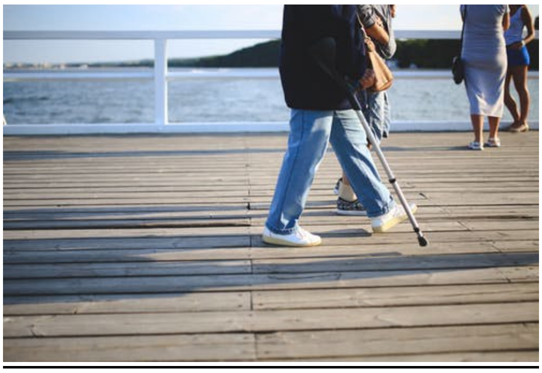
Causes of joint pain:

In all these joints and in most joint in the body there are bones, cartilage ligaments and muscles. Anyone of these things that we have explained can be a source of joint pain. In older people one of the most common causes of knee pain is *Osteoarthritis.* Osteoarthritis is a breakdown of healthy joint surfaces between two bones that form a joint. Osteoarthritis is often a the result of a lot of things happening together: It can be that we are more likely to have it because its passed down from our parents, or just being more likely to get it than other people, being overweight can make us likely to have it, having poor posture can also make us more likely. The diagnosis of Osteoarthritis has a clear criterion, the most important being change on an x-ray. It is important to remember that change on an x-ray do not necessarily reflect the pain that you are feeling. Many people with changes on the x-rays do not necessarily have pain

Muscle weakness can also contribute to pain, and pain can also cause the muscles to be a little weak. When there is pain somewhere in or around a joint the body tries to protect the joint by trying to move less. Muscles when they contract are what causes movement of different parts of our bodies. If muscle is prevented from moving muscles can become weak and stiff. Weak muscles mean poor movement in the joint moved by those muscles. Strong muscles add to the stability of the joint and it is important to keep muscles around the joint working well

Ligaments which join bone to bone also are there for stability. The ligaments can become stressed from being used too much or become injured because of bad movement patterns in the joints.

Exercise

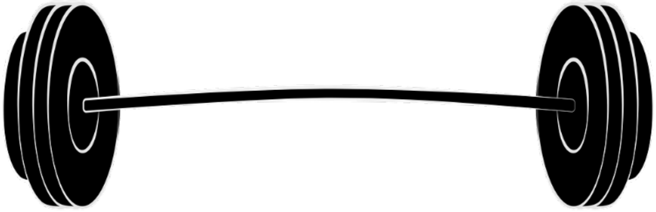


Exercise is one of the most important things that we can do to make sure that we have healthy lives. Exercise is good for the us because it helps to train our heart that it is strong and helps to keep our lungs working as they should, it helps with our digestive system to make sure we our body processes and uses food well and exercise keeps our muscles and bones strong and flexible to keep us moving well. Exercise is also a tool that we can use to control our weight or to lose weight. Exercise is the cheapest and best medicine we must treat pain and other chronic illness. Simply explained exercise is using your body in a way that uses more energy and strength than what you do during your normal activities of daily living in a planned and structured way. Exercise usually raises your heart rate and works your muscles harder. There can be a variety of goals with exercises. In this programme the aim is to minimize pain and to slow down degenerative processes that happen with arthritis in joint with exercise and to make sure it doesn't disturb us in doing things at home and other parts of our lives. To improve and maintain the best possible level of fitness for each person. Although exercise is good for us, we need to make sure that when we exercise it is safe to do. The body is good at giving information about whether we should exercise (this doesn't mean we should use there as excuses not to exercise). Clues that you may need rest from exercise is if you have vomiting or diarrhoea after exercising. If you get new pain during or after exercising it can be wise to speak to your doctor or physiotherapist about the new pain.

There are various types of exercises we can do at home:

Endurance Exercise: These are exercising that work on your heart and lung, they improve the way the of the heart and lungs work and give you stamina to be able to endure exercise for a longer period of time. These exercises can be walking, running, swimming, and cycling. In our area the ones that we can do is walking and running, these must be done at level that challenge what you already can do in order to increase your capacity.

Strengthening Exercises: These are exercise which are used to improve the strength in muscles and can cause the muscle to be strong. These exercises are done by causing the muscles to put more effort to be able to move, or by causing it to move more times than what the muscle would ordinarily move. For these exercises one can use things to have to cause the muscle to put in more effort: weights like those at gyms can be used or elastic resistances like Theraband, or even the use of a person's own body weight, or simply move their limbs at a rate more than what they ordinarily do, which will result in the strengthening of the muscles.



Stretching Exercise: There are exercises that are used to ensure that the body can more as it was intended to move, to prevent stiffening of the joint and shortening of the muscles. These exercises are done by moving joints through to the end of the entire range it supposed to be able to move, holding muscles in a stretch.

How does exercise help?

1. Exercise controls weight

Exercise can help us to lose weight if we are overweight, it can help us maintain our weight. When you exercise, you burn energy that would have been stored as energy in the form of fat. The more intense the activity, the more energy that you use. And the longer you exercise the more energy you use during exercising

To get the benefits of exercise, just get more active throughout your day walking to the shops yourself instead of sending the children. Walk to the furthest taxi stop and get off a distance from the shop you are going to. Doing regular exercise is important to reap the full benefits of exercise.

2. Exercise combats health conditions and diseases

Regular exercise helps to prevent or manage lots of different health problems. There is disease that are called disease of lifestyle. They are related to how we eat, and that we don’t exercise. Doing exercises more regularly can help to control this illness. Some of the illness that benefit from this are sugar diabetes, high blood pressure, depression, different types of arthritis can also benefit from exercising regularly. Exercise can help make us strong and help prevent falls.

3. Exercise improves mood

When you exercise there are chemicals that are released in the brain that make us feel better. These chemicals lift your mood and make you a little happier. Exercise can help with the release of tension, if you are worried and stressed exercise can help release the tension that you may feel in your body.

4. Exercise boosts energy

When you exercise you use more energy and that can help your body better release more energy to convert the fat in an energy form it can use. As you also improve in your strength and you heart and lungs get stronger, you are better able to do chores with more energy. Exercise makes your body be able to better and the better use of energy make us feel like we have more energy. When energy is there but it’s not used it make us feel like we have less energy.

How to exercise:

It is important to plan your exercise and to choose when you are going to do exercise. The first thing in exercise is choosing when we are going to exercise. It is best to do all the different types of exercises together in a session rather than just do one of those exercises. The different types that we can do are endurance, strength and stretch exercises.

For endurance exercises its best to do 30 minutes of exercise a day. This can be continuous for 30 minutes or spread out through-out your day which may be easier and more manageable. This should be done at least of 3 days a week. The recommended amount is 30 minutes of endurance activities for 5 days of the week.

Together with the cardio exercise we can do some strength exercises for different muscles around different joints. We change choose different muscles in different sessions These strength exercises can be between 3 -5 sets. A set is each time you complete a specific strengthening exercise. They can be done for between 8 – 12 repetitions. Three to 5 different types of strengthening exercises can be chosen each time. You can do one exercises and complete the 3 time and 10 repetition all at once, or you can mix the exercises and do mix sets with different exercises. This can also be done at one go or can be spread out during the course of the day. They can be done at the same time as you need to take you daily medication at different times of the day. *This is because exercise is medicine.*

For muscles that are stiff, they can be stretched. Stretches are a sustained hold, usually help for a minimum for 20 seconds towards 1 minute and can be repeated twice for each muscle that is stretched. Muscles also need to be moved through their entire range. Moving different body parts through the whole range is a way of making sure that you are flexible and able to stretch.

Week 2 Self-Management

Self-Management-

Self-management means that person taking responsibility for their own health care. This doesn't mean that we need anyone else to help with the heath care, but rather the person becomes an active in taking care of their health care and works together nurse, doctors, physiotherapist, and other members of the health care team to ensure that remain healthy.

There are a few things that can help us be better at managing our joint pain. The first is to try understanding why there is pain, how it can become worse and how it can impact on my everyday life. Having knowledge about your pain and putting it into practice can help you better understand your pain. The self-manager is also required to be able to make decision and put steps into place manage their pain.

Attitude towards our pain and belief in our ability to do exercise can significantly impact our ability to manage to be a self-manager. We need to think about if we feel like we will be able to manage our own pain and do exercises. For many people we have always just assumed that we can exercise, and we can manage our pain. If we don't believe we can manage our own symptoms we must try and identify the reason behind feeling that way. It is important that we believe in ourselves and that we believe that we can manage our pain. You can do what it takes to become a self-manager.

Pain Management at home

Pain can be controlled at home, controlling pain at home is not only about taking medications, although taking medications is a part of being able to control pain at home. If we understand pain, if we understand what we believe about the pain then we can control our pain when we are at home. Also understanding what other things impact on our experience of pain.

Pain in the joints is most often caused by a breakdown of the cartilage in the joint. One of the things that happen when the joint cartilage is worn down is that the cold usually makes the pain worse. When the weather changes and it becomes a bit colder, or during the winter months the pain can be worse. Some people believe that the cause of their knee pain is the cold when that just a sign that the joint is no longer the same as before. Once of the best way we can easily manage pain at home is by responding to the sign that the cold causes pain. For some people the pain is better in summer when you compare the pain that they experience in the other months. So, we can use heat to minimize our pain symptoms. A nice way is to buy a Hot water bottle that we can fill with hot water. wrap the bottle in a towel to make sure that we don’t burn our skin, we can apply the hot water bottle for 10-20 minutes on the joint that we where we experience pain. This a nice and inexpensive way of making your pain symptoms better. Other forms can be a microwavable heat pack. This is applied the same way as a hot water bottle, but it is heated by putting it in the microwave for two minutes. There are also electronic water bottles that way be used, where they are charged to heat the water bottle.

Pain can also be made worse by our mood, and what we believe about the pain. If we believe that pain will be made worse by movement. We teach the brain, even without thinking about it that when we move, we make the pain worse. This results in our being scared to move and do exercises, and we learnt in the last week that exercise and movement is important for pain management. The second things are attitude and our thinking around pain. If we are full of fear that if we move that we make our pain worse, we are unlikely to move, and movement will cause more pain. What we need to do is to understand that for good joint health there needs movement. Whilst it is true that too much movement too quickly can cause pain, but movement introduced at good state is important to get the joint health and to minimize pain in the joint. We have already discussed different types of exercise. It is important that these exercises become part of your life and are used at home as part of managing your pain. As we teach you different types of exercises you can chose some of them to do at home. Its important that you believe that you can do these exercises.

The third thing one can to do is to understand that our feelings at the thing that increase our stress (we will look at stress more closely in the third week). If emotionally you are unwell, it can cause us to experience pain as worse. If we are doing well emotionally, perhaps we are happy. In such situations it is possible that we feel the pain less. Emotions are a normal part of life and it will happen that in different times we may be happy and at other times we may be sad, but we must understand that it has a bearing on how we feel the pain. We then must also think if about how we are feeling when our pain feels worse. If it happens that we are emotionally we are down, we can then know that it is not a sign that we are getting worse pain but rather that we are experiencing as more painful because of being emotionally unwell.

Pacing

For a person with joint pain doing everyday activities requires that they pace themselves. To do enough activities whilst allowing themselves time to recover before continuing with other activities. A person must give themselves enough time between different activities. Some rest can help you get your energy back and makes sure that you don't make the pain worse with activities. There needs to be a balance between activities and rest, activities must be spread out during the day. This could mean that you do your house chore over several days instead of on one day. Instead of shopping for a long day, you can do over several days to ensure you don't make pain worse when you out shopping. Doing laundry and ironing doesn't need to all be done on one day. It can be spread over several days to ensure that you pace yourself.

Managing Chronic Pain:

Training the brain to understand how the chronic pain and its relationship with tissue damage. You must understand that the amount of pain that you experience is not necessarily related to underlying damage in the back, knee or the hip. The pain has outlived its usefulness and it requires actively telling you brain that the there is no need for severe pain message. The understanding that pain messages need not be sent can stimulate a response in the nerves system to begin to inhibit the pain.

We need to help our brain on how to understand our joint pain and not understanding it to be in immediate danger. When we actively interpret the pain for our brain it decreases our changes our experience of it causing us to fear movement. This is not to say that the pain in not real, but it's interpreted differently.

Assistive Devices

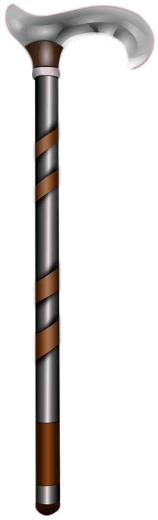
Joint pain can cause a lot of problems in our everyday, the most common is that it can cause problems with walking. When a person has joint pain, it can happen that they are not able to put their body weight on the body. The easiest way to help solve the problem is to provide what we call *an assistive device.* This is just something to assist to make it easier to walk whilst you have pain. The assistive device also has a section called walking aids. These are the ones that we use to make walking easier. The best way to choose a walking aid is with the help of a physiotherapist who can assess and chose the best one for you based on balance, pain, and strength in the arms. Walking aids e can be used in the home and outside the home and can be used when exercising. We also have braces which we use to assist the joint with stability and to decrease pain.

Types of assistive devices and braces.

Shoe inserts: shoe inserts can help to make the feet and leg take in less pressure when you are walking. In this way you can make less the pressure or force happen to fall in joint in the legs hip joint.

Braces: Even a very simple brace like a neoprene sleeve, with a cut out for your knee — can help keep your bone in place and relieve pain often people make their own brace using bandages tied around the knee joint. There are more stable hinge knee braces for knees with increased instability or pain. Braces can also offer warmth and compression, which can help reduce swelling. However, braces should not always be used to allow the muscle to also work and keep strong.

Canes/walking sticks: By leaning on a cane, you can transfer the weight off your knee, helping to reduce the pain. A cane can be made from aluminium or wood and has a handle.



Crutches: you rely on your arms to help bear weight and propel you forward when you walk.

Walking Frame: walking frames can relieve much of the weight that puts pressure on the joints. They provide added stability for patient with balance problems.

Goal Setting

Without goals it can it be very difficult to do what we set out to do. To make sure that we manage our pain at home, and that we exercise as we want it is important that we make goals. Sometimes we set goals but do it in such a way that we still don't achieve anything. So now here is a way that we can set goals that make sure we do what we say we want to do: SMART Goals where each letter of SMART explain how we set our goals.

S- Specific

The exercise goals that we want to achieve must be very specific. When trying to change our lifestyle, general goals may not be helpful or may be very difficult to do. Specific goals give direction to what we are working towards. In working towards a specific goal, one can ask themselves, questions like these: What do I want to achieve, when do I want to achieve it, how do I want to achieve it with whom do I want to achieve it?

M-Measurable

This word simply means that we can measure the goals, and to measure something means we can count it. The exercise goals can include exactly how often and how many times a person want to exercise in a week. How many of each exercise that one can do during the week.

A- Attainable

The goals we set need to be goals that can be attained. We cannot set goals that are so low that they do not challenge us and do not need any effort to attain them. At the same time we do not want to set goals that would be impossible to attain. Running 10km when you have just started exercising isn't attainable. However, walking two kilometres is attainable. All goal that one set should be attainable.

Relevant

With the goals that we chose they should be relevant for what we are trying to achieve. The goals for exercise should be geared towards being able to do activities of daily living, to manage pain and to foster confidence in exercise. It doesn't help to have goals that are not related to exercising and other thing when the lifestyle change, we need to learn.

Time-bound

The goals that you chose should be linked to the time in when you want to do those goals, and the how often which you want to complete them. The amount of time you want to spend doing the goals should so be noted

My goal is:
…..………|(What)
……………………………………………………………………………………………………(How
much………………………………………………………………..……………………………………………………………
(when)……………………………………………………………..……………………………………………………………
…………………………………………………………………………(how many)

Example

I want to *Walk (What)* to the shop and back (how much) in the morning after the kids go to school (When) 4 days a week (How many)

record of what I did:	I Plan to	I did
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		
Saturday		

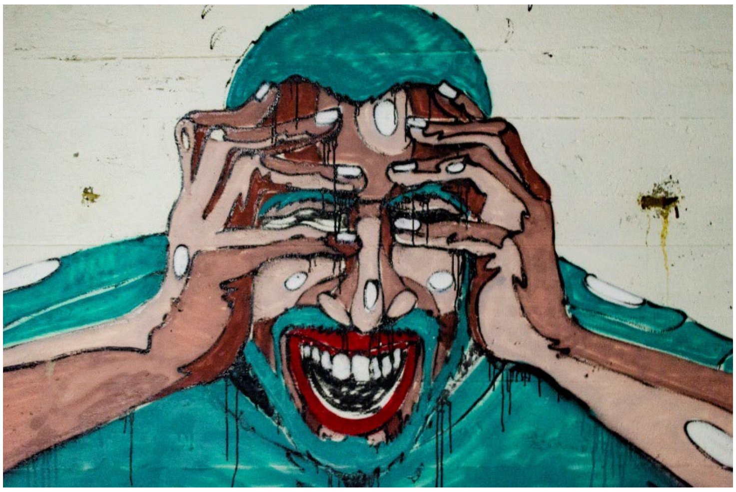
Sunday		

Week 3 Managing Stress

What is stress?

Stress if a word that is used in our everyday. People often speak about stress in very serious situations, but often stress is often related to everyday situations we face in our families, in our work and in our finances. What does stress mean? Stress is first and foremost a feeling. It’s a feeling that is a combination of worry, anxiety, and pressure. Stress is a normal part of life, but if it is not controlled it can become a problem and begin to affect us badly. People are affected by stress in different ways, and it makes sense they are also needed to respond to the stress in different ways. If Stress gets out of control it can affect our ability to cope with everyday life. Stress can affect our ability to make decisions about our health, it can mess up our sleep pattern and it can also cause us to speak to people in hurtful ways. Stress can disturb our concentration and then make it difficult to complete work or study and make it hard to enjoy life. Stress can cause the body to respond as though it is under attack, and it can make it hard for our bodies to work normally.

Stress isn’t always, bad some people find that the pressure that comes with stress causes them to do things better. Some people feel that they can perform better at school or university, or at their jobs when they are under stress. Some degree of stress is helpful to all people. The stress spurs the people on to work harder than what they normally would without stress.



It is important to understand that is impossible to have a stress-free life. We will always have some stress even if it is a small amount that doesn't really affect us in anyway. It is important not to allow the stress to get out of hand. We need to learn some ways that will help us control stress level in during times when there may be added pressure in life.

Stress management techniques:

Recognise Stress

There are different ways of controlling stress that are used. To be able to control stress you need to be able to recognise stress: you need to see when stress is beginning to become a problem and also situations in which we begin to feel increasing amounts of stress. The body and our actions can be changed by stress, signs that we are under lots of stress can include not being able to sleep properly, eating more or less than usual and feeling like you want to eat more junk food, being easily angry, feeling down and experiencing low energy level and motivation.

We must be able to see when a situation causes us stress. When it happens that we find ourselves in situations where we have lost the ability to control or to predict the outcome of certain situations. When you have pain that last a long time and there isn't an explanation of what can cause for the pain may be, consider if you are not under lots of stress.

When we are stressed our feelings of pain can be worse than when we are not stressed. There is a relationship between pain and stress that if stress is uncontrolled the pain will be experienced as worse. And there can be an unhealthy cycle of pain and stress. So as part of controlling our pain experience we must also mange stress. Table of stress symptoms:

Cognitive Symptoms	**Emotional**
Memory Problems Not being able to concentrate Not being able to judge situations well Seeing only the bad in most situations Anxious or changing thoughts quickly Constant worrying	General unhappiness Anxiety and agitation Moodiness, irritability, or anger Feeling overwhelmed Loneliness and isolation
Physical symptoms	**Behavioural symptoms**
Aches and pain Diarrhea or constipation Nausea, dizziness Frequent colds or flu	Eating more or less Sleeping too much or too little Isolating yourself Neglecting responsibilities Substance's abuse

Find methods to cope:

When we are stressful situations, we find way to cope with that stress. Some coping methods are healthy, and help to control the stress, where others are unhelpful

Substance abuse: When we are stressed, we can turn to different substances to help us to feel like we are controlling the stress. Sometimes it can be medicine we get from the doctor. or alcohol, which is one of the most abused substances. People like to drink their problems away or drown their sorrows away. Others may smoke more or return to smoking after having previously stopped smoking.

Unhealthy eating habits: Sometimes when a person has stress, they may change the way they eat. some people may eat more than they usually do, others can avoid eating all together. "Comfort" eating is when people use food to help them cope with their stress. They eat a lot, and they opt for unhealthy or junk foods.

Avoid and ignore in stressful time people will avoid the situation causing them stress or worse ignore it all together. This method of dealing with stress is totally unhelpful as it doesn't allow for stressful situation to be identified or and to addressed.

A good way of dealing with stress is for acknowledge that you are feeling stress and that you are not coping with the stress, or if you are managing the stress well to be aware that you are coping. When you know that you are not coping with the stress and you have admitted it, it's important that you try and find helpful ways of coping with the stress. If we have stress because we are in pain, it's important to manage out pain as it will make it easier to cope with the stress. Finding methods to understand, and deal with the pain will help to make the stress less. Dealing directly with other causes of stress in our lives will be helpful to coping with stressful situations.

Being with other people can be important for helping us deal with stress, isolation when we are stressed can sometime add to the stress. It's important then that we communicate with family and friends about the stresses that we face in our lives. They can listen to our fears and anxieties so that we can feel supported. We must be careful of over relying of family and friends. You must also be aware that their advice on pain management my not necessarily be correct or scientific. Being with people who face similar situations as those we find ourselves can help with dealing with stress. Being in a support group with people facing similar situations can be helpful to managing stress.

Changing our attitudes can be helpful to addressing stressful situations. If we look at stressful situation with the attitude that we will be able to resolve them it's likely that we will act to address the situation. If we look at our pain that we will never be able to control it and deal with it. We are unlikely to attempt to do so. However, if we believe that we can take steps to come and manage our stress it likely that we will do exactly that.

Exercise is an effective means of dealing with stress. People who exercise for 30 minutes three time a day are not as likely to have the stress become a problem that is uncontrollable. Exercise allows our brains to release chemical that will help make us feel more relaxed when we are dealing with stressful situations.

Other Feelings

Frustration

When you are struggling with pain, and you don’t understand your pain it can cause a person to feel frustrated. Struggling with everyday things that you used to be able to do for yourself can also cause you to be frustrated. The important thing is to be positive and try and find way of doing the things that you used to be able to do. Also accepting the current situation can help you more understand of the situation.

Isolation

Not being able to take part in social or community activities can cause you to feel lonely. It’s important that you do not allow pain to cause you loneliness. You must try to be part of social and community gatherings. It’s important not to allow pain to stop you from having friendships.

Depression

People with chronic pain can easily develop depression. This is not just feeling sad but when there is a chemical imbalance in the brain due to feeling sad and down for a long time. Depression is an illness that can be treated with medication and counselling. It is important that if you think that you have depression you alert your nurse of doctor, they will examine you and start you on treatment if necessary.

Managing relationships

Pain can cause us to not look after the different relationships, with our children or friends or family or spouses as we should. A combination of pain and stress can cause us to be irritable because of stress. It is important then to realise that we need to be careful how we talk and behave towards people to ensure that they can provide the necessary social support that is needed. Whilst it is true that we are dealing with the stress of having pain, and it is an experience that many who are close to you do not necessarily understand, it is important to recognise that when a family member or friends is unwell it also places emotional stress on those people. There needs to be an acknowledgement that's each person in that relationship is facing unique stressors and each of the people need to contribute towards making sure the relationship works.

Family and friends:

It is important that we are aware that family must not bear the consequences of our stress and pain experiencing. When we are feeling particularly stressed or experiencing severe pain, we must try communicate that with family so that they are aware of how we are feeling. We must also then be aware of how we then interact with them. Beware of shouting, and angry response at things or situation that don't need you to react in that way. We also need to be careful not to make them overwhelmed by expecting them to take complete care of us. People can sometime feel overwhelmed by a person's illness and need to be given space to also speak openly about their feelings.

If we need to make sure that we give ourselves space when we need space. Clear communication is important in the family,

It’s important to also allow people space to be able to communicate openly, or space not to be around the stressful situation all the time. Communication with family and friend should be open and honest. It should facilitate social support and good relationship with people.

Chronic diseases of Lifestyle

Patients with joint pain can sometimes have other chronic diseases that they live with outside of the joint pain alone. These diseases often require exercise as part of their management and living with joint pain prevents people from exercising. Common Chronic illnesses that people live with a High blood pressure; Diabetes, Heart diseases.

High blood pressure (Hypertension)

High blood pressure is considered a disease of lifestyle that means it's usually brought about by how we live and eat. When we don't regularly exercise, when we drink alcohol, eat too much salt and put on too much weight we put ourselves at risk of getting high blood pressure. When we have joint pain, and we are reluctant to exercise

Blood pressure in your body is there to move blood form the heart to the rest of the body and back. There is a normal pressure at which the blood must move within our blood vessels. High blood pressure is a condition when the pressure within your bloods is too high over a long period of time.

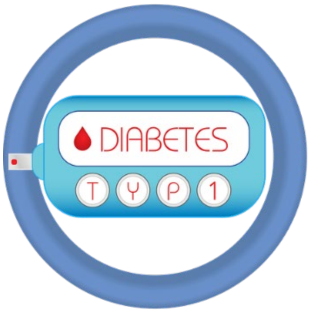
Blood pressure is important to because it is what allows blood that have air from our lungs to move from the heart to the rest of the body and back again. Our hearts pump blood that comes from the lungs to the rest of the body. The pressure of the heart pumping to the rest of the body is the bigger number or the *systolic* pressure. When the heart muscle is relaxed the blood pressure drops, and the blood is flowing back from the rest of the body, this is the smaller number or called the *diastolic blood* pressure. A Healthy systolic pressure is between 120 – 140 mmHg; and diastolic pressure is 70-90mmHg

Blood pressure can be controlled with the help of endurance exercise. As we do endurance exercise, we train our hearts to be stronger and better be able to pump blood throughout the body.

If a person already has high blood pressure it is commonly managed using different medicines. The medication needed to control high blood can be increased or other medicines added if they person doesn't respond well to different treatments. If a person doesn't change the behaviour that led to high blood pressure the disease can become worse. People with High blood pressure need to drink their medication as the have been told by the nurse or doctor to ensure good health, and to prevent any further complication of the high blood pressure One serious complication of high blood pressure is that a person can suffer a stroke which can be very fatal.

Blood pressure Category	Systolic (when the heart muscle pumps blood to the rest of the body)	Diastolic (When the heart relaxes) mmHg
Normal	Less than 120	80
Prehypertension	120-139	80-89
High blood Pressure Stage 1	140-159	90-99
High blood pressure stage 2	160 higher	100 higher

Diabetes:



This is a condition where our bodies don't not respond or produce a hormone that is necessary to control the sugar levels in our blood. There are two different type of sugar diabetes. There first is

Diabetes mellitus **type 1** if a form of diabetes where the body doesn't produce enough of the hormone necessary to control blood sugar level in the body.

Diabetes mellitus **type 2** if the body can produce the hormone by has lost some of its ability to respond to the hormone which means that the blood sugar in the body remains uncontrolled Diabetes type 2 is the most common form of diabetes.

When we eat, starch is converted to become sugar in our blood. We need a certain amount of sugar in our bodies to have enough energy to do our everyday activities. The body has a way of regulating the amount of sugar in our blood. If we don't have enough the body breaks down fat in to convert it into sugar in our body. If we have too much blood sugar in our body, the body converts it into a form that it can use later. That form in which it is stored is fat.

Diabetes is a disease that can run in families, if a parent or a sibling has diabetes it is possible that you too may have diabetes. If you are overweight and have large a waistline it increases your chances of getting diabetes. Other chronic disease like High blood pressure and heart disease are risk factors. |

The sign and symptoms of diabetes are needing to pee very frequently, feeling thirsty frequently, feeling hungrier suddenly and unexplained weight gain or weight loss.

Exercise is one of the ways in which we can help out body better control blood glucose level. It can also make the body use more blood glucose in our body, lowering the excess blood glucose level, but also breaking down fat so that we decrease the amount of fat stored in our bodies.

Complications of Diabetes can be heart disease, an increased chance that the vessels in the legs and arms can be compromised, blindness and kidney failure.

Heart failure/Coronary disease

Coronary heart disease is a disease in which a waxy substance called plaque builds up inside the arteries around the heart. Coronary arteries are the blood vessel that carry blood that has oxygen to the heart itself. When there is a lot of plaque build is referred to in medical terms as *atherosclerosis*.

Coronary Heart disease is also a result of the lifestyle that we live. When we eat unhealthy fats, they are converted into plaque in our vessels. The plaque build-up over years. When we visit our doctors, they can measure the cholesterol in our blood to possibly identify if we are at risk of developing coronary heart disease.

People who have had family member that have had coronary disease are also at risk of having the same disease. Being overweight increases your change of having the disease. Smoking and excessive alcohol use can also cause also place you at risk. The presence of other chronic disease like diabetes and high blood pressure also increase you changes of the diseases.

Managing chronic diseases

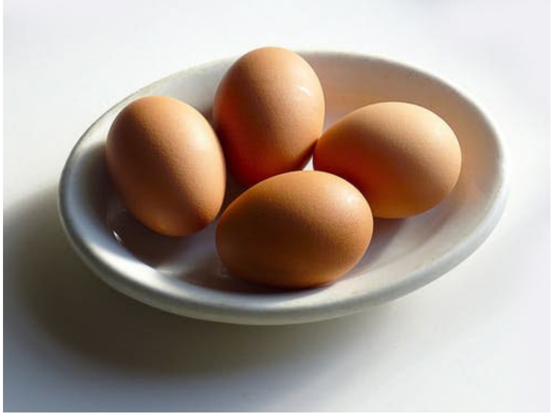
All three of these three chronic illness are treated by medication, lifestyle changes and exercises. It is important to know what medication you are required to take for your chronic illness and how exactly you are supposed to take the chronic medications. It is also helpful to know the different the different names of the medication so that you can also inform your doctor at the clinic what they are or even at the hospital. If you don’t know them, you can keep a box of your medication so that all your health care providers know what they are.

Living a lazy lifestyle is a risk in all the chronic disease that we have discussed so far. It then makes sense that living an active lifestyle can help to prevent or bring under control all this disease of lifestyle. It is important mostly do aerobic exercises for 30 minutes at least 3 days a week, you can refer to the previous section on exercise. This is a way of ensuring that you can bring this disease under control and that you prevent them from becoming worse if you already have them. It’s also important to make healthy choices in how you eat, to eat food that are healthier, refer to the nutrition section. If you are a smoker, it is important to take measures to try and stop smoking, also if you use snuff Tabaco. It is also important to not abuse alcohol and keep consumption to a minimum.

Eating Well:

The food we eat is an important part of living a healthy lifestyle that allows one to manage pain and keep active. How we eat can influence our energy levels, it can influence the way we control our other chronic disease and ultimately our weight. We need to eat a balanced diet that is composed of meats, starch, healthy fats, fruits, and vegetables. It is also important that we cook food in a way that that keeps the food healthy.

Proteins:



Meats, Fish and beans are a primary source of protein and protein is a nutrient that important for building muscle and the development of the brain. You can eat a variety of choices for protein like red meats: beef, mutton and goats or white meats like pork and chicken. Also eggs and fish are good sources of protein. Some meats are fattier then others, so removing the skin and access fat on the meat can help ensure we keep cholesterol, the plaque in the views, down. There are also vegetables like green beans and nuts that are also good sources of proteins. A person should eat about meat the size of their palm or less.

Grains:

Starches are a food group that is a main source of energy in our diets called carbohydrates. The starches can also include additional nutrients of vitamins that help with our overall wellbeing. Starches is food like pap, bread, rice, samp, potatoes and pastas. Grain is usually processed, and the better kinds of grains are wholegrain starches as opposed to processed grains. For example, it is better to eat bread with that is whole-wheat as opposed to eating white bread. The whole grain contains more fibre and allow for better digestion in our stomachs, and better use of energy over a longer time rather than use of an energy source that finishes quickly. It is suggested that the portion of starch that a person eats should be the size of their fist.

Fruits and vegetables

Fruits and vegetables are a wonderful source of vitamins, nutrients, and fibre. There are a variety of fruits available in South Africa throughout the year. Two portions of fruits are recommended as part of healthy diet.

There are various kinds of vegetables; Green leafy vegetables: spinach and lettuce. cruciferous vegetables: that are composed of cabbages, cauliflower, and broccoli. There are Marrows: Pumpkins, cucumber, and zucchini Roots: like carrots.

When eating vegetables its best to be guided by the vegetables that are available during the different seasons and by colours. It's important to choose a variety of colours when preparing a meal. The vegetable is best when they are raw and if they are cooked, they should be cooked for a short period of time so that they do not lose their nutrients

Water:

Water is an important is important to keep keeping the body full of water, the body is composed of approximately about 60% water. Water also is important in helping the body filter out waste products through the kidneys as urine, and through the bowel. Its important to drink to thirst but also aim to drink between a 1.5L to 2 litres a day. That is the same as drink 8 glasses of water.

Do's	**Dont's**
✓ Drink lots of water	▪ Drink lots of cooldrink and juices
✓ Eat whole gain starches	Eat starches that have been fried
✓ Don't skip meals unnecessarily especially breakfast	▪ Don't serve over sized portions of food

Pain medications:

Pain is often treated with pain medicines and to use our pain medicine in the best possible way we need to understand what kinds of pain medicine is out there, and how do they work.

It is important to know what medication that you are taking because it will help you know how to use this medication. Medication can be harmful if not used properly or with other medicines that interact with one another. If the medicine, you are taking is taken with other medicine it's possible that they can act against each other or they can become too much for the body. When getting medication for any illness, it's important to know the names of each of the medications. If you think you will forget the names you can ask the nurse to write the medication and dosage on a piece of paper so that you can show it to another health practitioner should the need arise.

Medications can be taken into the body in a few different ways. The first and most common way that medication are taken is through the mouth. Medication that are syrups or tablets are taken through the mouths. Some medications can be absorbed through the skin and are applied a topical cream on the skin. Some medications are delivered through an injection. There are usually deliver to people by a health professional like a nurse or a doctor. In some situations, like in diabetes some people are required to deliver their own injections. Other medications are taken through the veins in body. These are also most delivered by health professional usually in a clinic or hospital and it's also done with the drip attached.

Medication is not described by the shape or the colour. There are many different tablets or are the same medicine. It’s best to remember the name of the medication that you are taking, and if possible, the dosage that you are taking. It is also important to note that an injection also has various active ingredients. An injection isn’t the same thing, and it is just a different way of deliver various drugs. This is also true for the pain medications that you will take. Always know the name of each pain medication that you are given at the clinic. Always speak to a health practitioner about the names of the medications that you are taking when meeting them for the first time.

Pain Medications

Mild pain Killers

Paracetamol – A common pain medication that is found in a lot of over-the-counter medications. Common Paracetamol medications are *Panado, painblock, stop-pain, grandpa*. These medications do not necessarily work at the site of pain but work on the nerves that send pain messages to the brain. They work by telling the nerve to stop sending the message to the brain. This medication is usually taken in a tablet form. Mild pain killers do not have many side effects and thus make them easier to use, when compared to other pain medications.

Anti-Inflammatories

These are a kind of medication that is used reduce inflammation. Inflammation or swelling is the body’s response to injury, in the swelling there are things in the body that go to the site of injury to begin healing Example of inflammation can be red bump on the skin following a mosquito bite or a swollen ankle following a twisted ankle. Signs of inflammation are being hot on the area, redness close to the area, painful swelling. Acute inflammation lasts a few days whereas chronic inflammation lasts a longer time. Anti-inflammatory drugs are used in the treatment of both forms of inflammation. There are two types, non-steroidal anti-inflammatories, and steroidal anti-inflammatories.

Non-steroidal anti-Inflammatory (NSAIDs)

There medicines are used against inflammation driven pain. They are widely used in joint pain. The non-steroidal part of the name means that the active agents are not steroids, steroids are a natural substance produced by the body. There are many different types of NSAIDs some that can only be prescribed by a doctor and others that you can purchase over the counter. They all reduce pain and inflammation, but you might find that you get more relief from one NSAID over another, and some NSAIDs may have fewer side effects than others. The effect differs from person to person. The way the medicine works make it easy for the drug to cause ulcers in the stomach. It is therefore important that these medications are taken after food. Common NSAIDS are *Brufen, Ibuprofen, Disprin/Asprin and Voltaren.* Anti-inflammatories are sometime combined with our pain medications so that they can work together in one pill.

Steroidal Anti inflammatory

These are medications that mimic natural steroids that are produced by your body. These medications have a good strong anti-inflammatory effect but are meant to be used for a short period of time. Although there is a strong anti-inflammatory effect, there are big risk toward taking the medications. The medication can cause high blood pressure, high blood sugar levels, and muscle wasting. The steroid medications can be taken orally, or they can be taken administered as an intramuscular injection. A common steroidal anti-inflammatory taken orally is *prednisone* and often *cortisone* is administered as a injections.

Strong Pain Killers

Opioid (*Morphine based)* drugs:

These drugs pretend to be another natural substance that the brain produces naturally to control pain called opiates. These medicines stop the pain messages by working directly on the nerves, they stop the messages in the brain and in the spinal cord. Opioid medicines are addictive, and a person can easily become dependent on them, therefore they need to be used with caution. There are lots of side effects to opioid medicines amongst them being less alert, being drowsy, feeling sleepy, unusually happiness or unusual unhappiness. Opioid drugs influence a person's breathing and make it less, so patients with diseases like asthma and breathing related illness need to be careful when taking these drugs. Opioid drugs are usually taken through the mouth. Opioid medicines can be combined with other medicines paracetamol or non-Steroidal anti-inflammatories. This decreases dependency on opioids medicines. Opioid medicines need to be prescribed by a doctor and cannot be purchased over the counter.

Other medicines

Anti-spasmodic drugs:

There are medicines that are used against spasms as the name suggests. When a person has pain near a joint, the muscles can try and lessen they pain by tightening which can cause a spasm. These medicines work by preventing the chemical message to the muscle to tighten not to pass. The medicines can have also had severe side effects and are not to be used for a long time. There medicines are not available over the counter and are prescribed by a doctor.

Anti-depressant drugs & Anti-Epileptic drugs

The brain has a system of protecting itself called the blood brain barrier. That means blood cannot go directly on the brain, also chemical in the blood cannot have a direct effect on the brain. Mild pain killers cannot reach the brain for this reason. In some patients with chronic pain for a long time it can be required that they be given medicines that can work directly on the brain as a way of trying to minimize pain in the body. These medicines work to try and make the pain messages normal. These medicines are required to be taken over a longer period to work, they need to be taken at least over two weeks. These medicines can have lots of side effects like itchy eyes, feeling drowsy, having a dry mouth, constipation. These medicines are not available over the counter.

Analgesic Ladder:

Treatment of pain starts with usually the drugs that is likely to control pain and poses the least amount of risk. This is usually *paracetamol*. The degree of pain is not usually very severe when we are at the first step of the pain ladder. If pain is not well controlled with just their non-opioid pain medicine, we can add other medicines like a *non-steroidal anti-inflammatory* (*NSAIDS).* The next step on the ladder is to begin to add a mild of a weak opioid medicine to try of the control the pain. These can be used alongside other medications like paracetamol or NSAIDS. When these medications do not adequately control pain, we move on to the stronger opioid's medicines. These can also be used with other medications to better control pain that people experience.

My Medicines

Name of Medication	For which illness	Dosages	Number of times a day
e.g Paracetamol	*Pain*	*1 g*	*When need*

Week 6. Planning of the future
Decision Making

Decision Making

*

People with chronic pain have their emotions and decision-making skills impaired by the pain that they are feeling. All people are required to make decision towards living an active lifestyle and it requires active decisions toward a healthy lifestyle. Decision making is an active process that must be done actively to get to the correct decisions.

Steps to decision making:

1. First a person a person needs to **identify the decision to be made.** This is means that we that we need to look at what decisions we need to make. The decision that you need to make as someone with pain and chronic diseases is to make sure that you commit you living a healthy lifestyle. It could be about controlling your pain yourself. The decision can be about how we eat and other lifestyle changes. It is important that you clearly identify the decision you need to make, or you may make decisions that are not specific or clear. Meaning that no decision has been make at all.

2. **Gather information** that can help make a decision, and informed decision based on all the important information you need in order to know in order to make a decision. The information needs to be gathered from places and from people who can be trusted as worthy sources of information. A lot of people can offer different advice, but it isn't always reliable. People with professional training like Doctors, Nurses, Physiotherapists and Dietician are reliable sources of information that you can use to make decisions about one's health.

It also important to make sure that you gather enough information to be able to decide. If you are with a doctor or a nurse, make sure you feel that you have enough information to decide.

3. **Use the information** that have you gathered, and consider where the information you gather came from. Taking a decision require us to consider the good side or the bad side of taking a particular decision, or equally the good or the bad side of not making a particular decision. This must be applied to our use of medication, it must be applied to exercises and changing our way of living.

4. Then **Take Action** that is based on full information. The results of the decision that we take will allow us to see if the decision is indeed correct.

5. Then we need to **review the decision** and its outcome and then go through the decision-making cycle again based on the experience we now have. If the decision does not have the intended outcome, we can review it until we have the desired outcome. We will not get every decision correct, and it is therefore important we have clarity on the fact that we may need to often review our decisions.

Decision that we have taken in the past may need to be review based on what we see today. This means that the decision-making process can be applied on big decision and small everyday decisions. We cannot do things just because it was a decision we made in the past.

Continuing positive health behaviours

Reflection and plan for the future

The last six weeks have looked at a variety of discussion and included different types of exercises. Research has shown that people who put to practice the lessons that we have learned in the last six weeks that they can experience less pain and have fewer incidents of needing additional health care. Over the last 6 weeks we have learnt how to be part of the health care team that is responsible for your health. You can now live as a positive self-manager being able to set goals and make decisions which will also you to participate now fully in everyday activities. We have also learnt about how pain works, and how we can control the pain we experience. That we can also use additional measures like exercise to make sure we control the pain and that we also live healthier lives.

It’s important to consider that as this course comes to an end you can live your life. Having a chronic illness can cause us to worry about will happen if you fall sick, how you will manage your life and who will look after your family as you get sicker. These emotions and worries need to be managed in the future. It’s normal that you will encounter these worries in the future but it’s important that you cope well with those anxieties. We need to acknowledge that these six weeks cannot cover everything’s. We need to acknowledge that these six weeks are a start on a life long journey of self-management. Like with most thing in life we will have times where we are doing extremely well, and we will have moments where we are not doing as well as we would like to be doing. It’s then important that we be aware that we will keep trying and not give us when we find things challenging.

Planning for the future

Planning for the future is a similar process to making decisions. We need to be able to consider what it is that may cause us anxiety in the future. To be able to identify what we need to plan for in the future, we need to be vulnerable with ourselves. These possible future stressors can be financial, family, children, friends, and other things. We need to be able to be open and honest with ourselves as there may be things that we have been avoiding we may need to confront. What are the things you worry might happen to you in the future?

Once we have identified what it is may cause us anxiety, we also need to find ways in which we can manage those anxieties. We must find what we need to do to ensure that we manage the anxieties and to make sure we identify the people who can help us cope in the future.

We may need to consider how if these are personal stressors how we will be able to address then in the future. We may need to plan who are the people in our personal lives we may need to talk? And if we think it will be a good thing to talk to those people, as sometimes it might not be.

For other challenges we can rely on developmental organisations to help us deal with some of our anxieties. There are a variety of organisation that can help us cope with our challenge and plan for the future. The Treatment Action Campaign is an organisation that fight for the rights of patients with problems they face in the health system. The Family and Marriage Society of South Africa (FAMSA) and Department of Social Development (DSD) can also assist with social problems that we face. We can also have our spiritual being looked after at our local worship centres like churches. We can use all the institutions that exist to ensure our holistic wellbeing.

Who can help you in the family with the things you worry about?

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Which health care professionals can help you cope better should your illness become slightly worse? Which organisations do I need to help with my wellbeing and where can I find them?

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It is also important to understand that life is dynamic. Its means that we might need to remind ourselves of lessons that we have already learnt and learnt. We can use this booklet in the future to revisit lessons we learnt in the future. We must also realise that we need to be able to continue to learn and to make positive changes in the future.

What changes have I made to my life?

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What thing are still missing in life that need to be put in place?

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Contact Details

TAC
10th Floor
85 Main Street
Johannesburg
2001
Tel: 011 100 4721

Department of Social Development

Free State Devevlop Corperation Building
Setai Street
Phuthaditjhaba
9870
Tel: 058 7132995

Mofumahadi Manaop Mopeli Regional Hospital
Mampoi Road
Phuthaditjhaba
9870
Tel 058 718 3200

Elizabeth Ross District Hospital
Mota Road
Makong Village
9870
Tel 058 718 4000

Appendix L Exercise Programme Week 1 to Week 6

<table>
<tr><td colspan="6">WEEK 1</td></tr>
<tr><td colspan="6">Goals:
Introduction of types of exercise to patients
Increase physical activity
Facilitate task mastery in raise self-efficacy as related to exercise

Precaution
Recent vitals available
Attention to safety of the environment in which they are exercising
Awareness of the comorbidities of different participants

Logistical consideration

Organise area with chair and drinking water
Make Music available for exercise
Avail all necessary exercise equipment
Electronic BP Machine on hand
Heart rates before of exercises to be measured. Teach</td></tr>
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<tr><td>Functional come</td><td>Purpose of Exercise</td><td>Description</td><td>Frequency, Intensity and time</td><td>Biomechanical safety/Risk</td><td>Objective measure of progress</td></tr>
<tr><td>Warm</td><td>Dynamic warm up</td><td>Walking on the Spot</td><td>45seconds x 3</td><td></td><td></td></tr>
</table>

		High Knees on the stop	45second x 3	Participants are allowed to rest as needed	
		Shuttle walks	2.5m 5m 10m x 4		
	Stretching and warming of muscles	Neck rotation Left	3 x 10 sec hold	Participants are allowed to rest as needed Participants instructed to execute movement short of pain, they should feel a stretch not pain Patients that are unable to complete the movement in standing will be allow to they in sitting	Maintain range of motion in the Neck, Gleno-humeral join t Maintain range of motion and flexibility at hip and knee joints
		Neck rotation right	3 x 10 sec hold		
		Neck flexion	3 x 10 sec hold		
		Neck extension	3 x 10 sec hold		
		Should elevation anterior and posterior shoulder rolls	3x 10 repetitions		
		Posterior Deltoid stretch bilaterally	3 x 10 sec hold Pull arm across the body, provide overpressure with the opposite arm, should feel stretch at the back of the shoulder		
		Trunk rotations left and right	3 x 10 sec hold rotating as far as possible from left to right without allowing the hips to move		
		Standing Gastrocnemius stretch	3 x 10 sec hold		
		Standing/seated bilateral Hamstring stretch			

Water break 2 minutes					
Improved quality of life Improved endurance Improved functionality Increased self-efficacy	Muscle strengthening and cardiovascular exercise	Standing/seated Hip Flexion	10reps x 3sets	Participants are allowed to rest as necessary during exercises Patients can hold onto an object to ensure they complete the exercise with appropriate balance	Strengthen Muscles around the hip and knee joints
		Standing hip abduction	10reps x 3sets		
		Marching	Take to steps forwards and two steps back		
Water break 2 minutes					
Improved quality of life Improved endurance Improved functionality Increased self-efficacy		Step and punch: side Left and right, forward left and right	1min x 3	Participants are allowed to rest as necessary during exercises Patients can hold onto an object to ensure they complete the exercise with appropriate	
		Standing/seated calf raise	10reps x 3sets		
		Seated Knee extension	10reps x 3sets		
Cooldown	Flexibility Prevention of stiffness	Standing hamstring stretch bilaterally	3 x 10 second holds	Participants allowed to rest as needed	
	Gastrocnemius	Gastrocneumius stretch	3 x 10 second hold		
		Triceps stretch	3 x 10 second hold		

<table>
<tr><td></td><td></td><td>Posterior deltoid stretch</td><td>3 x 10 second hold</td><td></td><td></td></tr>
<tr><td colspan="6">Concluding group

Encourage use of exercise diary in workbook for the patients
Brief reflection on exercises done and how they felt.
Conclusion, and announcement for next week as necessary.</td></tr>
</table>

WEEK 2

Goals:

Introduction of types of exercise to patients
Increase physical activity
Facilitate task mastery in raise self-efficacy as related to exercise

Precaution

Recent vitals available
Attention to safety of the environment in which they are exercising

Awareness of the comorbidities of different participants

Logistical consideration

Organise area with chair and drinking water
Make Music available for exercise
Avail all necessary exercise equipment
Electronic BP Machine on hand
Heart rates before of exercises to be measured. Teach

Functional come	**Purpose of Exercise**	**Description**	**Frequency, Intensity and time**	**Biomechanical safety/Risk**	**Objective measure of progress**
Warm	Dynamic warm up	Walking on the Spot	45seconds x 3	Participants are allowed to rest as needed	Maintain range of motion in the Neck, Gleno-humeral join t Maintain range of motion and flexibility at hip and knee joints
		High Knees on the stop	45second x 3		
		Shuttle walks	2.5m 5m 10m x 4		
General mobility and increased flexibility	Stretching and warming of muscles	Neck rotation Left	3 x 10 sec hold	Participants are allowed to rest as needed Participants instructed to execute movement short of pain, they	
		Neck rotation right	3 x 10 sec hold		
		Neck flexion	3 x 10 sec hold		
		Neck extension	3 x 10 sec hold		
		Should elevation anterior and posterior shoulder rolls	3x 10 repetitions		

		Posterior Deltoid stretch bilaterally	3 x 10 sec hold Pull arm across the body, provide overpressure with the opposite arm, should feel stretch at the back of the shoulder	should feel a stretch not pain Patients that are unable to complete the movement in standing will be allow to they in sitting	
		Trunk rotations left and right	3 x 10 sec hold rotating as far as possible from left to right without allowing the hips to move		
		Standing Gastrocnemius stretch	3 x 10 sec hold		
		Standing/seated bilateral Hamstring stretch			
Water break 2 minutes					
Improved quality of life Improved endurance Improved functionality Increased self-efficacy	Muscle strengthening and cardiovascular exercise	Standing/seated Hip Flexion	10reps x 3sets	Participants are allowed to rest as necessary during exercises Patients can hold onto an object to ensure they complete the exercise with appropriate balance	Strengthen Muscles around the hip and knee joints
		Standing hip abduction	10reps x 3sets		
		Marching	Take to steps forwards and two steps back		
Water break 2 minutes					

Improved quality of life Improved endurance Improved functionality Increased self-efficacy		Step and punch: side Left and right, forward left and right	1min x 3	Participants are allowed to rest as necessary during exercises Patients can hold onto an object to ensure they complete the exercise with appropriate	
		Standing/seated calf raise	10reps x 3sets		
		Seated Knee extension	10reps x 3sets		
Cooldown	Flexibility Prevention of stiffnesss	Standing hamstring stretch bilaterally	3 x 10 second holds	Participants allowed to rest as needed	
	Gastrocnemius	Gastrocneumius stretch	3 x 10 second hold		
		Triceps stretch	3 x 10 second hold		
		Posterior deltoid stretch	3 x 10 second hold		
Concluding group Encourage use of exercise diary in workbook for the patients Brief reflection on exercises done and how they felt. Conclusion, and announcement for next week as necessary.					

WEEK 3

Goals:

Introduction of types of exercise to patients

Increase physical activity

Facilitate task mastery in raise self-efficacy as related to exercise

Precaution

Recent vitals available

Attention to safety of the environment in which they are exercising

Awareness of the comorbidities of different participants

Logistical consideration

Organise area with chair and drinking water

Make Music available for exercise

Avail all necessary exercise equipment

Electronic BP Machine on hand

Heart rates before of exercises to be measured. Teach

Functional come	**Purpose of Exercise**	**Description**	**Frequency, Intensity and time**	**Biomechanical safety/Risk**	**Objective measure of progress**
Warm	Dynamic warm up	Walking on the Spot	60 seconds x 3	Participants are allowed to rest as needed	
		High Knees on the stop	60 second x 3		

		Shuttle walks	2.5m 5m 10m x 4		
General mobility and increased flexibility	Stretching and warming of muscles	Neck rotation Left	3 x 10 sec hold	Participants are allowed to rest as needed Participants instructed to execute movement short of pain, they should feel a stretch not pain Patients that are unable to complete the movement in standing will be allow to they in sitting	Maintain range of motion in the Neck, Gleno-humeral join t Maintain range of motion and flexibility at hip and knee joints
		Neck rotation right	3 x 10 sec hold		
		Neck flexion	3 x 10 sec hold		
		Neck extension	3 x 10 sec hold		
		Should elevation anterior and posterior shoulder rolls	3x 10 repetitions		
		Posterior Deltoid stretch bilaterally	3 x 10 sec hold Pull arm across the body, provide overpressure with the opposite arm, should feel stretch at the back of the shoulder		
		Trunk rotations left and right	3 x 10 sec hold rotating as far as possible from left to right without allowing the hips to move		
		Standing Gastrocnemius stretch	3 x 10 sec hold		
		Standing/seated bilateral Hamstring stretch			
Water break 2 minutes					
Improved quality of life		Standing/seated Hip Flexion	15reps x 3sets	Participants are allowed to rest as	

Improved endurance Improved functionality Increased self-efficacy	Muscle strengthening and cardiovascular exercise	Standing hip abduction	15reps x 3sets	necessary during exercises Patients can hold onto an object to ensure they complete the exercise with appropriate balance	Strengthen Muscles around the hip and knee joints Increase number of repetition or sets in order to increase strength
		Marching	Take to steps forwards and two steps back		
Water break 2 minutes					
Improved quality of life Improved endurance Improved functionality Increased self-efficacy		Step and punch: side Left and right, forward left and right	90 seconds x 3	Participants are allowed to rest as necessary during exercises Patients can hold onto an object to ensure they complete the exercise with appropriate	
		Standing/seated calf raise	15reps x 3sets		
		Seated Knee extension	15reps x 3sets		
Cooldown	Flexibility Prevention of stiffness	Standing hamstring stretch bilaterally	3 x 10 second holds	Participants allowed to rest as needed	
	Gastrocnemius	Gastrocneumius stretch	3 x 10 second hold		
		Triceps stretch	3 x 10 second hold		
		Posterior deltoid stretch	3 x 10 second hold		
Concluding group					

Encourage use of exercise diary in workbook for the patients
Brief reflection on exercises done and how they felt.
Conclusion, and announcement for next week as necessary.

WEEK 4

Goals:
Introduction of types of exercise to patients
Increase physical activity
Facilitate task mastery in raise self-efficacy as related to exercise

Precaution
Recent vitals available
Attention to safety of the environment in which they are exercising
Awareness of the comorbidities of different participants

Logistical consideration

Organise area with chair and drinking water
Make Music available for exercise
Avail all necessary exercise equipment
Electronic BP Machine on hand
Heart rates before of exercises to be measured. Teach

Functional come	**Purpose of Exercise**	**Description**	**Frequency, Intensity and time**	**Biomechanical safety/Risk**	**Objective measure of progress**
Warm	Dynamic warm up	Walking on the Spot	60 seconds x 3	Participants are allowed to rest as needed	
		High Knees on the stop	60 second x 3		
		Shuttle walks	2.5m 5m 10m x 4		
General mobility and increased flexibility	Stretching and warming of muscles	Neck rotation Left	3 x 10 sec hold	Participants are allowed to rest as needed Participants instructed to execute movement short of pain, they should feel a stretch not pain Patients that are unable to complete the	Maintain range of motion in the Neck, Gleno-humeral join t Maintain range of motion and flexibility at hip and knee joints
		Neck rotation right	3 x 10 sec hold		
		Neck flexion	3 x 10 sec hold		
		Neck extension	3 x 10 sec hold		
		Should elevation anterior and posterior shoulder rolls	3x 10 repetitions		
		Posterior Deltoid stretch bilaterally	3 x 10 sec hold Pull arm across the body, provide overpressure with the opposite arm, should		

			feel stretch at the back of the shoulder	movement in standing will be allow to they in sitting	
		Trunk rotations left and right	3 x 10 sec hold rotating as far as possible from left to right without allowing the hips to move		
		Standing Gastrocnemius stretch	3 x 10 sec hold		
		Standing/seated bilateral Hamstring stretch			
Water break 2 minutes					
Improved quality of life Improved endurance Improved functionality Increased self-efficacy	Muscle strengthening and cardiovascular exercise	Standing/seated Hip Flexion	15reps x 4sets	Participants are allowed to rest as necessary during exercises Patients can hold onto an object to ensure they complete the exercise with appropriate balance	Strengthen Muscles around the hip and knee joints Increase number of repetition or sets in order to increase strength
		Standing hip abduction	15reps x 4sets		
		Marching	Take to steps forwards and two steps back		
Water break 2 minutes					
Improved quality of life Improved endurance		Step and punch: side Left and right, forward left and right	90 seconds x 3	Participants are allowed to rest as necessary during exercises	
		Standing calf raise	15reps x 4 sets		
		Mini squats	10reps x 3Sets		

Improved functionality Increased self-efficacy				Patients can hold onto an object to ensure they complete the exercise with appropriate	
Cooldown	Flexibility Prevention of stiffness	Standing hamstring stretch bilaterally	3 x 10 second holds	Participants allowed to rest as needed	
	Gastrocnemius	Gastrocneumius stretch	3 x 10 second hold		
		Triceps stretch	3 x 10 second hold		
		Posterior deltoid stretch	3 x 10 second hold		
Concluding group Encourage use of exercise diary in workbook for the patients Brief reflection on exercises done and how they felt. Conclusion, and announcement for next week as necessary.					

WEEK 5

Goals:
Introduction of types of exercise to patients
Increase physical activity
Facilitate task mastery in raise self-efficacy as related to exercise

Precaution
Recent vitals available
Attention to safety of the environment in which they are exercising
Awareness of the comorbidities of different participants

Logistical consideration

Organise area with chair and drinking water
Make Music available for exercise
Avail all necessary exercise equipment
Electronic BP Machine on hand
Heart rates before of exercises to be measured. Teach

Functional come	**Purpose of Exercise**	**Description**	**Frequency, Intensity and time**	**Biomechanical safety/Risk**	**Objective measure of progress**
Warm	Dynamic warm up	Walking on the Spot	60 seconds x 3		
		High Knees on the stop	60 second x 3		

				Participants are allowed to rest as needed	
		Shuttle walks	2.5m 5m 10m x 4		
General mobility and increased flexibility	Stretching and warming of muscles	Neck rotation Left	3 x 10 sec hold	Participants are allowed to rest as needed Participants instructed to execute movement short of pain, they should feel a stretch not pain Patients that are unable to complete the movement in standing will be allow to they in sitting	Maintain range of motion in the Neck, Gleno-humeral join t Maintain range of motion and flexibility at hip and knee joints
		Neck rotation right	3 x 10 sec hold		
		Neck flexion	3 x 10 sec hold		
		Neck extension	3 x 10 sec hold		
		Should elevation anterior and posterior shoulder rolls	3x 10 repetitions		
		Posterior Deltoid stretch bilaterally	3 x 10 sec hold Pull arm across the body, provide overpressure with the opposite arm, should feel stretch at the back of the shoulder		
		Trunk rotations left and right	3 x 10 sec hold rotating as far as possible from left to right without allowing the hips to move		
		Standing Gastrocnemius stretch	3 x 10 sec hold		
		Standing/seated bilateral Hamstring stretch			

Water break 2 minutes					
Improved quality of life Improved endurance Improved functionality Increased self-efficacy	Muscle strengthening and cardiovascular exercise	Standing/seated Hip Flexion	15reps x 4sets	Participants are allowed to rest as necessary during exercises Patients can hold onto an object to ensure they complete the exercise with appropriate balance	Strengthen Muscles around the hip and knee joints Increase reetitions of exercise and also include closed chain exercise to increase load.
		Standing hip abduction	20reps x 4sets		
		Marching	Take to steps forwards and two steps back		
Water break 2 minutes					
Improved quality of life Improved endurance Improved functionality Increased self-efficacy		Step and punch: side Left and right, forward left and right	90 seconds x 3	Participants are allowed to rest as necessary during exercises Patients can hold onto an object to ensure they complete the exercise with appropriate	
		Standing calf raise	15reps x 4 sets		
		squats	10reps x 3Sets		
Cooldown	Flexibility Prevention of stiffness	Standing hamstring stretch bilaterally	3 x 10 second holds	Participants allowed to rest as needed	
	Gastrocnemius	Gastrocneumius stretch	3 x 10 second hold		
		Triceps stretch	3 x 10 second hold		

		Posterior deltoid stretch	3 x 10 second hold		

Concluding group

Encourage use of exercise diary in workbook for the patients
Brief reflection on exercises done and how they felt.
Conclusion, and announcement for next week as necessary.

WEEK 6

Goals:
Introduction of types of exercise to patients
Increase physical activity
Facilitate task mastery in raise self-efficacy as related to exercise

Precaution
Recent vitals available

Attention to safety of the environment in which they are exercising
Awareness of the comorbidities of different participants

Logistical consideration

Organise area with chair and drinking water
Make Music available for exercise
Avail all necessary exercise equipment
Electronic BP Machine on hand
Heart rates before of exercises to be measured. Teach

Functional come	**Purpose of Exercise**	**Description**	**Frequency, Intensity and time**	**Biomechanical safety/Risk**	**Objective measure of progress**
Warm	Dynamic warm up	Walking on the Spot	60 seconds x 3	Participants are allowed to rest as needed	
		High Knees on the stop	60 second x 3		
		Shuttle walks	2.5m 5m 10m x 4		
General mobility and increased flexibility	Stretching and warming of muscles	Neck rotation Left	3 x 10 sec hold	Participants are allowed to rest as needed Participants instructed to execute movement short of pain, they should feel a stretch not pain	Maintain range of motion in the Neck, Gleno-humeral join t Maintain range of motion and flexibility at hip and knee joints
		Neck rotation right	3 x 10 sec hold		
		Neck flexion	3 x 10 sec hold		
		Neck extension	3 x 10 sec hold		
		Should elevation anterior and posterior shoulder rolls	3x 10 repetitions		
		Posterior Deltoid stretch bilaterally	3 x 10 sec hold		

			Pull arm across the body, provide overpressure with the opposite arm, should feel stretch at the back of the shoulder	Patients that are unable to complete the movement in standing will be allow to they in sitting	
		Trunk rotations left and right	3 x 10 sec hold rotating as far as possible from left to right without allowing the hips to move		
		Standing Gastrocnemius stretch	3 x 10 sec hold		
		Standing/seated bilateral Hamstring stretch			
Water break 2 minutes					
Improved quality of life Improved endurance Improved functionality Increased self-efficacy	Muscle strengthening and cardiovascular exercise	Standing/seated Hip Flexion	15reps x 4sets	Participants are allowed to rest as necessary during exercises Patients can hold onto an object to ensure they complete the exercise with appropriate balance	Strengthen Muscles around the hip and knee joints Progress closed chain exercises to increase load
		Standing hip abduction	20reps x 4sets		
		Marching	Take to steps forwards and two steps back		
Water break 2 minutes					

Improved quality of life Improved endurance Improved functionality Increased self-efficacy		Step and punch: side Left and right, forward left and right	90 seconds x 3	Participants are allowed to rest as necessary during exercises Patients can hold onto an object to ensure they complete the exercise with appropriate	
		Standing calf raise	15reps x 4 sets		
		squats	10reps x 3Sets		
Cooldown	Flexibility Prevention of stiffness	Standing hamstring stretch bilaterally	3 x 10 second holds	Participants allowed to rest as needed	
	Gastrocnemius	Gastrocneumius stretch	3 x 10 second hold		
		Triceps stretch	3 x 10 second hold		
		Posterior deltoid stretch	3 x 10 second hold		
Concluding group Conclude Exercise session Discuss continuation of exercises beyond the Rehabilitation programme Discuss follow measurement session.					

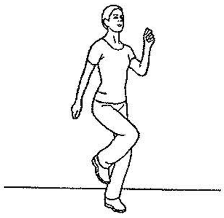
Appendix M Exercise Pamphlet

Personal exercise program

Six Week Education and exercise programme

Malebo Physiotherapists
Malebo Physiotherapists

Provided by Kopano Malebo
Provided for Study Participants
Training start date 8/12/2019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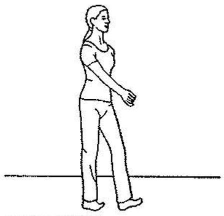
Stand.

Jog in place for 10-30 min.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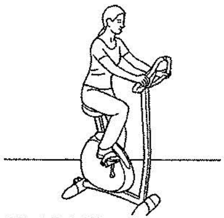
Stand.

Walk 10- 30 min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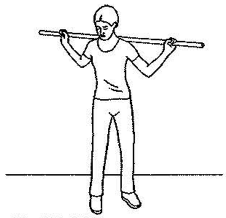
Cycling.

Time: ______

Weight load: ______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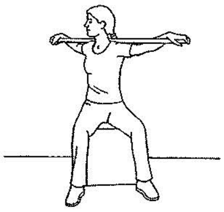
Standing with hips and knees bent. Hold a stick behind your neck as shown.

Twist your upper trunk keeping the pelvis still. The movement should be small and quick.

Repeat ______ times.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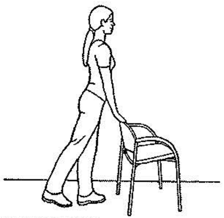
Sit on a chair with your legs apart and feet firmly on the floor. Hold a stick behind your neck as shown in the picture.

Twist your upper trunk from side to side. Let your head follow the movement.

Repeat _______ times.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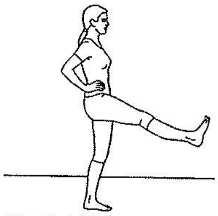
Stand straight holding on to a chair.

Bring your leg backwards keeping your knee straight. Do not lean forwards.

Repeat __8__ times.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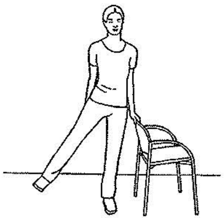
Stand straight.

Lift one leg with your knee straight.

Repeat _______ times.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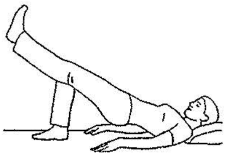
Stand straight holding on to a support.

Lift your leg sideways and bring it back keeping your trunk straight throughout the exercise.

Repeat _______ times.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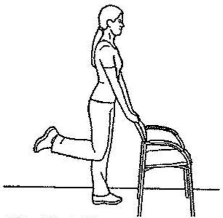
Lying on your back with knees bent.

Lift your hip up and keep it straight while shifting the weight over to one leg. Then straighten the other leg - put it back down and repeat with other leg.

Repeat _______ times.



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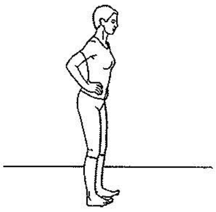
Stand. Hold onto a support and bring one leg slightly backwards.

Bend your knee and lift your foot off the floor.
Repeat _______ times.



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Transfer your weight from your toes to your heels.

Repeat _______ times.