IDENTIFICATION OF COMPONENTS OF A COMPREHENSIVE DISABILITY REHABILITATIVE PROGRAMME FOR ADULT PEOPLE LIVING WITH HIV: A SCOPING REVIEW

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the requirements for the Degree of Master of Science in Physiotherapy (Community).

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DECLARATION

I, Sithembile Precious Moalosi, hereby declare that the work presented in this research report is mine. It is being submitted to the University of the Witwatersrand, South Africa in partial fulfillment of the degree of Master of Science in Physiotherapy (Community). This research report has not been submitted before for any degree or examination at any other university.

…… ……

(Signature of candidate) Date

ABSTRACT

Background: Currently, over seven million South Africans live with HIV. Although antiretroviral therapy has increased the life expectancy of people living with HIV, there is growing evidence of HIV-associated disability contributing to morbidity in this population. Several studies have been undertaken to describe HIV-related disabilities and the rehabilitative interventions in respect thereof. However, there is no comprehensive management programme for HIV-related disability. The purpose of this scoping study is to identify components of a comprehensive disability management programme for people living with HIV.

Method: This study is a scoping review following the Joanna Briggs Institute's Scoping Reviews Manual. A systematic search for literature was done on the Public Medline and the Cumulative Index to Nursing and Allied Health Literature databases. The studies sought had been conducted in multiple settings worldwide on adult people living with HIV. The methodological quality assessments had been done using relevant tools.

Results: A total of 27 peer-reviewed studies met the inclusion criteria. A review of the literature showed how the impairments are linked to activity limitation and participation restrictions, and these aspects influence the manner in which rehabilitation should be undertaken. Interventions for the identified HIV-related disabilities included exercise training and massage therapy. These interventions improved muscle strength, quality of life, cardiorespiratory fitness, body composition, metabolic profile, and psychological outcomes.

Conclusion: This scoping review highlights the HIV-related disability and interventions thereof. The study showed how the respective impairments are linked to activity limitations and participation restrictions and their influence on the manner in which rehabilitation should be undertaken. Rehabilitative interventions are safe and recommended as part of routine HIV care.

Keywords: HIV-related disability, rehabilitation, interventions, PLWHIV

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LIST OF ABBREVIATIONS

ART	-Anti-retroviral therapy
CINAHL	-Cumulative Index to Nursing and Allied Health Literature
CBR	-Community-based Rehabilitation
CVD	-Cardiovascular disease
CONSORT	-Consolidated Standards of Reporting Trials
HBR	-Home-based Rehabilitation
HAART	-Highly Active Anti-retroviral Therapy
HIV	-Human Immunodeficiency Virus
ICF	-International Classification of Functioning, Disability and Health Framework
UNAIDS	-United Nations Program for AIDS
PLWHIV	-People living with HIV
PRE	-Progressive resistance exercise
PRISMA	-The Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PubMed	-Public Medline
QOL	-Quality of life
HR-QOL	-Health-related quality of life
RCT/RCTs	- Randomised Control Trial(s)
STROBE	- Strengthening the Reporting of Observational Studies
WHO	- World Health Organisation

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Since this condition was identified in 1981, HIV/ AIDS has had a devastating impact in Africa (Sharp *et al,* 2011). In 2015, Africa recorded the world's highest number of deaths related to HIV/AIDS (WHO,2015). There are over 36.9 million people globally living with HIV/AIDS, a figure that has been increasing steadily over the years (UNAIDS, 2017, 2018). The Eastern and Southern regions in Africa have the largest populations living with HIV worldwide, with 19% (n= 7.52 million) estimated to be living in South Africa (UNAIDS, 2017). In South Africa, the number of recorded AIDS-related deaths was 293 166 in 2006. They steadily declined to 115 167 by the year 2018 owing to the highly potent and well-tolerated antiretroviral therapy (Statistics South Africa, 2018, Vella *et al.* 2012).

Global and local initiatives have promoted the uptake of antiretroviral therapy (ART), to manage HIV and to reduce HIV-related mortalities and morbidities (Bendavid *et al.* 2012). Thus, HIV is now classified as a manageable chronic disease requiring a shift in health care management approach from being a purely medical issue to being a rehabilitation concern (Hillier *et al*. 2010). The shift to promote access to rehabilitation to minimise morbidity is now backed by the National Strategic Plan on HIV, STIs, and TB, 2017–2020. The aim is to **"**reduce morbidity by providing HIV, TB and STI treatment, care and adherence support for all" (Hopkins, Doherty and Gray, 2018).

Disability is an umbrella term for the interaction between impairments in body functions and structure, activity limitation (affecting the person's ability to perform tasks or actions), and participation restrictions influenced by personal and environmental factors (WHO, 2002). There is compelling evidence that PLWHIV experience varying degrees of impairments (pain, depression), activity limitation (walking, washing oneself) and participation restrictions (ability to work, maintain relationships) (Hanass-Hancock *et al*. 2015; Hanass-Hancock *et al*. 2013; van As *et al.* 2009).

In a study by Myezwa *et al,* (2009) 70% participants had HIV-related disabilities. Subsequent studies have shown HIV-related disability is prevalent among PLWHIV (Hanass-Hancock *et al*. 2014; Hanass-Hancock *et al*. 2013; Myezwa *et al*. 2011; Nixon *et al.* 2011; Hanass-Hancock *et al.* 2009). Although there is growing evidence of disabilities experienced by PLWHIV, rehabilitation intervention has not been given enough attention. The rehabilitation of a person with HIV-related disability has been highlighted as a means of increasing longevity (Nixon *et al*. 2011).

Rehabilitation is "a set of measures that assist individuals who experience, or are likely to experience, disability to achieve and maintain optimum functioning in interaction with their environments"(WHO, 2011 page 96). A proactive response in leading rehabilitation programmes for PLWHIV (Cobbing *et al*, 2013; Myezwa *et al*, 2009), requires that rehabilitation personnel are equipped with updated evidence-based rehabilitative strategies. However, this cannot be fully met by the current physiotherapy training curriculum in South Africa as it lacks adequate teaching on HIV management (Myezwa *et al.* 2013).

There are different interventions that have been investigated in the management of HIV which include exercise training (O'Brien *et al*. 2016; Mkandla *et al,* 2012; O'Brien *et al*, 2010; O'Brien *et al*, 2009; Mutimura *et al,* 2008), massage therapy (Hillier *et al,* 2010) and home-based rehabilitation programmes (Cobbing *et al,* 2016; Roos *et al*, 2015; Roos *et al*, 2014). However, there is no study that has mapped evidence on the management of HIV-related disability and there is no clarity on the components of the comprehensive rehabilitative programme to address HIV-related disabilities. As PLWHIV continue to live longer, it is vital that we work towards health, wellness, functionality, participation and quality of life.

1.2 PROBLEM STATEMENT

Progress in the medical management of HIV disease has been successful in improving the life expectancy of PLWHIV. However, disability in PLWHIV remains highly prevalent (Cobbing *et al.* 2017; Myezwa *et al*. 2016; Hanass-Hancock *et al*. 2014; Hanass-Hancock *et al*. 2013; Myezwa *et al*. 2011; Nixon *et al.* 2011; Hanass-Hancock *et al.* 2009). Despite evidence of disability among PLWHIV, not a lot of attention has been given to this area in terms of screening, prevention,and management. Even though there are studies reporting interventions for HIV-related

disability, a comprehensive rehabilitative programme that addresses HIV-related disability is not available. Thus, a methodical review of the literature on HIV/AIDS disability and rehabilitative interventions had to be conducted to identify components of a comprehensive disability rehabilitative programme that will potentially contribute to improved quality of life amongst PLWHIV.

1.3 RESEARCH QUESTION

What are the components of a comprehensive management programme for PLWHIV with disabilities?

1.4 AIM OF THE STUDY

To identify the components of a comprehensive disability management programme for PLWHIV.

1.4 OBJECTIVES OF THE STUDY

I) To describe HIV-related disability.

II) To identify rehabilitative interventions for HIV-related disability.

1.5 SIGNIFICANCE OF THE STUDY

This scoping review described HIV-related disability and mapped out the interventions that have been used to manage the disabilities. The identified components can be used to develop a comprehensive disability management programme for PLWHIV. Knowledge of the disabilities and existing interventions have the potential to reduce HIV-related disability and contribute to improved quality of life amongst PLWHIV. Furthermore, the results of this study have the potential to empower rehabilitation experts and personnel with appropriate intervention strategies. These intervention strategies can be used as a tool to advocate for rehabilitation services to be offered at all levels of care, thus improving access to rehabilitation for PLWHIV. Thus, gaps in the literature on HIV rehabilitation were identified in this study and form the basis for further research on rehabilitative interventions for PLWHIV.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews the literature pertaining to the course of HIV infection. Furthermore, this chapter also reviews the prevalence of HIV globally and in South Africa, antiretrovirals and their side effects, HIV-related disability, the impact of HIV on the quality of life, and rehabilitation. Narrative analysis and different appraisal methods relevant to this scoping review are also discussed.

The following keywords were used to search for literature on the Public Medline Database and Google Scholar: “HIV/AIDS management”, “antiretrovirals”, “HIV/AIDS prevalence”, “HIV/AIDS disability”.

2.2 HIV/AIDS PREVALENCE

In 2017, the United Nations Program for AIDS (UNAIDS) estimated that 36.9 million people globally were living with HIV/AIDS with a majority (35.1 million) being adults (UNAIDS, 2018). The largest number of PLWHIV were from the Eastern and Southern African regions (53 %, 19.6 million),followed by 16% (6.1 million) in Western and Central Africa, 14% (5.2 million) in Asia and the Pacific, and 6% (2.2 million) in Western and Central Europe and North America (UNAIDS, 2018).

In South Africa, the mid-year population estimates for 2018 showed about 7.52 million people were living with HIV (PLWHIV) with an overall prevalence of 13.1% (Statistics South Africa, 2018). The number of PLWHIV has been increasing steadily since the initial estimates of 4.25 million reported in 2002 (Statistics South Africa, 2018). Therefore, HIV should be seen in the same light as other chronic diseases that require long-term management strategies.

2.3 HIV MANAGEMENT

The current HIV management is mainly centred on anti-retroviral therapy (ART), a combination of drugs from different classes that restrain the HIV from replicating and mutating (Vella *et al,* 2012). Globally, an estimated 21.7 million PLWHIV were on ART in 2017 (UNAIDS, 2018), a considerable increase compared to the estimated 17 million in 2015 and 19,5 million in 2016 (Kanters *et al,* 2016; UNAIDS, 2017). In South Africa, about 4,4 million people of the 7.52 million estimated to be living with HIV are on ART programmes (UNAIDS, 2018). This shows that there is still a large percentage of PLWHIV not receiving ART. This is a matter for concern considering the global and national HIV strategies (Hopkins *et al.* 2018; UNAIDS 2014).

Global HIV/AIDS treatment targets include the UNAIDS 90-90-90 aimed at monitoring progress and ultimately ending the HIV epidemic by 2030 (UNAIDS, 2014). The targets require that the member countries achieve the following by the year 2020; 90% of all PLWHIV know their status; 90% of people diagnosed with HIV receive ART; and 90% of people on treatment will have suppressed viral loads(UNAIDS, 2014). In 2017, globally about 75% of PLWHIV knew their HIV status. Of those, 79% were on treatment and 81% of those on treatment were virally suppressed (UNAIDS, 2018). The UNAIDS (2018) data indicated that 90% of the population in South Africa was aware of their HIV status, 68% of whom were on ART and 78% of those on ART were virally suppressed. A household-based community survey revealed that 76.4% of the population knew their status, 70% of those who knew their status were on ART and 93% of those on ART were virally suppressed (Huerga *et al,* 2018). Recent literature advocates for the inclusion of the fourth target (100% of the services link chronic care to rehabilitation where needed) which will ensure integration of rehabilitation services and knowledge to strengthen chronic care and also deal with the long-term effects of HIV (Hanass-Hancock *et al.* 2016). Although great improvements have been made in ensuring that people get tested for HIV and know their status, more needs to be done to ensure that PLWHIV are managed holistically, as should be the case with any chronic condition.

In September 2016, South Africa launched a campaign for universal access to ART (Pillay, 2016), which meant that every person diagnosed with HIV would receive treatment at the point of diagnosis - a phenomenon known as “Universal Test and Treat” (WHO, 2015, Hayes *et al.* 2011). In addition to the proliferation of HAART, South Africa engaged in HIV prevention strategies such as voluntary medical male circumcision, the distribution of condoms, the prevention of mother-to-child transmission and the provision of antiretrovirals for pre-exposure prophylaxis (Hopkins *et al.* 2018; Vella *et al*. 2012). The focus of the third objective in the National Strategic Plan for HIV, STI, and TB 2017- 2022 is on ensuring that nobody is left behind however specific directions for rehabilitation has not been given.

The use of ART commenced in 1996 as highly active antiretroviral therapy (HAART) (Hanass-Hancock *et al,* 2009). HAART consisted of two drugs known as non-nucleoside reverse transcriptase inhibitors plus protease inhibitors (Tseng *et al.* 2015). These drugs suppressed the virology levels resulting in reduced morbidity and mortality (Tseng *et al.* 2015). Within a period of two years of ART initiation, studies emerged showing a rise in adverse effects and drug resistance (Khan *et al*, 2014; Vella *et al.* 2012; Hanass-Hancock *et al,* 2009). About 80% of those people initiated on ART experienced short-term or long-term side effects, varying from drug to drug and from person to person (Khan *et al.* 2014). The commonly reported side effects included peripheral neuropathy, anaemia, dyslipidemia, lipodystrophy, rashes, nightmares, headache and fatigue (Khan *et al.* 2014). In addition to the side effects, ART had other challenges such as toxicity, high pill burdens and frequent dosing which lowered treatment adherence (Tseng *et al.* 2015; Buscher *et al.* 2012). However, Recent ART regimens consist of a fixed-dose of combination pills taken once daily (Buscher *et al.* 2012).

There is growing evidence that the side effects of the medication could be a primer for the development of disabilities (Banks *et al.* 2017; Ortiz, 2014, Hanass-Hancock *et al.* 2009; O’Brien *et al.* 2009; Nixon *et al.* 2005). Pappin *et al,* (2012) found that patients with severe side effects reported more symptoms of anxiety compared to those without side effects, thus contributing to poor adherence or treatment failures

(van Egeraat *et al,* 2015; Brinkhof *et al,* 2009). Although ART is used to manage PLWHIV, the management of side effects arising from the administering of ART should be considered in routine HIV care.

The focus in the HIV management regime is managing the disease progression with ART which leaves out the long-term effects of being on ART and the sequelae of living with a chronic disease (Cobbing *et al.* 2016; Hanass-Hancock *et al.* 2015; Hanass-Hancock *et al.* 2013; Hanass-Hancock and Nixon 2009). HIV management follows a largely biomedical model of care and does not take into account the contextual factors which play an important role in alleviating or exacerbating the experience of living with a chronic disease (O'Brien *et al.* 2009). For an example, stigma is associated with poor treatment adherence (Moradi *et al*. 2014; O'Brien *et al.* 2009). The re-conceptualisation of HIV management is necessary to ensurethat all aspects of living with a chronic condition such as HIV are addressed (Hanass-Hancock *et al.* 2015). HIV as a chronic health condition should be approached and managed by a chronic care model, which should aim to control symptoms, promote health and prevent disability, with patient self-management at the centre of the care (Alebel and Wagnew, 2017).

2.4 IMPACT OF HIV ON QUALITY OF LIFE

HIV has a negative effect on the quality of life (QoL) (Miners *et al.* 2014). QoL is defined as an "individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns" (O'Connell *et al.* 2003). In PLWHIV, QoL is determined by the level of education, income, family support, HIV serostatus, and age (Odili *et al.* 2011). Research suggests PLWHIV generally have a low QoL (Miners *et al.* 2014; Basavaraj *et al.* 2010). The health-related quality of life (HR-QoL) looks at life in relation to health and includes domains related to the physical, psychological, level of independence, social, environmental and spiritual (Basavaraj *et al.* 2010).

Miners *et al,* (2014) compared HR-QoL in PLWHIV on ART and that of the general population. They found that PLWHIV on ART had significantly lower HR-QoL than

the general population. Another study that looked at HR-QoL in PLWHIV found that HIV affected six major domains of HR-QoL, with the lowest scores reported in the social domain (Basavaraj *et al.* 2010). Although ART is given to improve QoL, evidence shows that the QoL is poor among PLWHIV compared to the general population (Miners *et al.* 2014). This is an indication that ART is not sufficient to address QoL, more needs to be done in terms of managing challenges encountered by PLWHIV.

2.5 HIV- RELATED DISABILITY

The chronic nature of living with HIV has been linked with the development of disability. HIV-related disability is defined as episodic or permanent disabling effects that result primarily from being infected with the disease, co-morbid disease or secondary to the side effects of ART (Banks *et al.* 2015; Hanass-Hancock *et al.* 2009; O'Brien *et al.* 2008). The Episodic Disability Framework, developed from the perspective of PLWHIV,describes HIV-related disability as multidimensional and characterised by periods of wellness and illness (O'Brien *et al.* 2009; 2008). This definition is in line with the International Classification Framework for disability and functioning (ICF), which defines disability as impairments (e.g. depression, muscle weakness), activity limitations (e.g. walking, washing) and participation restrictions (e.g. employment, relationships) (WHO, 2001). It provides a broad overview of the health condition in relation to the impairments, activity limitation and participation restrictions influenced by contextual factors (Hanass-Hancock *et al*. 2013).The ICF views disability from a bio-psychosocial approach and has been used in PLWHIV to highlight disability at different domains that contribute to health and disability (Myezwa *et al.* 2011; Hanass-Hancock and Nixon, 2009; van As *et al*. 2009). Thus, using the ICF conceptualises the different aspects of disability well. In this study, the ICF concept was used to outline HIV-related disability.

HIV-related disability is highly prevalent among PLWHIV (Hanass-Hancock *et al.* 2014; Hanass-Hancock *et al.* 2013; Myezwa *et al*. 2011; Nixon *et al.* 2011; Hanass-Hancock and Nixon, 2009; Gaidhane *et al.* 2008; Zonta *et al.* 2005; Rusch *et al.* 2004). In order to establish HIV-related disability Rusch *et al,* (2004) used a checklist for participants to identify the impairments, activity limitations and participation

restrictions experienced. This was the first study to report HIV-related disability using the ICF. Previous studies had reported HIV-related disability in relation to the adverse effects that developed as a consequent of ART (Hanass-Hancock *et al.* 2009). Rusch *et al.* (2004) demonstrated a prevalence of impairments was over 90%, activity limitations, 80.4%, and participation restrictions, 93.2% in Canada (Rusch *et al.* 2004). Zonta *et al.* (2005) evaluated HIV-related disability in Brazil and the prevalence of HIV-related disability as 85%. Anandan *et al.* (2006) assessed impairments and function among PLWHIV in Chicago. Their findings showed that 84% suffered from fatigue, 78% from fear/worries, 75% had difficulty in concentrating, 69% had muscle aches, 66% depression and 35% had activity limitations (Anandan *et al*. 2006). These results were obtained from some of the earlier studies evaluating HIV-related disability that were done globally.

In South Africa, Myezwa *et al,* (2009) used the ICF framework to assess PLWHIV admitted at a Johannesburg hospital. The findings showed that 100% of the participants had impairments. On average, there were 11 impairments per person. Peltzer and Phaswana-Mafuya, (2008) assessed the HIV symptoms in 607 PLWHIV in the Eastern Cape. The findings showed that participants experienced a mean of 26 symptoms, the pain symptom was the most prevalent, followed by fever, thirst, fatigue, and weakness. Narasimooloo *et al.* (2011) found that the prevalence of pain symptoms featured in 91% of the patients admitted to a medical ward. The pain symptom also had a strong positive correlation with activity limitations and the severity of pain had an impact on the quality of life (Narasimooloo *et al.* 2011). Similarly, Nair *et al,* (2009) demonstrated that pain affects the ability to work and the symptom of pain becomes a barrier for PLWHIV to access the health care services they need. Other authors found that PLWHIV experiencing deteriorating clinical conditions are limited in their ability to access medication and care, impacting negatively on adherence to treatment and quality of life (Hanass-Hancock *et al.* 2017; Myezwa *et al.* 2016; van Egeraat *et al.* 2015; Uthman *et al.* 2014; Brinkhof *et al.* 2009).

In addition to pain, depression is another symptom that is common among PLWHIV (Myezwa *et al.* 2016; Choi *et al.* 2016; Hanass-Hancock *et al.* 2014; Narasimooloo *et al.* 2011; Myezwa *et al.* 2009; Anandan *et al.* 2006; Rusch *et al.* 2004). A systematic review and meta-analysis done in Sub-Saharan Africa revealed PLWHIV on HAART had a 19% prevalence of depressive symptoms (Benard *et al.* 2017). Depressive symptoms often lead to functional limitations (Myezwa *et al.* 2016). Factors such as gender, uncertainties about their future as HIV-infected patients, aging, unemployment, the presence of disability; co-morbidity and the severity of the HIV condition increased the odds for depressive symptoms (Myezwa *et al.* 2016, Choi *et al*. 2016; Solomon *et al,* 2014). Gupta *et al*, (2010) and Pappin *et al*, (2012) associated the depression symptom with stigma, suggesting that PLWHIV experiencing stigma are likely to experience depressive symptoms. The findings indicate a need for the regular screening of depression during normal HIV care visits to ensure that PLWHIV do not experience a lag in health status.

2.6 MANAGEMENT OF HIV-RELATED DISABILITY

2.6.1 Rehabilitation

Rehabilitation has been flagged as a necessary component of HIV management. Rehabilitation is defined as processes designed to assist individuals to reach their highest functioning potential and to be able to participate fully in their environment (WHO, 2011). The rehabilitative interventions aim to minimise or eliminate barriers, encourage independence and optimise participation in life events, ultimately improving QOL (Steihaug *et al.* 2016). To manage disability in the population, South Africa adopted the Framework and Strategy for Disability and Rehabilitation Services 2015-2020 (South African Department of Health 2015) which is founded on the community-based rehabilitation model of care. The Framework and Strategy for Disability and Rehabilitation Services 2015 – 2020 cited the poor integration of rehabilitation programmes with priority health programmes, such as Non-Communicable Diseases, Maternal, Child and Women's Health, HIV and AIDS, as a challenge for the implementation of rehabilitation services (DOH, 2015).

In South Africa, there are various factors that impact on the effectiveness of rehabilitation service. The inadequate number of therapists, poor multidisciplinary collaboration, and professional development have been cited as barriers to the effective delivery of rehabilitation services (Chetty and Hanass-Hancock 2016; van Egeraat *et al.* 2015, Cobbing *et al.* 2013). There is empirical evidence that people with disabilities experience various barriers when accessing the health care system (Chetty and Hanass-Hancock 2016; van Egeraat *et al*. 2015; Cobbing *et al*. 2013; Groce *et al* 2013). Barriers in terms of negative attitudes towards patients; physical challenges; and financial challenges (van Egeraat *et al.* 2015; Cobbing *et al*. 2014; Cobbing *et al.* 2013; Majumdar and Mazaleni, 2010). Consequently, these barriers influence the effectiveness and sustainability of rehabilitative programmes and have adverse effects on health outcomes (Chetty and Hanass-Hancock, 2016, Cobbing *et al.* 2014; Cobbing *et al*. 2013).

The goal of rehabilitation is to prevent further deterioration of condition, improve levels of functioning and participation, and other health-related outcomes (Cobbing *et al.* 2017; Mkandla *et al,* 2016; O'Brien *et al.* 2016; Banks *et al* 2015; Lopez *et al.* 2015; Gomes-Neto *et al.* 2015; Cobbing *et al.* 2013; O'Brien *et al.* 2010; O'Brien *et al.* 2009, O'Brien *et al*. 2008; Galantino *et al.* 2008). The chronic nature of HIV infection and the high prevalence of HIV-related disability necessitate the inclusion of rehabilitation into HIV management (Cobbing *et al.* 2017; Myezwa *et al.* 2016). Over the years, researchers have explored the practical aspects of integrating rehabilitation into HIV management programmes. Chetty *et al,* (2014) proposed a comprehensive model of care for rehabilitation in PLWHIV. This proposed model is built on public health principles of empowerment, participation, accessibility and affordability (Chetty *et al.* 2014). Cobbing *et al.* (2017) described a home-based rehabilitation (HBR) programme for PLWHIV following the model of care proposed by Chetty *et al*. (2014)that is designed to address challenges faced by PLWHIV in accessing health care services (Cobbing *et al.* 2017; Hanass-Hancock *et al*. 2015; Cobbing *et al.* 2014). The HBR programme included the training and support of staff, task shifting to lay workers, improved accessibility, referral linkages to institutional care and community, with the main focus being on improving function and independence (Cobbing *et al.* 2017). The findings from this study showed that HBR

interventions can implement elements of an integrated model of care (Cobbing *et al.* 2017). O'Brien *et al.* (2013) made recommendations for rehabilitation professionals that were endorsed by 19 PLWHIV and clinicians for the rehabilitation of older PLWHIV.

The recommendations are as follows:

1. Provision of care and management for older adults living with HIV and other co-morbidities
2. Comprehensive assessment and treatment through an individualised and interprofessional approach
3. Multidisciplinary rehabilitation to address the nature of HIV-related disability across the continuum of care
4. Consideration of extrinsic contextual factors and practical social supports by rehabilitation professionals
5. Consideration of intrinsic contextual factors such as self-management and spirituality by rehabilitation professionals.
6. Individually tailored combined exercise training for medically-stable older adults living with HIV
7. Cognitive rehabilitation interventions for adults experiencing mild cognitive impairment and stroke
8. Rehabilitation professionals should use literature and clinical practice guidelines for specific co-morbidity interventions.

Various physical rehabilitative intervention strategies have been investigated for effectiveness in addressing HIV-related disability, namely, exercise training, home-based rehabilitation, community-based rehabilitation and health promotion.

- **Exercise training interventions**

Treatment plans for PLWHIV should include exercise training as a clinical therapeutic option (Lopez *et al*. 2015). Several reviews on exercise training for PLWHIV suggest that it is safe in this population and produces significant physical and psychological benefits (O'Brien *et al.* 2017, O'Brien *et al.* 2016, Lopez *et al.* 2015, Gomes-Neto *et al*. 2013, O'Brien *et al*. 2010, O'Brien *et al*. 2008). Exercise

training can be either aerobic, resistance and/or combined exercise training. Muscle adaptation occurs in response to specific training.

1. Aerobic training

Aerobic training is the type of exercise training designed to increase endurance performance and requires a continuous supply of oxygen to produce adequate energy to meet energy demands during exercise (Howley, 2001). Systematic reviews found this form of training in PLWHIV to significantly improve aerobic capacity, quality of life, and symptoms of depression (O'Brien *et al.* 2016, Lopez *et al*. 2015, Gomes-Neto *et al*. 2013). These findings were possibly due to the physiological changes following aerobic training that occur over time and that augment the efficacy of the lungs, heart and blood vessels in transporting oxygen through the body.

2. Resistance training

Resistance training involves the overloading of skeletal muscle-using weight, machines and resistance bands. Resistance training programmes are characterised by the use of machines, weight stations, and free weights for the large muscle groups in the lower and upper limbs, progressively from moderate to high intensity (60% - 90% of one-repetition maximum) (O'Brien *et al.* 2017; Gomes-Neto *et al.* 2013; O'Brien *et al.* 2008).In a progressive resistance exercise training programme, there is a gradual increase in the loading of the muscle. Studies have shown that resistance training improves outcomes related to cardiorespiratory status, muscle strength, weight and body composition in PLWHIV (O'Brien *et al*. 2017, Gomes-Neto *et al*. 2013).

3. Combined training

Combined training combines aerobic and resistance training components in one training programme, and offers superior benefits in cardiovascular health and muscle strength in adult PLWHIV (O'Brien *et al.* 2017). Systematic reviews report significant improvements in aerobic fitness, muscle strength, physical functioning, quality of life and self-efficacy in PLWHIV following a combined exercise training programme (O'Brien *et al.* 2017; Lopez *et al.*

2015, Gomes-Neto *et al.* 2013). However, Gomes-Neto *et al*. (2013) found that for combined training, the duration of the programme had to be longer and to be done at a moderate intensity.

2.6.2 Home-based rehabilitation (HBR)

Home-based rehabilitation **(**HBR) is defined as "the provision of health services by formal and informal caregivers in the patient's home in order to promote, restore and maintain a person's maximum level of comfort, functioning, and health, including care towards a dignified death" (WHO, 2001). Mashau and Davhana-Maselesele, (2009) defined HBR as a system designed to enable PLWHIV to manage their health condition and to improve the quality of care they receive. There are several benefits to offering HBR as opposed to the alternative institution-based rehabilitation, such as a reduction in the costs incurred by patients and long waiting hours in the institutions (Chetty *et al*. 2014, Cobbing *et al*. 2014, Cobbing *et al.* 2013, Motswasele, 2008). HBR offers comprehensive health care directed at an individual in the context of their own home convenience (Russels and Schneider, 2000). HBR interventions have been recommended and proposed as a solution for PLWHIV experiencing HIV-related disability (Cobbing *et al.* 2017; Chetty & Hanass-Hancock, 2015; Roos *et al.* 2015; Cobbing *et al*. 2014).

2.6.3 Community-based rehabilitation

Community-based rehabilitation (CBR) is a multi-sectoral strategy that forms part of the community development aimed at promoting rehabilitation, reducing poverty, leveling opportunities, and social integration of people with disabilities (WHO, 2010). Central to the successful implementation of CBR programmes is participation of people with disabilities, their families, and their communities following a bottom-up approach (WHO, 2010). Community participation increases knowledge and accessibility to resources for PLWHIV. It also creates supportive networks. However, there is a need to build capacity regarding the effects of stigma and challenges faced by PLWHIV in the communities when implementing CBR programmes (Majumdar and Mazaleni, 2010).

A systematic review looking at CBR for people with disabilities in low- and middle-income countries, found that a CBR programme for people with disabilities improves clinical outcomes, functioning and their quality of life (Lemmi *et al.* 2016). Lemmi *et al.* (2016) reviewed CBR programmes specific for people with mental and physical disabilities following a cardiovascular incident, arthritis, and chronic obstructive pulmonary disease. A review by M'kumbuzi and Myezwa, (2016) investigating the conceptualisation of CBR in Southern Africa, found a dearth of evidence on CBR. Furthermore, the quality of the available evidence found was not sufficient to inform or direct practice or policy in CBR (M'kumbuzi and Myezwa 2016). The two reviews (Lemmi *et al.* 2016, M'kumbuzi and Myezwa, 2016) revealed a need for good-quality evidence in CBR as a strategy aiming at improving health for PLWHIV.

In considering the financial challenges and physical difficulties PLWHIV encounter in their attempts to reach rehabilitation services or to return for their follow-up visits, CBR and HBR programmes are recommended interventions to mediate these challenges (Cobbing *et al.* 2013). Both HBR and CBR interventions are further supported by the National Framework and Strategy for Disability and Rehabilitation Services 2015-2020 for Disability Management (DOH, 2015).

2.6.4 Health promotion

Health promotion (HP) is an "ongoing process of changing health behavior at multiple levels to empower people to have more control over their own health" (Ottawa Charter for Health Promotion, 1986). HP programmes are aimed at addressing the causes of ill health. In a study describing the experiences of PLWHIV attending physiotherapy and receiving individualised rehabilitative programmes, Cobbing *et al*, (2013) found that participants had limited knowledge of their own health condition. The chronic nature of HIV is not well understood, PLWHIV default on attending HIV programmes when their health condition seems to improve or when it deteriorates (Hanass-Hancock *et al.* 2017; van Egeraat *et al*. 2015; Uthman *et al*. 2014, Brinkhof *et al.* 2009). Cobbing *et al*, (2013) recommend that information be

disseminated through posters on notice boards or handed to patients in pamphlets. A health promotion programme can also be used as a capacitating tool for

communities to provide support and reduce stigma and discrimination for PLWHIV and their families (Majumdar and Mazaleni, 2010).

Health education is one of the key strategies to improve awareness and related skills in health promotion. In an explorative study by van Egeraat *et al.* (2015) looking at the impact of HIV-related disability on the healthcare workers, findings showed that the experience of the treatment side effects could lead to treatment failures. To promote adherence to treatment, a health education intervention was introduced (van Egeraat *et al*. 2015). The health education provided information about the side effects, and coping strategies. Thus interventions that integrate health education on HIV infection and the secondary complications related to living with HIV could encourage PLWHIV to remain in treatment despite the challenges encountered. However, more research is necessary to ascertain the impacts of health education on adherence to ART.

2.7 THE METHODOLOGY APPRAISAL TOOLS

Methodological quality assessment is generally not a requirement for scoping reviews (Arksey& O'Malley, 2005). Daudt *et al.* (2013) emphasized the significance of including methodological quality assessments using validated tools when conducting scoping reviews.

2.7.1 Observational studies

Observational research consists of three categories of studies those are cohort studies, cross-sectional studies, and case-control studies. Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) statement is a tool consisting of 22 checklist items used as a guideline for reporting observational research, critical appraisals and interpretations of results (da Costa *et al*. 2011, von Elm *et al.* 2007). Out of the 22 items on the checklist, 18 are common to all three (cohort, cross-sectional and case-control) and four (items number 6, 12, 14, and 15) are specific to each study design (Cuschieri *et al*. 2019; da Costa *et al.* 2011, von Elm *et al.* 2007). Poorolajal *et al.* (2011) investigated the quality of reporting of the cohort studies conducted after the development of the STROBE checklist. They found that the cohort studies reported only 69% items on the STROBE checklist and

concluded based on the findings that the reporting of cohort studies was still not clear or desirable enough (Poorolajal *et al.* 2011). Similarly, Ramke *et al*. (2017) used the STROBE checklist to evaluate the quality of reporting in surveys looking at the prevalence of blindness in low and middle-income countries. Researchers recommend the STROBE checklist as it ensures observational research is transparent with clear presentation and that all the key elements of the observational research are reported (Ramke *et al*. 2017; da Costa *et al.* 2011; Poorolajal *et al.* 2011; von Elm *et al.* 2007). Based on these findings, the STROBE checklist was used in this scoping review to assess the reporting of included studies.

2.7.2 The preferred reporting items for the systematic reviews and meta-analyses (PRISMA) 2009 checklist

The PRISMA guidelines consist of a flow diagram and a checklist (Moher *et al. 2009*. The flow diagram outlines the steps taken by a researcher in selecting eligible studies for systematic reviews. It has four phases starting with identification, screening, eligibility and ends with included literature (Moher *et al. 2009)*. The checklist has 27 recommended items that cover each section of a research paper. It provides guidance to authors, reviewers and editors, also to improve the reporting of systematic reviews and meta-analyses (Liberati *et al.* 2009; Moher *et al.* 2010). Full compliance with the checklist items ensures that the reporting of a systematic review is transparent, clear and complete(Liberati *et al.* 2009). Fleming *et al.* (2013) found that the PRISMA checklist improved the quality of reporting orthodontic systematic reviews. Lee *et al,* (2017) assessed the reporting quality of systematic reviews and meta-analyses in ophthalmology using the PRISMA guidelines. They found low compliance with the PRISMA guidelines, concluding that the use of the guideline would eliminate uncertainities (Lee *et al,* 2017). In these studies (Lee *et al,* 2017; Fleming *et al.* 2013) the PRISMA checklist provided clarify on the important details a systematic review should report, as such it was used to review the reporting of the eligible studies for this review.

2.7.3 The consolidated standards of reporting trials (CONSORT) 2010 statement

The CONSORT 2010 statement was developed as a guide for the reporting of randomised controlled trials (RCTs) to ensure better quality reporting (Turner *et al.* 2012; Schulz *et al.* 2010). The tool similarly to the STROBE checklist is helpful in ensuring completeness of reporting, critical appraisal and interpretation of literature (Turner *et al.* 2012; da Costa *et al.* 2011; Moher *et al.* 2009). The CONSORT is endorsed by more than 600 journals and international organisations of editors (Turner *et al.* 2012). The checklist consists of 25 items. Since its development, the reporting of RCTs have improved noticeably (Stevely *et al.* 2015). Systematic reviews evaluating the use of the CONSORT checklist found that it improved the quality and completeness of reporting of RCTs (Turner *et al.* 2012; Plint *et al*. 2006). These findings supported the use of the CONSORT in this scoping study

2.8 CONCLUSION

In conclusion, as a result of the advancement of ART, the course of HIV infection has changed over the years. HIV is now a chronic medical condition requiring lifelong medical care along the continuum. As life expectancy in PLWHIV increases, the evidence of disabilities related to HIV grows. However, the current management is still mainly focused on managing disease progression with ART. Various rehabilitative interventions have been investigated for effectiveness in people living with HIV. Rehabilitation interventions such as exercise training have been shown to improve physical functioning and the health-related quality of life in this population. It is on this basis that the integration of rehabilitation into priority areas is proposed. Currently, there is no comprehensive rehabilitative programme for HIV-related disability.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the methodology used to address the following objectives:

- To describe HIV-related disability.
- To identify rehabilitative interventions for HIV-related disability.

3.2 STUDY DESIGN

This study is a scoping review following the Joanna Briggs Institute's (JBI) Scoping Reviews Manual (Peters *et al,* 2015). The aim of this study was to identify the components of a comprehensive disability management programme for people living with HIV (PLWHIV). A scoping review methodology was chosen as it permitted the exploration of a vast body of literature and the mapping of evidence from different sources (Arksey & O'Malley, 2005).

3.3 INCLUSION CRITERIA

3.3.1 Participants

This review included studies that focused on people living with HIV (PLWHIV), regardless of their gender, and who were 18 years and older. In addition, studies written in all languages, conducted since the identification of HIV and to the present date, were also considered.

3.3.2 Concepts

This review reported on the following concepts:

- **Disability**

The World Health Organization describes disability as impairments (affecting body structure and function), the limitation of activity (affecting the person's ability to perform tasks or actions) and participation restrictions (preventing a person from

being involved in a life situation within the society (WHO, 2002). Examples are peripheral neuropathy, depression, and immobility.

- **Rehabilitative interventions**

Rehabilitation is defined as a selection of processes designed to assist individuals to reach their highest functioning potential and to flourish in their environment (WHO, 2011). Rehabilitative interventions aim to minimise or eliminate barriers, encourage independence and optimise participation in life events, ultimately improving quality of life (Steihaug *et al.* 2016). Rehabilitative interventions that address HIV-related disability include exercise training programmes, massage therapy, and home-based rehabilitation.

3.3.3 Context

The literature search focused on global evidence, all relevant studies conducted in the community, hospitals or clinics, and consideration was also given to HIV health centres.

3.4 EXCLUSION CRITERIA

Commentaries and editorials were considered inappropriate to meet the objectives set out in this paper and were not included as part of this scoping review.

3.5 TYPES OF SOURCES

The review included studies that used qualitative and quantitative research methods sourced from journal articles.

3.6 SEARCH STRATEGY

Literature published since the onset of HIV on HIV-related disability and rehabilitative interventions was sought. The initial search was done on the Public Medline (PubMed) and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases using the following text words: “disability and HIV/AIDS”, “disability and interventions”, “health education and health promotion” and “exercise”. The JBI scoping reviews manual recommends a search strategy be done in at least two databases. The titles and abstracts were screened, this task being based on their relevance to the topic and research question. Inclusion and exclusion criteria

were applied to the selected article titles and abstracts. The retrieved papers were imported to Endnote software and two files were created, one for articles retrieved from the CINAHL database and the other for articles from the PubMed database. The articles from both databases were then combined, and duplicated articles were removed. The reference lists and citations from the selected studies were further checked for additional papers until there was not one that met the inclusion criteria. The inclusion and exclusion criteria of the eligible studies were extracted (Table 1). The search strategy was limited to physical rehabilitative interventions.

Chapter 3 Table 1: Inclusion and exclusion criteria of the eligible studies

Author	Inclusion criteria	Exclusion criteria
O'Brien *et al.* 2017	RCTs of adults (18 years of age and older). Supervised and un-supervised trials comparing progressive resistance exercise (PRE) (or combinations of progressive resistance and aerobic exercise) with no PRE or another exercise or treatment intervention performed at least three times per week for at least four weeks.	Not provided
Pullen, 2017	HIV-positive adults (18 years of age and older**)** who received Physiotherapy services between June 1, 2014, and December 31, 2015; diagnosed with pain.	Not provided
O'Brien *et al*. 2016	RCTs of adults (18 years of age and older) living with HIV. Trials comparing aerobic exercise (or combined aerobic and resistance exercise) with no aerobic exercise or another exercise or treatment modality performed at least three times per week for at least four weeks.	Not provided
Cobbing *et al.* 2016a	Studies written in English that assessed the quality of life or functional ability outcomes of Home-based rehabilitation interventions for adults (over 18 years of age) living with HIV.	Non-peer reviewed articles (e.g. books, magazines, policy briefs, etc.). Articles not written in English. Literature reviews and commentaries
Cobbing *et al.*2016b	Participants 18 years or older, on ART 6 month or longer. If participants scored for mobility limitations, according to the WHO Disability Assessment Schedule (WHODAS 2.0) questions S1 and S7.	If participants were: pregnant, had complete spinal cord injury, had an acute opportunistic infection, had a recent myocardial infarction, or had unstable angina
Mkandla *et al,* 2016	Participants between 18 and 70 years on first-line antiretroviral therapy for 6 months with CD4+ counts of any level. Participants with no previous history of physiotherapy intervention.	Not provided
Myezwa *et al.* 2016	Participants 18 years or older, on ART 6 month or longer, and not in a stage of any acute disease (e.g. TB).	Not provided
Brown *et al.* 2016	Studies published in peer-reviewed journals that included both HIV-positive and HIV-negative participants of all age groups, measured respiratory symptoms in each group and provided quantitative data.	Studies reporting symptomsof obstructive sleep apnoea; ear symptoms; studies without HIV-negative individuals.
Gomes-Neto *et al.* 2015	RCTs revewing the effects of combined aerobic and resistance exercise in HIV-infected patients. Combined training performed at least twice weekly for at least four weeks.	Studies that enrolled patients with cardiac or respiratory diseases.
Lopez *et al.* 2015	RCT's on adult participants (18 years of age and older). with more than 60% of	Not provided

Author	Inclusion criteria	Exclusion criteria
	participants on ART evaluating aerobic exercise, resistance exercise, or combination without dietary or any other therapy for more than 1 week. Trials evaluating physical and mental health pre- and post-intervention and/or compared to a non-exercise control group outcomes.	
Paes *et al*. 2015	People living with HIV older than 18 years, on HAART for at least 12 months	AIDS diagnosis; cerebral toxoplasmosis or any infectious diseases compromising the central nervous system; use of anabolic hormone therapy or ergogenic resources to gain muscle mass; cardiovascular, respiratory, bone, muscle, or joint problems that could limit physical function; less than 75% of attendance to the exercise sessions
Hamid and Rajah, 2015	Men over 18 years of age with HIV able to perform exercises or movements with their upper and lower limbs.	Participation on PRE within the past six months, total inability to use upper and/or lower limbs, a contraindication to PRE and those on anabolic or hormonal therapy.
Hanass-Hancock *et al.* 2015	Participants 18 years or older, on ART 6 month or longer, and not in a stage of any acute disease (e.g. TB).	Not provided.
Cobbing *et al.* 2014	Participants living with HIV referred for physiotherapy intervention.	Participants unable to communicate or understand the researcher (e.g. due to advanced HIV dementia) and those that refused participation.
Gomes-Neto *et al*. 2013	RCTs done on adults (18 years and older) that compared exercise training with non-exercise training or with another therapeutic modality. Intervention performed at least twice per week for at least 4 weeks.	Not provided
Hanass-Hancock *et al*. 2013	Participants living with HIV. Studies that used the ICF to report disability. Studies that used standardised and validated instruments in one or more HIV hyperendemic country. Data collected after 2004 and published between January 1, 2005 and July 31, 2011.	Newspaper articles, case studies, literature reviews, narrative papers, and papers not written in English.
Kinirons *et al*. 2013	Adult participants (18 years and older) known as living with HIV admitted during the time period from January 1, 2004, to June 30, 2004.	If the admission was for research purposes or if the medical record was missing, in use, or incomplete.
Pappin *et al*. 2012	Adult participants (18 years and older) on ART.	Not provided
Myezwa *et al.* 2011	Cross-sectional studies done on adult participants living with HIV that used ICF.	Not provided

Author	Inclusion criteria	Exclusion criteria
Hillier *et al.* 2010	RCTs and Controlled clinical trials comparing massage therapy with no therapy or another therapy modality. Studies that reported Immunological and virological indicators and psychosocial measures.	Not provided
O'Brien and Nixon, 2010	A 54-year-old woman living with HIV	Not applicable (case study)
O'Brien *et al*. 2008	Adult participants (18 years and older) living with HIV. Studies with a randomized comparison group reporting PRE intervention performed at least three times weekly for at least four weeks.	Not provided
Gaidhane *et al*. 2008	Individuals at all stages of HIV infection	Participants who left the interview and examination midway.
Peltzer and Phaswana-Mafuya, 2008	Adult participants (18 years and older) living with HIV able to respond to an interviewer-administered questionnaire.	Not provided
Anandan *et al*. 2006	Adult participants living with HIV	Not provided
Zonta *et al*. 2005	Patients with HIV infection.	Not provided
Rusch *et al.* 2004	Patients with HIV infection.	Not provided

3.7 METHODOLOGICAL QUALITY ASSESSMENT

The methodological quality assessment of the selected studies was carried out by two researchers. The disagreements noted in the results were resolved through re-assessments of the papers in question and discussions between the two reviewers. The third reviewer was available to assist when there were differences of opinion between the reviewers. The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) 2009 checklist was used to evaluate the methodological quality of the systematic reviews and meta-analyses (Moher *et al.* 2009). The Consolidated Standards of Reporting Trials (CONSORT 2010) checklist was used for randomised control trials (Schulz *et al.* 2010). Studies that used qualitative research methods were evaluated using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist (da Costa *et al.* 2011).

3.8 DATA EXTRACTION

Following the comprehensive search for studies, from the retrieved papers, information pertaining to the authors, year of publication, aims of the study, sample, methodology and key findings, as they relate to this review, were extracted. Data extraction was conducted by the main reviewer. Studies were then grouped according to the two objectives of this study, namely, to describe HIV-related disability and to identify rehabilitative interventions for HIV-related disability. Studies evaluating HIV-related disability were grouped separately from the studies reporting on the interventions as they answer to each of the two objectives. Two tables were created, one for the studies reporting HIV-related disability and the second table for studies reporting interventions. Ethical clearance waiver was granted by the Human Research Ethics Committee at the University of Witwatersrand (Ref: W-CJ-170419-2).

3.9 PRESENTATION OF RESULTS

A PRISMA flow chart (Appendix 1) was used to outline the entire search process (Moher *et al.* 2009). The results were presented as information guided by the objectives of this review. Tables were created to sort the studies in terms of the content, study design, methodological quality and the type of evidence presented. A

brief introduction was provided, followed by the tables and a narrative summary describing how the tabulated results related to the review question.

3.10 CONCLUSION

This chapter gave an overview of the methodology of this study. A scoping review study design was used to explore the literature since the identification of HIV that pertains to HIV-related disability and the rehabilitative interventions. Studies conducted on adult PLWHIV were included in this study; however, editorials and commentaries were excluded. The methodological quality of the selected studies was reviewed using the relevant tools for assessment.

CHAPTER FOUR

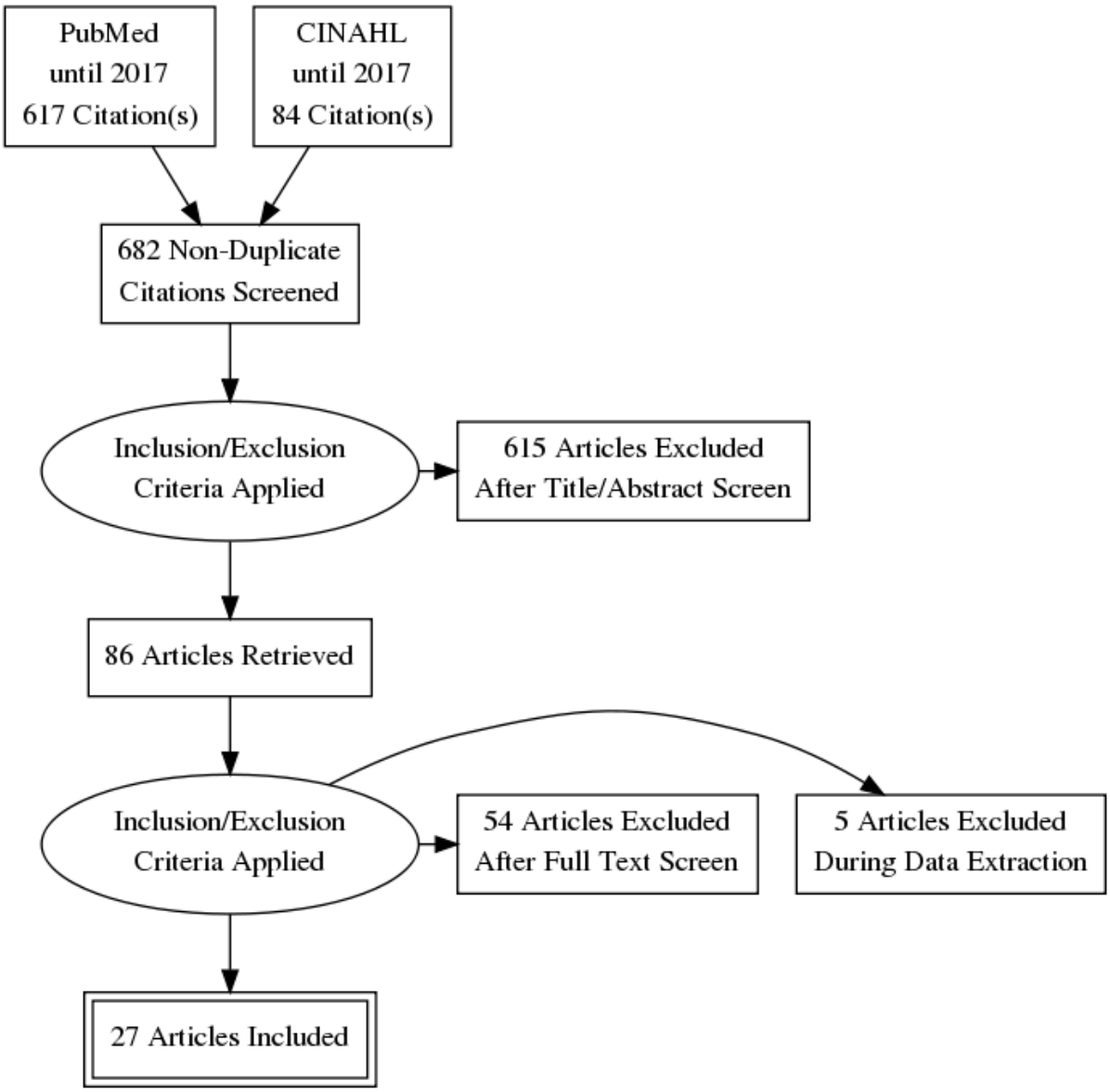
RESULTS

4.1 INTRODUCTION

This scoping review aimed to identify components of a comprehensive rehabilitative programme for PLWHIV suffering from HIV-related disability. The first objective of the study was to describe HIV-related disability and the second was to identify rehabilitative interventions for HIV-related disability. This chapter, therefore, covers the results of the studies that investigated HIV-disability and rehabilitative interventions. The content that is presented in this study covers the study selection process, study characteristics (study design and population), key findings and methodological quality.

4.2 STUDY SELECTION PROCESS

The initial search yielded 701 titles and abstracts. The titles and abstracts were screened - based on their relevance to the topic and research question. Inclusion and exclusion criteria were applied to the selected article titles and abstracts. The studies from the databases that met the inclusion criteria amounted to (105) before the removal of the 19 duplicated studies. A total of 86 full- texted articles were downloaded, printed and reviewed for eligibility. Studies that were not directly reporting on HIV- related disability and rehabilitative interventions for HIV were excluded. The excluded studies looked at the law and the medical and psychological management of HIV disability. Further, the individual studies included in the eligible systematic reviews and meta-analyses that had been selected for this review were removed at this stage. The reference lists and citations from the selected articles were further checked for additional papers until there was none that met the inclusion criteria. The total number of articles included in the final stage was 27. (See Figure 1 for a flow diagram for the study selection process).



Chapter 4 Figure 1: Flow Diagram for the study selection process (Moher *et al.* 2009)

4.3. SUMMARY OF SELECTED STUDIES

This scoping review included 27 studies that used different study designs, as shown in Table 1.

Chapter 4 Table 1: Study designs of included studies

Study designs	HIV-related disability	Interventions	Total
Systematic reviews	2	8	**10**
Randomized control trial	0	4	**4**
Observational studies	11	2	**13**
Total	**13**	**14**	**27**

Out of the 27 studies selected for this review, 48% (n= 13) studies were observational studies, 37% (n=10) were systematic reviews and 15% (n= 4) of the studies were randomised control trials. Most of the studies (84.6%) that reported HIV-related disability used observational research methods. Intervention studies (57%) were mostly systematic reviews.

4.4 HIV-RELATED DISABILITY

4.4.1 Selected studies

This scoping review included 13 studies focused on HIV-related disability that were conducted between September 2004 and April 2017. The selected studies used different research methodologies (Table 1), most studies (82%) were observational studies and 18% were systematic reviews.

Chapter 4 Table 2: HIV-related disabilities (n= 13)

Author	Aims	Population/sample size	Study design	Key findings
Myezwa *et al.* 2016	To investigate the link between the onset of the disability and depressive symptoms amongst a cohort of people on ART.	1050 adult PLWHIV	Cross-sectional survey and cohort study	Participants with depressive symptoms had higher functional limitations that were associated with health symptoms. ART adherence is associated with functional limitation.
Brown *et al.* 2016	To investigate the associations between HIV status and respiratory symptoms and how these have changed with the availability of ART.	38 523 participants (PLWHIV and controls without HIV)	Systematic review and meta-analysis	Prevalent symptoms were cough and breathlessness. ART reduces the prevalence of respiratory symptoms.
Hanass-Hancock *et al.* 2015	To measure activity limitations (disability) and its associations with health, adherence, and livelihood indicators in patients on ART.	1042 PLWHIV on ART	Cross-sectional survey and cohort study	Activity limitations in 35.6% PLWHIV on ART. A strong association between activity limitations and depression symptoms. The activity limitations domain of mobility is associated with ART adherence.
Hanass-Hancock *et al.* 2013	To examine the extent, nature, and range of disability among people living with HIV in HIV hyper-endemic countries.	20134 PLWHIV	A scoping review	Impairments affecting these functions: mental, sensory, cardiovascular and respiratory, digestive, metabolic and endocrinal, genitary and reproductive, muscle and related tissue. Activity limitations: mobility and self-care problems. Participation restrictions: community, social and civic life; difficulties with general tasks and demands, interpersonal relationships, domestic life, employment, school, and higher education.
Kinirons *et al.* 2013	To examine PLWHIV who accessed physiotherapy after admission into an acute-care hospital.	475 PLWHIV	Cross-sectional study	Impairments and functional limitations improvements in mobility, muscle strength, endurance, and pain.
Pappin *et al.* 2012	To explore the correlates of anxiety and depression in patients enrolled in a public sector ART programme in South Africa.	716 PLWHIV on ART	Cross-sectional study	30.6% prevalence of anxiety and 25.4% for depression. Correlates of anxiety and depression: side effects from ART, avoidant coping, stigma and the length of time knowing HIV status. Support groups associated with a decline in depression.
Myezwa *et al.*	To describe how HIV affects the functioning and health of people within	185 PLWHIV	Cross-sectional	Neuromuscular functions and skin problems. Problems with mental functioning

Author	Aims	Population/sample size	Study design	Key findings
2011	different environmental contexts.		study	(sleep, energy and driving functions) and emotional functions, weight maintenance and body image problems)
O'Brien and Nixon, 2010	To highlight evidence on disability and rehabilitation in the context of HIV	One person with HIV on HAART.	Case study	Impairments: Fatigue, weakness, peripheral neuropathy, pain, ostroarthritic knees, and worries/ anxiety. Activity limitations and participation restrictions: difficulty getting out of bed, household chores, walking and standing for long periods.
Gaidhane *et al.* 2008	To determine the nature of self-care among people living with HIV/AIDS in a rural tertiary care centre.	194 PLWHIV	Cross-sectional study	Activity limitations and participation restrictions: 64% of participants had self-care problems, particularly in maintaining their health and with defecation.
Peltzer and Phaswana-Mafuya, 2008	To assess HIV symptoms and the demographic, social and disease variables of people living with HIV in South Africa.	607 PLWHIV at least 18 years old	Cross-sectional study	Pain in the form of headache (79%), painful joints (65%), muscle aches (59%), abdominal pain (55%), chest pain (46%) and breast pain (28%). Headaches, fever, thirst, fatigue, and weakness were the top five highly prevalent symptoms.
Anandan *et al.* 2006	To explore occupational functioning across various activities, to describe various prevalent impairments and to examine their impact on the person's perceived occupational competence.	35 PLWHIV	Cross-sectional study	Impairments:fatigue (84.4%); fear/worries (78.1%); difficulty concentrating (75%); muscle aches (68.8%); and depression (65.6%); (67.7%) had trouble managing finances Activity limitations (35.5%)
Zonta *et al.* 2005	To examine and quantify the various types of disability in hospitalised persons affected by AIDS and to examine associations of disability with immunological and clinical data.	120 PLWHIV	Cross-sectional study	85% had impaired physical activity; 82% had various degrees of weaknesses; 55% of disabilities were due to neurological complications; Association between lower functional status and higher average viral load.
Rusch *et al.* 2004	To measure the prevalence of and associations among impairments, activity limitations and participation restrictions in persons living with HIV in British Columbia	762 PLWHIV	Cross-sectional study	Mental impairment (78.2%, n = 596), Sensory impairment (71.9%,n=548), Neuromuscular impairment (49.5%, n= 377), Internal impairment (81.0%, n= 617) Activity limitations (80.6%, n = 607) Participation restrictions (93.2%, n=699)

Information pertaining to the authors, the year of publication, aim, population and sample size, study design and key findings that extracted from the studies are presented in Table 2. The results revealed all three types of observational studies, namely cohort studies, cross-sectional studies, and case-control studies. The studies used the International Classification of Disease, Ninth Revision (ICD-9): Sign and Symptom Checklist for persons with HIV (SSC-HIV) and the International Classification of Functioning, Disability, and Health Framework (ICF) to measure disability. Most of the studies used ICF to outline the disabilities (Myezwa *et al.* 2016; Hanass-Hancock *et al.* 2015; Hanass-Hancock *et al.* 2013; Myezwa *et al.* 2011, O'Brien and Nixon, 2010, Gaidhane *et al.* 2008; Rusch *et al*. 2004). Additionally two systematic reviews (Brown *et al.* 2016; Hanass-Hancock *et al*. 2013) that reported on findings from 24 and 41 studies respectively. Lastly, one study by Myezwa *et al.* (2011) compared data from four cross-sectional studies that used the ICF in PLWHIV.

4.4.2 Study population

The selected studies reported HIV-related disability in adult men and women living with HIV at various stages of HIV infection. Two studies (Myezwa *et al.* 2016, Hanass-Hancock *et al.* 2015) were population-based studies. The sample size ranged from 1 to 38523 with a total number of 63844.

4.4.3 Key findings

The key findings pertaining to the first objective (to describe HIV-related disability) are outlined using the International Classification of Functioning, Disability and Health Framework (ICF) conceptual model (WHO, 2001).

4.4.3.1 Impairments

The results showed that HIV infection affects multiple body functions, as illustrated in Table 3. Additionally, the presence of multiple impairments was found to be high (Myezwa *et al.* 2011; Peltzer and Phaswana-Mafuya 2008, Rusch *et al*. 2005).

Chapter 4 Table 3: Impairments due to HIV

Body Functions	Impairments Types	Authors
Mental functions	Depression, anxiety, fatigue, dementia, post-traumatic disorder, cognitive impairments, sleep disturbances, reduced self-esteem, energy levels, and driving ability.	Myezwa *et al*. 2016, Hanass-Hancock *et al*. 2015, Hanass-Hancock *et al.* 2013, Pappin *et al.* 2012, Myezwa *et al.* 2011, Peltzer and Phaswana-Mafuya, 2008, Anandan *et al.* 2006, Rusch *et al*. 2004
Sensory functions and pain	Parasthesia and pain (headaches, painful joints, muscle aches, abdominal pain, and chest pain)	Mkandla *et al.* 2016, Hanass-Hancock *et al*. 2013, O'Brien and Nixon, 2010, Anandan *et al.* 2006, Rusch *et al.* 2004, Peltzer and Phaswana-Mafuya 2008, Zonta *et al.* 2005
Neuromusculoskeletal pain and reduction in movement-related functions	Loss of muscle power, muscle and joint pain, joint stiffness.	Hanass-Hancock *et al.* 2013, Kinirons *et al.* 2013, Myezwa *et al.* 2011, O'Brien and Nixon, 2010, Anandan *et al.* 2006, Rusch *et al.* 2004, Zonta *et al.* 2005, Cobbing *et al.* 2013, Myezwa *et al*. 2016, Peltzer and Phaswana-Mafuya, 2008
Functions of the cardiovascular, haematological, immunological and respiratory systems	Cough and breathlessness, high blood pressure.	Brown *et al*. 2016, Hanass-Hancock *et al.* 2013 and Anandan *et al.* 2006
Functions of the digestive, metabolic and endocrine systems	Weight maintenance, obesity, rashes, diarrhea, and diabetes.	Hanass-Hancock *et al.* 2013, Myezwa *et al.* 2011, Peltzer and Phaswana-Mafuya, 2008, Rusch *et al.* 2004)

4.4.3.1.1 Mental functions

Eight out of 13 (62%) studies reported on impairments in mental function (Myezwa *et al.* 2016, Hanass-Hancock *et al.* 2015, Hanass-Hancock *et al.* 2013, Pappin *et al.* 2012, Myezwa *et al.* 2011, Peltzer and Phaswana-Mafuya, 2008, Anandan *et al.* 2006 and Rusch *et al*. 2004). Common mental impairments reported were depression, anxiety, and fatigue. Other mental impairments reported were a post-traumatic disorder, dementia, energy, and driving impairments, sleep disturbances (Hanass-Hancock *et al*. 2013). The mental impairments were associated with higher functional limitations (Myezwa *et al.* 2016; Hanass-Hancock *et al*. 2015).

4.4.3.1.2 Neuromusculoskeletal and movement-related functions

Eight out of 13 (62%) studies reported impairments affecting neuromusculoskeletal and movement-related functions (Myezwa *et al*. 2016, Hanass-Hancock *et al.* 2013, Kinirons et al 2013, Cobbing *et al.* 2013, Myezwa *et al.* 2011, O'Brien and Nixon 2010, Peltzer and Phaswana-Mafuya, 2008, Anandan *et al.* 2006, Zonta *et al.* 2005, Rusch *et al.* 2004). The common neuromusculoskeletal impairments were a loss of muscle power, painful muscles, and joints, including joint stiffness.

4.4.3.1.3 Sensory functions

Seven out of 13 (54%) studies reported impairments in sensory functions (Mkandla *et al*. 2016, Hanass-Hancock *et al.* 2013, O'Brien and Nixon 2010, Peltzer and Phaswana-Mafuya 2008, Anandan *et al.* 2006, Zonta *et al*. 2005, Rusch *et al.* 2004). Common impairments reported were paraesthesia and pain, with often a diagnosis of peripheral neuropathy (Table 3).

4.4.3.1.4 Functions of the digestive, metabolic and endocrine systems

Four out of 13 (31%) studies reported issues relating to body image, body weight, diarrhea and disorders such as obesity and diabetes (Hanass-Hancock *et al.* 2013, Myezwa *et al*. 2011, Peltzer and Phaswana-Mafuya 2008, Rusch *et al.* 2004). Six out of 41 (14.6%) studies reviewed by Hanass-Hancock *et al.* (2013) reported data relating to changes in body weight (both increase and loss of body weight), rashes, obesity and a diagnosis of diabetes. Myezwa *et al*. (2011) reported that 93% of the participants on long-term ART had body image issues, and two-thirds of the participants experienced weight maintenance problems. Peltzer and Phaswana-Mafuya, (2008) found that participants had weight gain in the stomach area, with skinny arms and legs.

4.4.3.1.5 Functions of the cardiovascular, haematological, immunological and respiratory systems

Three out of 13 (23%) studies reported impairments affecting the cardiovascular and respiratory functions in PLWHIV (Table 3). All three studies showed breathlessness and cough were the most prevalent respiratory symptoms (Brown *et al.* 2016, Hanass-Hancock *et al.* 2013 and Anandan *et al.* 2006), while hypertension was a frequently reported cardiovascular dysfunction (Hanass-Hancock *et al.* 2013).

Hanass-Hancock *et al.* (2013) attributed respiratory problems to tuberculosis. Results further showed that PLWHIV were more prone to developing respiratory symptoms compared to people who are HIV negative (Brown *et al.* 2016).

4.4.3.2 Activity limitations and participation restrictions

In this review, eight of the 13 (62%) studies reported activity limitations and participation restrictions (Hanass-Hancock *et al.* 2015, Hanass-Hancock *et al.* 2013, Kinirons *et al*. 2013, Myezwa et al. 2011, O'Brien and Nixon 2010, Gaidhane et al. 2008, Anandan *et al.* 2006 and Rusch *et al.* 2004). Table 4 provides an overview of the results of activity limitations and participation restriction clustered according to the domains of the ICF framework.

Chapter 4 Table 4: Activity limitations and participation restrictions

ICF domains	Activity limitation and participation restrictions	Authors
Mobility:	Walking, lifting and carrying objects	Hanass-Hancock *et al.* 2015, Hanass-Hancock *et al.* 2013, Kinirons *et al.* 2013, O'Brien and Nixon 2010, Anandan *et al*. 2006, Zonta *et al* 2005, Rusch *et al.* 2004
Self-care	Washing and dressing	Hanass-Hancock *et al*. 2013, O'Brien and Nixon 2010, Gaidhane *et al.* 2008
Domestic life	Acquisition of goods and services, household chores and preparation of meals. Vigorous and moderate activities	Rusch *et al*. 2004
Interpersonal interactions and relationships	Intimate relationships and formal relationships	Rusch *et al.* 2004
Major life areas	Remunerative employment, economic self-sufficiency, and education	Hanass-Hancock *et al.* 2013, Myezwa *et al*. 2011
Community, social and civic life	Barriers in obtaining products for personal use and in using technology	Hanass-Hancock *et al.* 2013, Myezwa *et al.* 2011

Activity limitations and participation restrictions were noted in all the ICF domains (Table 4). Most studies (n= 7) reported on mobility-related activity limitations

(Hanass-Hancock *et al.* 2015, Hanass-Hancock *et al.* 2013, Kinirons *et al*. 2013, O'Brien and Nixon 2010, Anandan *et al.* 2006, Zonta *et al.* 2005, Rusch *et al.* 2004) and three studies reported self-care (Hanass-Hancock *et al*. 2013, O'Brien and Nixon 2010, Gaidhane *et al.* 2008). Mobility challenges identified included walking, lifting and carrying objects. Hanass-Hancock *et al.* (2015) linked the domain of mobility with anti-retroviral therapy adherence, showing that people who were not able to walk were predisposed to treatment failures. Few studies (n= 3) reported on participation restrictions (Hanass-Hancock *et al.* 2013, Myezwa *et al.* 2011; Rusch *et al.* 2004). A scoping review by Hancock *et al.* (2013) evaluating HIV-related disability in HIV hyper-endemic countries also found participation restrictions were the least reported. Participation restrictions identified in this review were in general tasks and demands, interpersonal interactions and relationships, domestic life and major life areas (Hancock *et al.* 2013). Results showed PLWHIV encountered difficulties in terms of sustaining meaningful Intimate and formal relationships (Rusch *et al.* 2004). Myezwa *et al*. (2011) reported the barriers in developing relationships were in terms of attitudes in the society such as stigma attached to living with the disease. Other participation restrictions reported were in terms of employability and education; accessing products and in using technology (Hanass-Hancock *et al.* 2013, Myezwa *et al*. 2011). Barriers in accessing products and in using technology were linked to impairments or activity limitations (Hanass-Hancock *et al.* 2013, Myezwa *et al*. 2011).

4.5 METHODOLOGICAL QUALITY

A scoping review synthesizes literature available in a particular topic with an aim of mapping the literature "to identify key concepts, gaps and types of evidence to advance practice, policy making, and research" (Arksey & O'Malley, 2005). As such methodological quality assessments of the synthesized studies are not a requirement (Arksey & O'Malley, 2005) but should be performed (Daudt *et al.* 2013).

The eligible studies fell into two research categories, that is observational studies and systematic reviews. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) and the Preferred Reporting Items for Systematic

reviews and Meta-Analyses (PRISMA) checklists were used to assess the methodological quality of the studies included in this review, findings are presented in Table 5 and Table 6 below.

Chapter 4 Table 5: PRISMA checklist for systematic reviews

PRISMA checklist scores		Brown et al. 2016	Hanass-Hancock et al. 2013
Title	1	+	+
Structured summary	2	+	+
Rationale	3	+	+
Objectives	4	+	+
Protocol and registration	5	+	-
Eligibility criteria	6	+	+
Information sources	7	+	+
Search	8	+	+
Study selection	9	+	+
Data collection process	10	+	+
Data items	11	+	+
Risk of bias in individual studies	12	+	-
Summary measures	13	+	-
Synthesis of results	14	+	-
Risk of bias across studies	15	+	-
Additional analyses	16	+	-
Study selection	17	+	+
Study characteristics	18	+	+
Risk of bias within studies	19	-	-
Results of individual studies	20	+	-
Synthesis of results	21	+	+
Risk of bias across studies	22	+	-
Additional analysis	23	+	-
Summary of evidence	24	+	+
Limitations	25	+	+
Conclusions	26	+	+
Funding	27	+	+
Total		**26/27**	**17/27**

-Items not present, + items found

There were two systematic reviews that reported on HIV-related disability. A systematic review by Brown *et al.* (2016) scored 26 out of 27 items and the second study (Hanass-Hancock *et al.* 2013) scored 17/27. Both studies omitted to report item 19 (risk of bias within studies). It is not clear whether the individual studies had checked for bias at all. However, Brown *et al.* (2016) assessed the risk of bias across those studies (item 22). Potential sources of biases in research include a number of processes such as the allocation, blinding (performance and detection

bias), selective reporting (reporting bias) and incomplete reporting of data (attrition bias) (O'Brien *et al.* 2016).

Chapter 4 Table 6: STROBE checklist for observational studies

	Item number	Myezwa *et al.* 2016	Hanass-Hancock *et al.* 2015	Kinirons *et al.* 2013	Pappin *et al.* 2012	Myezwa *et al.* 2011	O'Brien and Nixon, 2010	Gaidhane *et al.* 2008	Peltzer and Phaswana-Mafuya, 2008	Anandan *et al.* 2006	Zonta *et al.* 2005	Rusch *et al.* 2004
Title and abstract	1	+	+	+	+	+	+	+	-	-	-	+
Background/rationale	2	+	+	+	+	+	+	+	+	+	+	+
Objectives	3	+	+	+	+	+	-	+	-	+	+	+
Study design	4	+	+	+	+	+	+	+	+	-	+	+
Setting	5	+	+	+	+	+	+	+	+	+	+	+
Participants	6	+	+	+	+	+	+	+	+	+	+	+
Variables	7	+	+	+	+	+	+	+	+	+	+	+
Data sources/ measurement	8	+	+	+	+	+	+	+	+	+	+	+
Bias	9	+	-	-	-	-	-	-	-	-	-	-
Study size	10	+	-	+	-	-	+	-	-	-	-	-
Quantitative variables	11	+	+	+	+	+	+	+	+	+	+	+
Statistical methods	12	+	+	+	+	+	+	-	+	+	+	+
Participants	13	+	+	+	+	+	+	+	+	+	+	+
Descriptive data	14	+	+	+	+	+	+	+	+	+	+	+
Outcome data	15	+	+	+	+	+	+	+	+	+	+	+
Main results	16	+	+	+	+	-	+	-	+	-	-	+
Other analyses	17	+	+	+	+	-	+	-	+	+	+	+
Key results	18	+	+	+	+	+	+	+	+	+	+	+
Limitations	19	+	-	+	+	+	+	+	+	+	+	+
Interpretation	20	+	+	+	+	+	+	+	+	+	+	+
Generalisability	21	+	+	+	+	+	+	+	+	+	+	+
Funding	22	-	+	+	+	+	-	-	+	+	-	+
TOTAL		21	19	21	20	18	19	16	18	17	17	20

The data presented in Table 6 above shows the items reported by the eleven observational studies investigating HIV-related disability. Overall there was good compliance in reporting items on the STROBE checklist with a mean of 19. However, a majority of the studies (91%) did not report on item 9 which entails describing efforts made towards addressing potential sources of bias. Also, a large percentage

of the studies (73%) did not report Item 10 which explains how the researchers arrived at their sample size. The study by Gaidhane *et al*, (2008) scored the least on the STROBE checklist with an overall score of 16 out of a possible 22, followed by Anandan *et al.* (2006) and Zonta *et al*. (2004) with a score of 17 out of 22. These were earlier studies done before the STROBE checklist was developed. The findings possibly indicate advancement in observational research reporting in the era of STROBE checklist.

4.6 REHABILITATIVE INTERVENTIONS FOR HIV-RELATED DISABILITY

The second objective of this study was to describe rehabilitative intervention for HIV-related disability. This section presents the results of the studies selected for this objective.

4.6.1 Study designs

The comprehensive search for literature revealed 14 studies that investigated rehabilitative interventions for HIV-related disability. The studies used different research methods, as illustrated in Table 7. Most studies were systematic reviews (57%), followed by randomised control trials (29%) and observational studies (14%).

Chapter 4 Table 7: Study designs for Intervention studies

Study designs	Interventions
Systematic reviews	8
Randomised control trial	4
Observational studies	2
Total	**14**

The information that was significant for this study was extracted from the individual studies and presented below (Table 8) as guided by the objective of this study. Data extracted included details about the author, year of the study, aims, population and sample size, study design and key findings.

Chapter 4 Table 8: Studies reporting interventions (n= 14)

Author/ s	Aims	Population/ sample size	Study design	Key findings
O'Brien et al. 2017	To examine the safety and effectiveness of progressive resistive exercise interventions on immunological, virological, cardiorespiratory, strength, weight, body composition and psychological outcomes.	764 PLWHIV	Systematic review and meta-analysis	Improved outcomes in terms of cardio respiratory status, muscle strength, weight, and body composition.
Pullen, 2017	To examine pain outcomes in PLWHIV who had received physiotherapy for pain management.	46 PLWHIV	Descriptive study	Decrease in pain (65.2%, n=30), pain free (28.3%, n=13), no change (15.2%, n=7) and increased pain (6.5%, n=3)
O'Brien et al. 2016	To examine the safety and effectiveness of aerobic exercise interventions on immunological, virological, cardiorespiratory, strength, weight, body composition, and psychological outcomes.	936 PLWHIV	Systematic review and meta-analysis	Significant improvements in selected outcomes of cardiorespiratory status, strength, body composition, depression symptoms, and quality of life with exercise *versus* no exercise
Cobbing et al, 2016a	To assess the empirical evidence related to the effectiveness of home-based rehabilitation (HBR) interventions on the functional ability and quality of life of adults living with HIV.	285 PLWHIV	A scoping review	HBR intervention is safe for PHLWHI. Improvement in aerobic fitness and strength; no significant changes in immune status. Improvement in psychological parameters. Lack of evidence

Author/s	Aims	Population/ sample size	Study design	Key findings
Cobbing et al. 2016b	To assess the impact of a 16-week disability-inclusive HBR programme on the quality of life, perceived disability, functional capacity, and the mobility of adult PLWH	68 PLWHIV	Randomised control trial	Evidence in support of task-shifting in the physical rehabilitation of PLWHIV. Improvement in functional ability and QOL
Mkandla et al, 2016	To determine the effect of progressive resistance training on quality of life.	160 PLWHIV	Randomised clinical trial	Improved outcomes: HR-QOL and muscle strength
Gomes-Neto *et al.* 2015	To analyze RCTs investigating the effects of combined aerobic and resistance training (CARE) on peak oxygen consumption, muscle performance and quality of life.	386 PLWHIV	Systematic review and meta-analysis	Combined training Improves aerobic capacity, muscle strength, and HR-QOL. Significant improvement in health status, energy/ vitality and physical function domains of QOL.
Lopez *et al.* 2015	To summarise the findings on the effects of aerobic and resistance training alone or combined on disease progression, fitness, physical functioning, mental health, and quality of life.	478 PLWHIV	Systematic review	Aerobic training improves aerobic capacity, QOL and depressive symptoms. Resistance training improves muscle strength. Combined training improves aerobic fitness, muscle strength, physical functioning, QOL, and self-efficacy**.**
Paes *et al.* 2015	To investigate the influence of a two-year supervised exercise programme on body composition and muscle strength.	27 PLWHIV on HAART	Randomised control trial	Exercise training over a two-year period maintains muscle strength and mass, thus preventing sarcopenia and risks for physical disability.
Hamid and Rajah, 2015	To assess the effects of progressive resistance exercise programmes on self-reported health-related quality of life, body composition and muscle strength among patients with HIV.	29 PLWHIV	Randomised control trial	Group 2 showed significant improvements in the domain of mental health. Both groups- improved muscle strength. Positive effects on self-reported HR-QOL scores; No differences were found in the intervention group.

Author/s	Aims	Population/ sample size	Study design	Key findings
Cobbing *et al*. 2014	To explore and describe the experiences of patients living with HIV who participated in a rehabilitation programme.	Eight PLWHIV	Descriptive study	Improvement in activity limitations and participation restrictions following a combined exercise training programme.
Gomes-Neto et al. 2013	To determine the effects of different types of exercise on physiological and functional measurements in patients with HIV.	1195 PLWHIV	Systematic review	Improved outcomes: body composition (weight, mid-thigh cross-sectional muscle area, lean body mass, and bone mineral density) and muscle strength. Aerobic training improves body composition and aerobic capacity. Combined training improves body composition, muscle strength, aerobic capacity and quality of life.
Hillier et al. 2010	To examine the safety and effectiveness of massage therapy on quality of life, pain and immune system parameters in PLWHIV.	178 PLWHIV	Systematic review	Massage therapy in combination with other modalities (biofeedback stress reduction and meditation) improves the quality of life. Improved immunological markers (CD4 cell count and natural killer cells count); Significant reduction in depression.
O'Brien et al. 2008	To examine the safety and effectiveness of PRE interventions on immunological/ virological, cardiopulmonary, strength, weight and body composition and psychological outcomes.	332 PLWHIV	Systematic review and meta-analysis	Improved outcomes: weight and body composition, cardiopulmonary fitness, muscle strength, and psychological status. Meta-analysis showed a significant increase in body weight and HRQOL.

Three types of interventions were reported for HIV-related disability, namely exercise training, massage therapy, and home-based rehabilitation. One study reported on the effect of a physiotherapy intervention for chronic pain management (Pullen, 2017). The physiotherapy intervention included exercise, manual therapy, taping, and health education. A detailed analysis of the individual studies was undertaken and the results are presented in section 4.6.2

4.6.2 Studies evaluating exercise training

- O'Brien *et al.* (2017) reviewed 20 articles (n=764) and performed five meta-analyses. The results of the meta-analyses showed PRE, or a combined training performed three times a week for six weeks and lasting 20 minutes per session produced significant improvements in cardiorespiratory status, muscle strength, weight, and body composition (arm and thigh girth). The meta-analyses performed on studies that investigated body weight outcomes showed greater weight gain with PRE compared to aerobic and combined training. The overall findings on this systematic review and meta-analysis recommended combined training for maximal cardiovascular health and strength for PLWHIV. O'Brien *et al.* (2017) updated an earlier review (O'Brien *et al.* 2008)

- O'Brien *et al.* (2016) examined the safety and effectiveness of aerobic exercise interventions on immunological, virological, cardiorespiratory, strength, weight, body composition, and psychological outcomes. They reviewed 24 studies (n = 936 participants); 11 studies discussed aerobic exercise interventions and 13 studies reported on combined training and performed 58 meta-analyses. The results showed significant improvements in selected outcomes of cardiorespiratory status, strength, body composition, depression symptoms, and quality of life among exercisers compared with non-exercisers.

- Mkandla *et al.* (2016) evaluated the effects of a progressive resistance training (PRE) programme on health-related quality of life (HR-QoL). The intervention group received PRE intervention on the lower limbs while the control group got advice about engaging in normal activities. The intervention

lasted for 12 weeks. The results showed significant improvements in HR-QoL following the PRE training programme.

- Hamid and Rajah, (2015) compared the effects of PRE with the use of elastic resistance bands and PRE without elastic resistance bands (comparative group)., Both groups showed significant increase in the average and peak shoulder lift strength and positive effects on self-reported HR-QoL scores. A significant improvement in the domain of mental health was also reported in the comparative group.
- Lopez *et al.* (2015) reviewed 18 studies to examine the effect of exercise training on disease progression, fitness, and quality of life. The results showed that aerobic interventions improve cardiorespiratory fitness, quality of life and depressive symptoms. Combined training in addition to that, improves muscle strength, physical functioning, and self-efficacy.
- Paes *et al. (*2015) conducted a randomised control study investigating the effects of a two-year supervised exercise programme which included aerobic, strength and flexibility exercises. They showed that long-term aerobic training in PLWHIV maintains muscle mass and muscle performance. The reported aerobic training programmes entail the use of a cycle ergometer and/or walking and/or jogging in moderate to high intensities (that is 50% to 85% of the age-predicted heart rate) for an average of 45 minutes three times per week for the duration of 12 weeks.
- Gomes-Neto *et al*, (2015) reviewed seven studies evaluating combined exercise training interventions. The results showed that combined training improves aerobic capacity, muscle strength, and HR-QOL.
- Gomes-Neto *et al.* (2013) reviewed 29 studies. Eight studies were on PRE training, eight on aerobic exercise training, eleven on combined training and two compared aerobic and resistance training. Findings showed aerobic training improved body composition and aerobic capacity while the other types of training (PREand combined training) improved body composition outcomes and muscle strength.
- O'Brien *et al.* (2008) reviewed ten studies. The results showed a significant increase in body weight and muscle strength following PRE.

4.6.3 STUDY POPULATION

The selected studies evaluated the effects of a rehabilitative intervention in adult PLWHIV. The total population or sample size was 4892 (Table 8). The study with the largest population of 1195 participants was a systematic review by Gomes-Neto *et al.* (2013) and the study with the least number of participants was an observational study by Cobbing *et al.* (2014) with 8 participants. The systematic reviews had the largest number of participants (4554) with a mean of 569. Mkandla *et al,* (2016) had the largest population (160) in the RCTs, a total number of participants in the RCTs were 284 with a mean of 71. The two observational studies had a total of 54 participants with a mean of 27 (Table 8).

4.6.4 KEY FINDINGS

The interventions that evident in this review are outlined in Table 9.

Chapter 4 Table 9: Interventions for HIV-relate disability

Authors	Aerobic training	PRE	Combined training	Massage therapy	Home-based
O'Brien *et al.* 2017		✓	✓		
O'Brien *et al.* 2016	✓				
Mkandla ***et al.* 2016**		✓			
Cobbing *et al.* 2016a					✓
Cobbing *et. al.* 2016b					✓
Lopez *et al.* 2015			✓		
Gomes-Neto *et al.* 2015			✓		
Paes *et al.* 2015	✓		✓		
Hamid and Rajah, 2015		✓			
Gomes-Neto *et al.* 2013	✓				
Hillier *et al.* 2010				✓	
O'Brien *et al*. 2008	✓	✓			

Nine studies reported data on exercise-training interventions (Table 9). The three types of exercise-training interventions evaluated for effectiveness in adult PLWHIV were aerobic, progressive resistance and combined training. Massage therapy and other interventions offered via home-based rehabilitation model of care were the interventions found in this study. There were three exercise training interventions identified in the literature search (Table 9). The modality (what was done), duration

(how long), intensity (how easy or hard), frequency (how often) and the outcome (results) for each exercise training intervention are outlined in Table 10.

Chapter 4 Table 10: Exercise training programmes

Exercise type	Modality	Intensity	Duration	Frequency	Outcome	Authors
Aerobic training	Walking, jogging, treadmill, cycle ergometer,	50 to 85% of the HRmax	45 minutes for per session 12 weeks.	3 days/ week	↑aerobic capacity, HR-QOL, and symptoms of depression	O'Brien *et al.* 2016, Paes *et al.* 2015, Gomes-Neto *et al.* 2013
Progressive resistance training	Machine, weights, resistance bands	60 – 90% RM	At least 20 minutes per session for 6 weeks	3 days/ week	↑cardiorespiratory status, muscle strength, weight, and body composition	O'Brien *et al.* 2017, Mkandla *et al.* 2016, Hamid and Rajah, 2015 and O'Brien et al. 2008
Combined training	Combination of aerobic and resistance training modalities	60% to 80% of the RM, 1-4 s x6/ 18 reps 45% to 80% of the HRmax	60 – 120 minutes per session for 12 to 16 weeks	2-3 days/week	↑aerobic capacity, muscle strength, physical functioning, quality of life and self-efficacy	O'Brien *et al.* 2017, Lopez *et al.* 2015, Gomes-Neto *et al.* 2015, Gomes-Neto *et al.* 2013

4.6.4.1 Exercise-training Interventions

4.6.4.1.1 Aerobic exercise

Three studies investigated the effects of aerobic exercise training in PLWHIV (O'Brien *et al.* 2016, Paes *et al.* 2015, Gomes-Neto *et al*. 2013). The results showed significant improvements in selected outcomes of cardiorespiratory status, strength, body composition, depression symptoms, and quality of life (Table 10). The reported aerobic training programmes entailed the use of a cycle ergometer and/or walking and/or jogging in moderate to high intensities (that is 50% to 85% of the age-predicted heart rate), for an average of 45 minutes three times per week for the duration of 12 weeks.

4.6.4.1.2 Progressive resistance exercise

Four studies reviewed the effect of a progressive resistance exercise- (PRE) training programme (O'Brien *et al.* 2017, Mkandla *et al*. 2016, Hamid and Rajah, 2015, O'Brien *et al.* 2008). PRE improves the cardiorespiratory status, muscle strength, weight and body composition outcomes (Table 10). The meta-analyses performed on studies that investigated weight outcomes showed greater weight gain with PRE compared to aerobic and combined training (O'Brien *et al.* 2017). Findings from the two randomised control trials (Mkandla *et al.* 2016, Hamid and Rajah, 2015) showed significant improvements in health-related quality of life (HR-QOL) following a PRE training programme.

4.6.4.1.3 Combined exercise training

Four studies reviewed the effects of combined training (O'Brien *et al*. 2017, Lopez *et al.* 2015, Gomes-Neto *et al.* 2015, Gomes-Neto *et al.* 2013). Findings were an improvement in the aerobic capacity, muscle strength, physical functioning, quality of life and self-efficacy (Table 10). The combined training intervention in the four reviews was characterised by a resistance exercise component consisting of concentric and eccentric contractions lasting six to 10 seconds - with the use of machines, weight stations, and free weights. The intensity of the programme ranged from 60% to 80% of the repetitive maximum (RM), one to four sets of six to 18 repetitions. The training was done two to three times per week (mostly 3x) for a duration of 60 to 120 minutes for 12 to 16 weeks. The aerobic exercise component started with a warm-up period of five to 10 minutes, followed by a treadmill, bike, cycle ergometer, walking, or jogging with intensities ranging from 45% to 80% of the HRmax (Lopez *et al.* 2015, Gomes-Neto *et al*. 2015, Gomes-Neto *et al.* 2013, O'Brien *et al.* 2017). Gomes-Neto *et al.* (2013) recommended that the duration of a combined training programme be longer compared to the other forms of training and be conducted at a moderate intensity.

4.6.4.2 Study reporting on the massage therapy

The results showed one study that evaluated the effects of massage therapy in PLWHIV (Hillier *et al.* 2010). The aim of this systematic review was to examine the safety and effectiveness of massage therapy on quality of life, pain and immune

parameters in PLWHIV (Hillier *et al.* 2010). The review included four studies that evaluated massage therapy. The setting for the studies was either community or palliative care centres. The findings presented evidence supporting the use of massage in conjunction with other modalities (meditation and stress reduction) to improve the quality of life and to effect positive changes in immunological function.

4.6.4.3 Studies reporting on home-based rehabilitation

Two studies reviewed home-based rehabilitation (HBR), namely:-.

- Cobbing *et al.* (2016a) reviewed six studies that explored evidence related to HBR in PLWHIV. The results demonstrated that HBR interventions improved cardiorespiratory fitness, muscle strength, reduced waist circumference, and waist/hip ratios, significantly reduce pain and improve the domains of quality of life. The study reported a dearth of evidence on HBR intervention in PLWHIV.
- Cobbing *et al.* (2016b) reported the results of a randomised controlled trial evaluating the effects of a 16-week disability-inclusive HBR intervention on the quality of life, the perceived functional mobility associated with disability, and the functional capacity of adult PLWHIV. The participants in the intervention group of the study (n=38) received an individualised treatment programme by a trained community health worker once a week at their homes and at convenient times. Participants in the control group were given handouts with general tips on healthy living for people on ART, as well as on the standard of care offered to all PLWHIV. Findings from the intervention group showed significant improvements in both overall quality of life and the physical domain. Following HBR intervention, participants experienced fewer functional challenges and showed better outcomes compared to the control group. However, the changes were not statistically significant between the intervention and control groups.

4.6.5 OUTCOME MEASURES

Several outcome measures were investigated in the interventions described above. The outcomes measures evaluated muscle strength, quality of life, cardiorespiratory

fitness, body composition, immunology or virology, and psychological outcomes (Table 11).

Chapter 4 Table 11: Outcome measures

Authors	Quality of life	Muscle strength	Cardiorespiratory	Immunology/ Virology	Psychological outcome	Body composition	Pain	Functional outcomes
O'Brien *et al.* 2017		✓	✓	✓	✓	✓		
Pullen 2017							✓	
Cobbing *et al*. 2016a				✓				
Mkandla *et al.* 2016	✓	✓						
O'Brien *et al.* 2016		✓	✓	✓	✓	✓		
Gomes-Neto *et al.* 2015	✓	✓	✓					
Lopez *et al.* 2015	✓	✓	✓	✓	✓	✓		✓
Paes *et al.* 2015		✓				✓		
Hamid and Rajah, 2015	✓	✓				✓		
Gomes-Neto *et al*. 2013	✓	✓	✓			✓		
Hillier *et al.* 2010	✓			✓				
O'Brien *et al.* 2008		✓	✓		✓	✓		
Total	**6**	**9**	**6**	**5**	**4**	**7**	**1**	**1**

Muscle strength was evaluated using the one-repetition maximum (1RM) outcome measure in major muscle groups. Quality of life was assessed using one or a combination of the HRQOL, WHOQOL-BREF and MOS-HIV surveys. Body composition outcomes were assessed using anthropometric measurements (weight, height, waist and hip circumference). Cardiorespiratory outcomes were assessed using maximal oxygen consumption (VO2 max/ peak), heart rate maximum (HRmax) and the lactic acidosis threshold. Psychological outcomes were assessed using the Profile of Mood State (POMS) or both the Center for Epidemiological Studies-Depression Scale and POMS. Immunology or virology outcomes were assessed using the CD4+ cell count and viral load. Functional outcomes were assessed by the

Physical Performance Test (PPT) and the pain was evaluated using the numeral rating-scale outcome measure.

4.6.6 METHODOLOGICAL QUALITY ASSESSMENT

The methodological quality of the studies was assessed using relevant tools. The quality of RCTs was assessed using CONSORT 2010 (Table 12). PRISMA checklist was used for systematic review (Table 13) and the STROBE checklist was used for the observational studies (Table 14).

Chapter 4 Table 12: CONSORT 2010 checklist for randomised control trials

CONSORT 2010 checklist	Cobbing *et al.* 2016b	Mkandla *et al.* 2016	Paes *et al.* 2015	Hamid and Rajah, 2015
Title and Abstracts 1a 1b	+ +	- +	- +	- +
Background and Objectives 2a 2b	+ +	+ -	+ +	+ +
Trial Design 3a 3b	+ +	+ -	+ +	+ +
Participants 4a 4b	+ +	+ +	+ +	+ +
Interventions 5	+	+	+	+
Outcomes 6a 6b	+ +	+ +	+ +	+ +
Sample size 7a 7b	+ +	+ +	- +	+ +
Randomisation : 8a 8b	+ +	+ +	- -	+ +
Allocation concealment 9	+	-	-	+
Mechanism implementation 10	+	-	-	-
Blinding 11a 11b	+ +	+ +	- -	- -
Statistical methods12a 12b	+ +	+ +	+ -	+ +
Results: Flow diagram13a 13b	+ +	+ +	+ +	- -
Recruitment14a 14b	+ +	+ +	+ +	+ +
Baseline data 15	+	+	+	+
Numbers analysed 16	+	+	+	+
Outcomes and estimation17a 17b	+ +	+ +	+ +	- -
Ancillary analyses 18	+	+	+	-
Harms 19	+	-	+	-
Discussion: Limitations 20	+	+	+	+
Generalisability 21	+	+	+	+
Interpretation 22	+	+	+	+
Registration 23	+	-	+	+
Protocol 24	-	-	-	-
Funding 25	+	-	+	+
Total	**24/25**	**18/25**	**18/25**	**17/25**

Key + = item present , - = item not available

Methodological quality assessment done for the four RCTs revealed the CONSORT checklist scores ranged from 17/25 to 24/25. None of the four studies provided details about the protocol (item 24); three did not identify the paper in the title as a randomised control trial (item 1), and the mechanism implementation (item 10) was

not discussed. Two studies did not provide information pertaining to blinding (item 9) and harms (item 19).

Chapter 4 Table 13: PRISMA checklist for systematic reviews

PRISMA checklist scores		**O'Brien *et al.* 2017**	**O'Brien *et al.* 2016**	**Cobbing *et al.* 2016a**	**Gomes-Neto *et al.* 2015**	**Lopez *et al.* 2015**	**Gomes-Neto *et al.* 2013**	**O'Brien *et al.* 2013**	**Hillier *et al.* 2010**	**O'Brien *et al.* 2008**	**Total**
Title	1	+	+	+	+	+	+	+	+	+	9
Structured summary	2	+	+	+	+	+	+	+	+	+	9
Rationale	3	+	+	+	+	+	+	+	+	+	9
Objectives	4	+	+	+	+	+	+	+	+	+	9
Protocol and registration	5	+	+	-	-	-	-	+	-	+	3
Eligibility criteria	6	+	+	+	+	+	+	+	+	+	9
Information sources	7	+	+	+	+	+	+	+	+	+	9
Search	8	+	+	+	+	+	+	+	+	+	9
Study selection	9	+	+	+	+	+	+	+	+	+	9
Data collection process	10	+	+	+	+	+	+	+	+	+	9
Data items	11	+	+	+	+	+	+	+	+	+	9
Risk of bias in individual studies	12	+	+	-	+	+	+	+	+	+	8
Summary measures	13	+	+	-	+	-	-	+	+	+	6
Synthesis of results	14	+	+	-	+	+	+	+	+	+	8
Risk of bias across studies	15	+	+	-	+	+	-	+	+	-	6
Additional analyses	16	+	+	-	+	-	-	+	+	+	6
Study selection	17	+	+	+	+	+	+	+	+	+	9
Study characteristics	18	+	+	+	+	+	+	+	+	+	9
Risk of bias within studies	19	+	+	-	+	-	-	+	+	+	6
Results of individual studies	20	+	+	-	+	+	+	+	+	+	8
Synthesis of results	21	+	+	-	+	-	-	+	+	+	6
Risk of bias across studies	22	+	+	-	+	-	-	+	+	-	5
Additional analysis	23	+	+	-	-	-	-	+	+	+	5
Summary of evidence	24	+	+	+	+	+	+	+	+	+	9
Limitations	25	+	+	+	+	+	+	+	+	+	9
Conclusions	26	+	+	+	+	+	+	+	+	+	9
Funding	27	+	+	+	+	-	-	+	+	+	9
Total		**27/27**	**27/27**	**16/27**	**25/27**	**20/27**	**18/27**	**27/27**	**27/27**	**26/27**	

Key + = item present , - = item not available

The results show that four studies complied fully with all the items on the PRISMA checklist **(**O'Brien *et al.* 2017, O'Brien *et al.* 2016; O'Brien *et al.* 2013; Hillier *et al.* 2010). One study (O'Brien *et al.* 2008) missed item 22 (Risk of bias across studies), scoring 26/27. Cobbing *et al.* (2016a) had the lowest score of 16/27, possibly

because the study was a scoping review. Item 5 (protocol and registration) was not reported by six of the studies. Four studies Cobbing *et al.* 2016a, Lopez *et al.* 2015, Gomes-Neto *et al.* 2013, O'Brien *et al.* 2008) did not report on item 22 (risk of bias across studies) and item 23 (additional analyses).

Chapter 4 Table 14: STROBE checklist for observational studies

Authors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Total
Pullen *et al.* 2017	+	+	+	+	+	+	+	+	-	+	+	-	+	+	+	+	-	+	+	+	+	+	19/22
Cobbing *et al.* 2014	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	21/22

Key + = item present , - = item not available

Neither of the two observational studies reported on item 9 (Bias) on the STROBE checklist, which entails describing efforts to address potential sources of bias. Additionally, Pullen *et al.* (2017) did not report on item 12 (Statistical methods) and item 17 (Other analyses). It is important that observational research presents all the statistical methods used to examine subgroups, explain missing data, analytical methods and describe any sensitivity analyses (Cuschieri, 2019; von Elm *et al.* 2007).

4.7 CONCLUSION

The study selection process led to 27 studies being selected for this scoping review. Thirteen of the studies reported on the first objective (to describe HIV-related disability) and 14 studies reported on the second objective (to identify rehabilitative interventions). Most studies describing HIV-related disability were observational studies, and the eligible studies that reported interventions were largely systematic reviews. At body functioning level, HIV-related disability was found to affect function at multiple levels, to limit levels of activity (walking, toileting), and to lead to participation restrictions (employment, relationships) The rehabilitative interventions that were evident included three different types of exercise- training interventions (aerobic, progressive resistance and a combination of the two) and massage

therapy. These interventions were offered at the institution and as part of home-based rehabilitation. The findings of the methodological quality assessments of the eligible studies were presented. A discussion of the results is presented in the next chapter.

CHAPTER FIVE

DISCUSSION

5.1 INTRODUCTION

In this chapter, the results outlined in Chapter 4 of this scoping review are discussed. The objectives of this review were to describe HIV-related disability and to identify rehabilitative interventions in relation thereof. The findings are discussed against these objectives. The methodological quality assessments performed, HIV-related disability and the rehabilitative interventions are also discussed.

The discussion is divided into two sections: HIV-related disability and the related interventions.

5.2 HIV- RELATED DISABILITY

5.2.1 Study Characteristics

The purpose of a scoping review is to map current evidence on a specific topic that has not been reviewed (Arksey & O'Malley, 2005). A previous scoping review in HIV-related disability only mapped the extent, nature, and range of HIV-related disability experienced by PLWHIV (Hanass-Hancock *et al*. 2013). This scoping review has mapped the most recent evidence on HIV-related disability and has identified rehabilitative interventions for HIV-related disability. With the increase in the prevalence of disabilities, there is a growing need to strengthen rehabilitation services. The evidence identified can be used to develop a comprehensive disability management programme for people living with HIV (PLWHIV).

The current scoping review looked at global evidence in contrast to the scoping review by Hanass-Hancock *et al.* (2013) which focused only on evidence from hyper-endemic regions, namely South Africa, Botswana, Lesotho, Zimbabwe, and Swaziland. Although the review study by Hanass-Hancock *et al.* (2013) provided rigorous evidence on HIV-related disability in hyper-endemic regions, there is value

in understanding the global picture of HIV-related disability and the available interventions to manage these disabilities.

Compared to the scoping study by Hanass-Hancock *et al*. (2013), which reviewed 41 studies, the current study reviewed 13 studies. A study by Hanass-Hancock *et al*. (2013) is included in this scoping review which could explain the small number of studies that were eligible for this review. In both scoping reviews, the studies included were mostly cross-sectional studies: 69% in this study and 73% in the study by Hanass-Hancock *et al*. (2013).

The methodology of the studies is determined based on the aims and objectives of the study. The cross-sectional studies identified reported the prevalence and outcomes of disability findings among PLWHIV. It is not surprising that most of the studies (nine) were cross-sectional studies. Cross-sectional studies are useful in determining the prevalence and can assess multiple outcomes, although they are limited in that they do not discuss the cause and the effect of the disabilities (Mann, 2003).

The review included two cohort studies that reported from the same sample of patients (Myezwa *et al,* 2016; Hanass-Hancock *et al,* 2015). Since Cohort studies are generally used to investigate the incidence, causes, and prognosis of a disease or condition (Mann, 2003), the first cohort study measured disability (activity limitation) in relation to other indicators (health, adherence to treatment, and livelihood) (Hanass-Hancock *et al,* 2015), while the second study investigated the association between disability and depression (Myezwa *et al,* 2016). The advantage of using an already existing cohort is that it minimises bias as the study was not initially purposed for the data collected. However, a limitation is that the relevant information may not have been collected rigorously (Mann, 2003).

The evidence presented in this scoping study is from studies that evaluated adult men and women living with HIV. The sample size ranged from 1 to 38518 with an average of 4911 participants, which suggests that the evidence is representative of the population living with HIV.

5.3 KEY FINDINGS

The results showed that HIV-related disability occurs at the body structure and functioning level, which, as described in the International Classification of

Functioning, Disability and Health Framework (ICF) conceptual model (WHO, 2001), limits the ability to engage in day-to-day activities and participation in life situations. These findings further confirmed that the ICF model is a suitable tool for describing disability. The ICF describes disability as occurring at the impairment level (e.g. painful limbs, anxiety, and depression), limiting activity (e.g. walking, household chores, and self-care) and participation levels (e.g. ability to. work, study, and engage in and sustain relationships) (Hanass-Hancock and Nixon, 2009; WHO, 2001). The presence of impairments is not surprising as the HIV is known to attack and destroy the CD4+ T-cells, which mediate the immune responses against infection, causing immunodeficiency which predisposes PLWHIV to other infections and diseases (Vidya-Vijayan *et al,* 2017; Okoye and Picker, 2013; Hillier *et al,* 2010). The impairments and the resulting functional limitations are discussed below in terms of the studies reviewed. The body impairments in different areas include mental functions, movement-related functions, sensory functions, functions of the digestive, metabolic and endocrine systems, cardiovascular and respiratory systems.

5.3.1 Mental functions

Most of the studies (62%, n= 8) reported mental functional impairments (Myezwa *et al.* 2016, Hanass-Hancock *et al.* 2015, Hanass-Hancock *et al.* 2013, Pappin *et al*. 2012, Myezwa *et al.* 2011, Peltzer and Phaswana-Mafuya 2008, Anandan *et al.* 2006 and Rusch *et al*. 2004). Niu *et al.* (2016) reviewed the literature on the mental health aspects of PLWHIV in China. The results showed that the prevalence of anxiety and depression was over 40% and 60% respectively. A systematic review evaluating HIV/AIDS and mental health in Sub-Saharan Africa found the prevalence of mental health aspects ranged from 5% to 83% in different countries due to the different tools used to assess the prevalence and the population assessed (Breuer *et al.* 2011). Mental functions have to do with a level of consciousness, orientation (to time, place and person), intellectual abilities, high-level cognitive functions, language, energy and drive functions, sleep, attention, memory, emotional and perceptual functions (WHO: ICF Checklist, 2003). The National Mental Health Policy Framework and Strategic Plan (2013-2020) defines mental health as having the ability from early childhood until later on in life to carry out productive activities, having meaningful relationships, possessing adaptation skills and coping strategies. In order to make a diagnosis of a mental disorder, a group of particular symptoms must be present such

as feelings of sadness, loss of interest, suicidal thoughts, loss of appetite or weight, sleeping problems and poor concentration resulting in impairments or significant distress (Jonsson *et al*. 2013).

The findings of this scoping review revealed that depression and anxiety are common mental dysfunctions in PLWHIV, followed by fatigue, dementia, and impairments in cognitive-motor abilities (Hanass-Hancock *et al.* 2013; Papin *et al.* 2012; Myezwa *et al.* 2011; Peltzer and Phaswana-Mafuya, 2008; Anandan *et al.* 2006; Rusch *et al.* 2004). The coexistence of mental health problems and HIV is not a new phenomenon; Adams *et al.* (2016) reported on mental health problems in PLWHIV from a period ranging from 1990 to 2014.

Globally, 300 million people are estimated to have depression (WHO, 2018). People living with HIV (PLWHIV) have a two-fold greater prevalence for major depressive disorder than the general population (Jonsson *et al*. 2013). Depression in PLWHIV is associated with an altered immune response or it may be a result of the neurochemical imbalance in serotonin, dopamine, and noradrenaline (Rivera-Rivera, Vázquez-Santiago *et al.* 2016). Certain ART drugs such as efavirenz, stavudine, zidovudine, and abacavir are associated with neuropsychiatric complications (Gaida *et al*. 2015; Abers *et al.* 2014). However, the relationship between ART and mental dysfunctions is unclear (Rivera-Rivera, Vázquez-Santiago *et al.* 2016).

Depressive disorders are characterised by the presence of symptoms such as feelings of emptiness, sadness and irritability, with specific cognitive and somatic symptoms (Mania *et al,* 2016), whereas anxiety disorders present with excessive fear, anxious anticipation, increasing levels of tension and changes in behavior such as avoidance of stimuli or situations that trigger anxiety (Mania *et al,* 2016). Perazzo *et al.* (2015) found a strong association between mental health dysfunctions and fatigue intensity. In HIV, fatigue is often not linked to exertion (Ferrando *et al,* 1998) but associated with mental dysfunctions (sleep disturbances, anxiety, and depression), functional morbidity and poor quality of life (Perazzo *et al.* 2017; Myezwa *et al.* 2011; Low *et al,* 2011). Perazzo *et al.* (2017) defined fatigue as an acute or chronic symptom characterized by physical and/or psychological exhaustion associated with deficiencies in nutrients, high resting metabolic rates, endocrinal

dysfunction, and anaemia. Anaemia is a medical condition that reduces the ability of the body to carry oxygen to the tissues. The body is then unable to meet the oxygen demand, and fatigue ensues (Perazzo *et al.* 2017). These effects would impact on an individual's exercise tolerance. Therapists need, therefore, to assess exertion levels and prescribe exercise based on the patient's capacity.

A systematic review and meta-analysis (Vancampfort *et al.* 2016) investigating the prevalence and predictors of treatment dropout in exercise interventions found that PLWHIV had a higher dropout from exercise interventions than populations with chronic morbidities. To improve adherence to the exercise interventions, Vancampfort *et al.* (2016) recommended that supervised exercise interventions be prescribed by qualified professionals (i.e., exercise physiologists, physical educators, or physical therapists). It is important that the therapists who manage PLWHIV know how to prescribe exercises. Grace *et al*, (2015) provided a practical guideline for exercise prescription in PLWHIV. The authors recommend that exercise interventions be done three times weekly on alternate days in 30 to 60-minute sessions to improve quality of life, endurance, neuromuscular function, reduce the risk of cardiometabolic disease, and promote long-term exercise compliance. Aerobic training should incorporate any of the following: running, walking, swimming, circuit training, and cycling at moderate intensity (40-60% heart rate maximum) (O'Brien *et al.* 2016, Paes *et al.* 2015, Gomes-Neto *et al.* 2013). Progressive resistance training should entail weights, cables/ pulleys/ resistance bands, body weight, and plyometrics (O'Brien *et al.* 2017, Mkandla *et al.* 2016, Hamid and Rajah, 2015), starting at moderate intensities of 50 to 60% 1 RM and increase to about 75 - 80% 1 RM after four to 12 weeks of training (Grace *et al.* 2015).

5.3.2 Movement-related functions

Findings from 62% (n= 8) of the selected studies further identified that HIV infection affects the neuromusculoskeletal system (Myezwa *et al*. 2016; Hanass-Hancock *et al. 2013*; Cobbing *et al.* 2013; Kinirons *et al*. 2013; Myezwa *et al.* 2011; O'Brien and Nixon 2010, Peltzer and Phaswana-Mafuya 2008; Anandan *et al.* 2006, Rusch *et al.* 2004, Zonta *et al.* 2005). The findings showed a loss of muscle power, joint stiffness, and muscle and joint aches, as common conditions among PLWHIV (Cobbing *et al*. 2013; Hanass-Hancock *et al.* 2013; Kinirons *et al.* 2013; Myezwa *et al*. 2011; O'Brien and Nixon 2010; Peltzer and Phaswana-Mafuya, 2008; Anandan *et al.* 2006; Zonta

et al. 2005; Rusch *et al.* 2004). In a study by van As *et al.* (2009), 27% of the participants presented with reduced muscle strength. Similarly, Oliveira *et al.* (2018) found reduced muscle strength in PLWHIV. The neuromusculoskeletal manifestations occur at any phase of HIV infection and are caused by the HIV infection itself and ART drugs (Pullen, 2014). The low quality of the muscle, on account of increased fatty infiltrations, has been reported as a risk factor for the development of disability among PWLHIV (Natsag *et al,* 2017).

The case study by Pullen *et al,* (2017) of a patient presenting with pain, weakness, and decreased endurance (shortness of breath on mild exertion) and fatigue, showed improvements in pain, muscle strength and endurance following a 12-week intervention. The intervention included massage therapy, aerobic exercise, and resistive exercise done three times weekly for 30 minutes on alternate days. Although the findings reflect the outcome of an individual, they are promising. The presence of the neuromusculoskeletal conditions among PLWHIV indicates that rehabilitation is an area of priority for PLWHIV.

5.3.3 Sensory functions

Sensory impairments were reported in 54% (n= 7) of the studies evaluating HIV-related disability (Mkandla *et al.* 2016, Hanass-Hancock *et al.* 2013, O'Brien and Nixon 2010, Peltzer and Phaswana-Mafuya 2008, Anandan *et al.* 2006, Zonta *et al.* 2005, Rusch *et al.* 2004) with parasthesia and pain, generally associated with a diagnosis of peripheral neuropathy being the most commonly reported neurological complications (Mkandla *et al.* 2016 Hanass-Hancock *et al.* 2013, O'Brien and Nixon 2010, Anandan *et al.* 2006, Zonta *et al.* 2005; Rusch *et al.* 2004). Other researchers have investigated the prevalence of neuropathies among PLWHIV. Tumusiime *et al.* (2014) found a 59% prevalence of peripheral neuropathy among PLWHIV. Similarly, Galantino *et al.* (2014) reported a 67% prevalence of HIV-related distal sensory polyneuropathy among PLWHIV.

Paraesthesia is a sensation of burning, numbness, tingling, itching or prickling, largely affecting the extremities (hands and feet). HIV infection on the perineuronal cells of the somatosensory ganglia reduces the neuronal density and the epidermal nerve fibre density and alters the C-fibre conduction properties (Mangus *et al.* 2014). Additionally, the side effects of ART contribute to neurological complications (Prior *et*

al. 2018, Gaida *et al*. 2015, Abers *et al.* 2014), particularly in the case of dideoxynucleoside analogues also known as d-drugs (stavudine, didanosine, and zalcitabine), which cause neuropathy via mitochondrial toxicity (Adem *et al.* 2019, Robinson-Papp and Simpson 2009) or by inhibition of mitochondrial DNA polymerase (Abers *et al.* 2014).

HIV-related neuropathies are associated with functional limitations and reduced quality of life in adult PLWHIV (Saylor *et al.* 2017; Galantino *et al*. 2014; Biraguma and Rhoda, 2012). Psychotherapy, physiotherapy and pharmacological interventions, tailored to the individual needs are recommended by the clinical practice guidelines for management of neuropathic pain in South Africa (Chetty *et al*, 2012). Pillay *et al*, (2015) found that 66% of the participants were on analgesics as recommended by the guideline; however 90% of their sample still experienced moderate or severe pain. There is a need for an effective pain management regime for HIV-associated sensory neuropathy that includes the different options as recommended by the guideline (Pillay *et al*, 2015). The finding support a multidisciplinary approach to management of HIV- related neuropathies. PLWHIV should be screened for HIV-related neuropathy and initiated on pharmacological treatment and rehabilitation programmes to prevent disablement.

The findings also revealed pain as a symptom in the form of headache, painful joints, muscle aches, abdominal pain, chest, and breast pain (Hanass-Hancock *et al.* 2013, Kinirons *et al.* 2013, Myezwa *et al.* 2011; O'Brien and Nixon, 2010; Peltzer and Phaswana-Mafuya, 2008, Anandan *et al.* 2006). Similarly, Mphahlele *et al. (*2014) reported pain symptom at multiple sites with head, chest and feet.being the most commonly affected. The prevalence of pain in South Africa ranges from 54 to 91% among PLWHIV (Parker *et al.* 2017, Parker *et al.* 2014; Narasimooloo *et al.* 2011). Other studies revealed that the pain symptom among PLWHIV was not adequately managed (Parker *et al.* 2017, Parker *et al.* 2014; Mphahlele *et al.* 2014; Narasimooloo *et al.* 2011). This is a matter for concern as pain has been linked with disabling effects such as activity limitations (Vancampfort *et al,* 2017; Parker *et al.* 2017; Merlin *et al.* 2013; Narasimooloo *et al.* 2011), low self-efficacy (Parker *et al.*

2017), depression (Parker *et al.* 2017), inability to work (Nair *et al.* 2009), and a lower health-related quality of life (Hanass-Hancock *et al.* 2017, Parker *et al.* 2017; Miners *et al.* 2014, Nair *et al.* 2009). The pain was experienced at multiple sites and with different intensities (Wardley *et al.* 2019; Parker *et al.* 2014; Mphahlele *et al.* 2014), which could also explain the challenges in pain management.

A systematic review by Merlin *et al,* (2016) examined the impact of pharmacological or non- pharmacological interventions on pain and the functional outcomes among PLWHIV. The results showed only eleven studies of low to moderate health-related quality of life met the study inclusion criteria, which is surprising considering the high prevalence of pain that is reported among PLWHIV. Most of the studies (seven) included in the review examined pharmacological interventions. Four studies reported non-pharmacological interventions such as cognitive behavioural therapy, self-hypnosis, and smoked cannabis. The outcome of the study showed that there was insufficient evidence to inform practice. Mphahlele *et al,* (2014) reported a significant reduction in pain (moderate to severe) over a six month period despite adequate analgesic prescription. Although the reasons for the results were unclear, they attributed them to a “care-effect”. The finding indicates that interaction with caring health care workers can have positive outcomes on the pain experienced by patients.

It is evident that pain management should be prioritised among PLWHIV. Routine screening for pain in PLWHIV would better facilitate the management of pain as a symptom. The therapist needs to be cognisant of the impacts of pain and that there may be more than one cause of pain. A careful assessment of the pain symptom will point to the relevant interferences.

5.3.4 Functions of the digestive, metabolic and endocrine systems

The results revealed problems with weight maintenance, obesity, high blood pressure, and diabetes as common in PLWHIV (Hanass-Hancock *et al.* 2013; Myezwa *et al.* 2011). A recent study of 862 PLWHIV on ART attending an HIV outpatient unit found 22% (n=191) were overweight and 5% (n=46) were obese (Obry-Roguet *et al,* 2018). Lake, (2017) associated weight gain with initiation into ART. These findings can be explained in terms of lipodystrophy, a condition

characterised by an increase in visceral fat and an accumulation of fat in the back, neck, and chest areas, while subcutaneous fat in the face, arms, and buttocks is reduced (Ortiz, 2014). Lipodystrophy is caused by physical and metabolic changes on account of HIV infection (Ortiz, 2014) and is associated with low levels of physical activity (Vancampfort *et al,* 2017, Jaggers *et al.* 2014). PLWHIV have low physical activity levels compared to any other population group with chronic disease. Vancampfort et al, (2016) consider PLWHIV to be higher risks for cardiovascular disease (Obry-Roguet *et al,* 2018; Lake, 2017; Akil *et al.* 2011). Further, Biraguma *et al.* (2018) found that both low levels of physical activity and hypertension are associated with a low health-related quality of life (HR-QOL). Jaggers *et al.* (2014) found that moderate physical activity among PLWHIV is associated with a reduction in waist circumference and metabolic improvements. A case study by Mendes *et al.* (2011) showed metabolic improvements in a person living with HIV and presenting with lipodystrophy following a 12-week exercise programme. The findings suggest that interventions promoting physical activity are warranted.

5.3.5 Functions of the cardiovascular, haematological, immunological and respiratory systems

Findings identified breathlessness, cough and hypertension were the most prevalent respiratory and cardiovascular dysfunctions (Brown *et al.* 2016; Hanass-Hancock *et al.* 2013; Anandan *et al.* 2006). PLWHIV are more prone to developing respiratory symptoms than the entire population (Brown *et al.* 2016). Brown *et al.* (2017) assessed the symptom of breathlessness among adult PLWHIV on ART, and the results showed 25% had unexplained breathlessness compared to the 11% who were HIV-negative participants. Similarly, Gingo *et al,* (2010) found that 64% of the total (167) participants in the study had respiratory symptoms; dyspnea and cough were the common respiratory symptoms among PLWHIV.

Hanass-Hancock *et al.* (2013) attributed the respiratory symptoms of breathlessness and cough to tuberculosis (TB), a public health challenge worldwide with10.4 million new cases per annum reported globally (Gjergji *et al,* 2017). PLWHIV are at a higher risk of contracting TB because of the suppressed immune system on account of HIV. The changes observed in the lung tissue such as cavitation formation, necrosis, and fibrosis, due to TB infection, reduce the lung function capacity (Dheda *et al.* 2005). These changes are accountable for the symptoms of breathless and cough. A

systematic review and meta-analysis looking at the global statistics for TB admissions and in-hospital mortalities found that 18% of hospital admissions were because of TB and the mortalities attributable to TB were 25% (Ford *et al,* 2016). These mortalities were related to TB, not HIV.

The symptom of breathlessness was linked with functional limitations and low health-related quality of life (Brown *et al.* 2017; Aweto *et al;* 2016; Brown *et al.* 2015; Masumoto *et al.* 2014). Pullen *et al.* (2017) showed that exercise-training intervention improves endurance in a patient complaining of shortness of breath on mild exertion. The effects of exercise interventions on cardiorespiratory functions are discussed under the section, “Intervention for HIV-related disability”. The findings of a high prevalence of breathlessness suggest a need for a rehabilitative intervention among PLWHIV that would be designed to improve the functional capacity.

The results further showed that hypertension was common among PLWHIV (Brown *et al.* 2016; Hanass-Hancock *et al.* 2013; Anandan *et al.* 2006). A similar finding was reported by a systematic review and meta-analysis evaluating the global prevalence of hypertension among PLWHIV (Xu *et al.* 2017). The results showed an overall 25% prevalence of hypertension, with the prevalence being higher for people on ART (34.7%) compared to 12.7% in ART-naïve participants (Xu *et al.* 2017). HIV-related hypertension occurs because of the changes in blood vessels mediated by the HIV itself and owing to lipid metabolism and increased oxidative stress in the endothelial cells caused by ART (Calò *et al,* 2013). Islam *et al.* (2012) estimated the risk for cardiovascular disease to be twice as high for those on ART compared to those, not on ART and 61% higher than the risk for this disease in HIV-uninfected people. Hypertension is a chronic medical condition associated with cardiovascular and cerebrovascular diseases (Xu *et al.* 2017). In HIV, hypertension is associated with ART in addition to other factors such as advancing age and obesity (Lima *et al*. 2017; Xu *et al.* 2017). Evidence points towards a need to screen and manage risk factors for hypertension among PLWHIV.

Although ART has been effective in restoring immune function, reversing AIDS-defining events and reducing AIDS-related mortality rates (Islam *et al*. 2012), the side effects of medication contribute to a disability burden (Xu *et al.* 2017; Khan *et al*. 2014; Vella *et al.* 2012; Hanass-Hancock *et al.* 2009). As the life expectancy of PLWHIV on ART increases, the literature suggests that the morbidities due to ART will also increase. Interventions for PLWHIV should include preventative (addressing identified health risks or threat) and rehabilitative strategies to address the impairments reported in this study. Further impacts of HIV on other systems are recorded and related in the next paragraph. As discussed, the presence of impairments leads to limitations in activity and participation.

5.3.6 Activity limitations and participation restrictions

The study showed that PLWHIV present with multiple impairments associated with activity limitations and participation restrictions (Myezwa *et al.* 2016; Hanass-Hancock *et al*. 2015; Kinirons *et al.* 2013; Gaidhane *et al.* 2008; Anandan *et al.* 2006; Rusch *et al.* 2004). The ICF links impairments with activity limitations and participation restrictions (WHO, 2001). Common activity limitations identified were inability to walk, to carry out activities of daily living such as washing oneself, toileting, lifting and carrying objects, using transportation, doing multiple tasks independently, household chores and preparation of meals (Hanass-Hancock *et al.* 2015; Hanass-Hancock *et al.* 2013; O'Brien and Nixon 2010; Gaidhane *et al.* 2008). The study further showed that HIV-related disability has an impact on participation as it affects remunerative employment and economic self-sufficiency (Hanass-Hancock *et al*. 2013; Myezwa *et al.* 2011), intimate relationships and formal relationships (Rusch *et al.* 2004).

According to the ICF description of disability (WHO, 2001), impairments would of necessity result in activity limitations and participation restrictions. Previous studies have reviewed the relationship between impairments and activity limitations apart from the resulting disability. Depression is also associated with impairment, the limitation of activity and the eventual restriction of participation (Vancampfort *et al,* 2017; Myezwa *et al.* 2016; Serres *et al.*1998). A study by Fernando et al. (1998)

investigated the associations between fatigue and depression, physical limitations, and disability. They found that fatigue predicts physical limitations. The pathophysiology of fatigue in the absence of depression differed from that associated with depression (Ferrando, Evans *et al*. 1998).

Merlin *et al.* (2013) showed that pain increases the odds of presenting with functional limitations. However, the pathways of impairments to activity limitation are different. For instance, a person with a neuromusculoskeletal impairment such as muscle weakness or joint stiffness will present with functional limitations. But the pathways to functional limitations will differ from those of a person with depression. In a study by Penninx *et al,* (1990) that evaluated the effect of depression on physical disability in a cohort of older people, the results showed that older people with depression are more likely to develop a disability in activities of daily living and mobility. Depression, on the other hand, is associated with sociodemographic features (family support, marital status, social contacts, level of education and income) and the presence of co-morbid conditions such as arthritis (Penninx *et al,* 1990). Sociodemographic features are further associated with poor health-related quality of life (Hyejin Park and Kisok Kim, 2018). Additionally, the findings are not surprising. The lack of mobility in depression, for instance, leads to neuromusculoskeletal dysfunctions such as increased joint stiffness and the loss of muscle power. These factors affect the levels of participation (such as employment and relationships) and ultimately the patient's quality of life.

The knowledge of the different pathways of impairments resulting in functional limitation is important for rehabilitation as it identifies the point where rehabilitative interventions should start. Thorough assessments of patients will indicate the pathways that lead to disability. Rehabilitation personnel must be clear on the impairment pathways to deliver an effective intervention. This has an impact on the resources to be put in place and the services to be implemented.

5.3 METHODOLOGICAL QUALITY OF THE SELECTED STUDIES

5.3.1 Observational studies

The findings identified eleven studies that used observational research methods to investigate HIV-related disability. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist was used to assess the completeness of reporting of these studies. The results showed compliance in reporting (average 86%) of the items listed in the STROBE checklist. The incompleteness of reporting was noted in terms of some of the key items such as bias and explanations as to how the researchers arrived at the study size. The risk of bias is important as it impacts on the extent of the validity of the results (Viswanathan *et al.* 2012; Liberati *et al*. 2009). As a result, the findings needed to be interpreted with caution. The overall findings indicate the reporting of observational research has advanced over the years since the introduction of the STROBE checklist.

5.3.2 Systematic reviews

Two systematic reviews were assessed using the PRISMA checklist. Brown *et al.* (2016) scored 26 out of 27 items and the second study scored 17/27 (Hanass-Hancock *et al.* 2013). Both studies omitted to report on the risk of bias within the studies (item 19). The study by Hanass-Hancock *et al.* (2013) is a scoping review. Certain items in the PRISMA checklist such as the risk of bias assessments (items 15 and 22), summary measures (item 13), additional analyses (items 16 and 23), are not applicable to a scoping review (Tricco *et al,* 2018). These five items contributed to a final score for Hanass-Hancock *et al*. (2013) being 17/27. The risk of bias is important in a systematic review because it affects the extent of the validity of the results (Viswanathan *et al*. 2012, Liberati *et al.* 2009). The results presented in this scoping study should, therefore, be interpreted with caution.

5.4 REHABILITATIVE INTERVENTIONS FOR HIV-RELATED DISABILITY

5.4.1 Study characteristics

The second objective of this study was to identify rehabilitative interventions for HIV-related disability. The comprehensive search for literature revealed 14 eligible studies that assessed rehabilitative interventions for PLWHIV. A scoping review by Quigley *et al,* (2017) mapping evidence on physical activity and cognition in HIV found 16 eligible studies, while Cobbing *et al,* (2016a) found six. The discrepancy in the number of eligible studies in the Cobbing *et al*. (2016a) study is likely because the study looked at the evidence that was specific to HBR, while this scoping study looked at the overall evidence of interventions for PLWHIV.

This scoping review includes eight systematic reviews, four randomised control trials, and two observational studies. A large number of systematic reviews in this study indicate that most of the literature on rehabilitative interventions have been synthesised. That could explain the small number of studies included in this review.

5.4.2 Key findings

The rehabilitative interventions that are evident in this review are exercise training; massage therapy and home-based rehabilitation. The effects of these interventions on different body functions are now discussed and related to the key findings of HIV-related disabilities.

5.4.2.1 Exercise training interventions

Findings identified three different types of exercise training were evaluated for effectiveness in PLWHIV: aerobic (O'Brien *et al.* 2016;Paes et al. 2015; Gomes-Neto *et al*. 2013), progressive resistance (O'Brien *et al*. 2017, Mkandla *et al.* 2016, Hamid and Rajah, 2015; O'Brien *et al.* 2008) and combined training (O'Brien *et al.* 2017; Lopez *et al.* 2015; Gomes-Neto *et al.* 2015; Gomes-Neto *et al.* 2013). The exercise duration, range, and intensity varied from one study to another. The results showed that an exercise programme done three times per week for at least five weeks is effective in terms of improving muscle strength, cardiorespiratory fitness, depression and quality of life (O'Brien *et al.* 2017; O'Brien *et al.* 2016; Gomes-Neto *et al.* 2015; Lopez *et al.* 2015; Gomes-Neto *et al.* 2013; O'Brien *et al.* 2008). The results further showed that combined training programmes (incorporating both progressive

resistance and aerobic training) provide more superior benefits than those isolated with progressive resistance exercise and aerobic training programmes (O'Brien *et al.* 2017, Lopez *et al.* 2015, Gomes-Neto *et al.* 2015, Gomes-Neto *et al.* 2013). O'Brien *et al.* (2017) found that combined training maximises gains in the cardiovascular system and muscle strength.

5.4.2.1.1 Effects of exercise training on different systems

- **Mental functions**

The results revealed three studies that review the effects of exercise on psychological outcomes using the Profile of Mood State (POMS) or both the Center for Epidemiological Studies-Depression Scale and POMS. The three studies showed an improvement in mental functions following an aerobic exercise-training intervention (O'Brien *et al.* 2017; 2016; Lopez *et al.* 2015). Aweto *et al.* (2016) evaluated the effects of aerobic exercise training on the pulmonary functions, respiratory symptoms and the psychological status of PLWHIV. The intervention group received counseling and aerobic exercise training three times a week for six weeks and the control group received only counseling. The results showed significant improvements in pulmonary functions, respiratory symptoms, and depression (Aweto *et al.* 2016). Jaggers *et al,* (2014) found that an aerobic exercise of moderate intensity done three times a week for 60-minute sessions improved the psychological outcomes (depression and anxiety) in PLWHIV. Passos *et al.* (2014) showed that a four-month intervention of moderate aerobic exercise in sedentary participants with chronic primary insomnia improves sleep, depression, and cortisol levels, and promotes significant changes in immunological variables. A systematic review and meta-analysis by Herring *et al.* (2012) reported similar findings following an exercise intervention programme for patients with a chronic illness. The mechanism for the outcome-generating exercises is associated with physiological changes such as increased metabolism; oxygenation and blood flow in the brain, the release of neurotransmitters and neurotrophic factors which improve mood, behavioural and cognitive functions, and the overall health of patients with mental dysfunctions (Portugal *et al,* 2013). PLWHIV should be screened for mental health,

and an exercise programme based on the clinical presentation and findings of the objective assessments should be designed.

- **Neuromusculoskeletal system**

The scoping review included ten studies that investigated the effect of exercise training on muscle strength using one-repetition maximum (1RM) outcome measure in major muscle groups. The results showed exercise-training interventions increase muscle strength and quality of life (O'Brien *et al.* 2017; 2016, Mkandla *et al,* 2016; Cobbing *et al,* 2016a; 2016b; Gomes-Neto *et al.* 2015; Lopez *et al.* 2015; Paes *et al.* 2015; Hamid and Rajah, 2015, Gomes-Neto et al. 2013; O'Brien et al. 2008). Other studies have reported similar findings following exercise training (Pérez Chaparro *et al.* 2018; Bessa *et al,* 2017; Pullen *et al,* 2017; Mendes *et al.* 2011).

A meta-analysis by Pérez Choparro *et al,* (2018) reviewed the effects of aerobic and resistance training, alone or combined, on strength and hormone outcomes. The findings showed that exercise interventions improve upper and lower limb muscle strength and lowered the levels of interleukin 6 (high levels indicate a great risk for loss of muscle strength). Poton *et al,* (2017) conducted a meta-analysis of randomised control trials to determine the effects of resistance training in PLWHIV. The findings showed a 35% increase in muscle strength. The largest increase was noted in trials that lasted 24 weeks compared to trials lasting 12 weeks. The mechanism for the increase in muscle strength is associated with the adaptations that occur in skeletal muscles such as an increase in total mitochondria and in the oxidative capacity of the skeletal muscle (Patil *et al,* 2017). These adaptations are essential for improvements in neuromusculoskeletal function.

Pérez Chaparro *et al.* (2018) established that exercise training programmes supervised by an exercise professional produced greater gains in muscle strength compared to unsupervised exercise training programmes. Vancampfort *et al.* (2016) recommended that exercise interventions for PLWHIV be prescribed and supervised by a qualified therapist. The therapist should ensure that patients presenting with loss of muscle strength be offered a combined training programme as it has been shown to produce better results than isolated aerobic or progressive exercise (O' Brien *et al.* 2017)

- **Cardiovascular, haematological, immunological and respiratory systems**

The results showed exercise training interventions improve the cardiorespiratory fitness (O'Brien *et al*. 2017; 2016, Mkandla *et al*, 2016; Cobbing *et al,* 2016a; 2016b; Gomes-Neto *et al.* 2015; Lopez *et al.* 2015; Paes *et al*. 2015; Hamid and Rajah, 2015, Gomes-Neto *et al.* 2013; O'Brien *et al.* 2008). The results of this study corroborate the findings from prior studies that reported improved cardiorespiratory fitness following exercise (Bessa *et al.* 2017; Aweto *et al.* 2016, Stubbs *et al*. 2015, Jaggers *et al.* 2014). Stubbs *et al.* (2015) conducted a meta-analysis of randomised control trials to review the effect of exercise on cardiorespiratory fitness in people with depression. The results showed a significant increase in cardiorespiratory fitness. The physiological adaptations such as an increase in stroke volume, cardiac output and the perfusion capacity of the muscle, resulting in an improvement in oxygen delivery, are associated with aerobic exercise (Hellsten and Nyberg, 2016). Bessa *et al,* (2017) reported a reduction in the resting heart rate and overall physical fitness following a three-month exercise training programme.

The results of the studies that reviewed immunology showed no significant changes in immune function as measured by the CD4+ cell count and viral load following exercise training interventions (O'Brien *et al.* 2017; 2016; Lopez *et al.* 2015). Similarly, Engelson et al, (2006) found no significant change in the CD4+ count or HIV viral load following a 12-week diet and an exercise weight-loss programme. The scoping review by Cobbing *et al.* (2016a) showed three studies that measured the immune function. Two of the studies reported no change and one case study showed an increased CD4+ count following exercise interventions (Cobbing *et al.* 2016a). Bessa *et al.* (2017) reviewed the effects of a three-month training programme on the CD4+ cell count, strength, heart rate and body composition among PLWHIV. The authors found a 23% increase in the CD4+ cell count. Similarly, Poton *et al.* (2017) reported a 26% increase in the CD4+ cell count following a resistance-exercise training programme. Exercise has also been linked to improved inflammatory markers and an improved immune system in patients with sickle cell anemia (Abd El-Kader and Al-Shreef, 2018). The findings suggest that exercise interventions are not associated with disease progression as measured by the CD4+ count and viral load, and may improve immune function, although more

research is required to demonstrate significant findings. Exercise interventions are safe and PLWHIV who are medically stable should engage in exercise programmes.

- **Digestive, metabolic and endocrine systems**

The results showed seven studies that evaluated the effect of exercise training on body composition using anthropometric measurements (weight, height, waist and hip circumference). The results were a reduction in waist circumference and waist/hip ratios following exercise training (O'Brien *et al*. 2017; 2016; Cobbing *et al,* 2016a; 2016b; Lopez *et al*. 2015; Paes *et al.* 2015; Hamid and Rajah, 2015, Gomes-Neto *et al.* 2013; O'Brien *et al.* 2008). A systematic review by Leach *et al,* (2015) examined the effect of exercise on body composition in PLWHIV which corroborates these findings. The authors found an increase in body mass, the sum of skin folds and of limb girths in trials that used progressive resistance training.

In trials that used aerobic training, the results showed a reduction in the body mass index, the waist-hip ratio, body mass, the triceps skin fold, the waist circumference and the sum of skin folds (Leach *et al,* 2015). Other researchers have reported improvements in body composition and metabolic profile in PLWHIV following an exercise programme (Bessa *et al.* 2017; Jaggers *et al.* 2016; Jaggers *et al.* 2014). A case study by Mendes *et al.* (2009) examined the effects of exercise training on morphological changes, the lipid profile and the quality of life in a woman with lipodystrophy. Following a 12-week combined exercise programme, she had a significant reduction in her lipid profile and waist circumference, improved cardiorespiratory fitness and quality of life (Mendes *et al.* 2009). However, the findings of the case study cannot be generalised to all of the PLWHIV. The overall evidence supports the use of exercise interventions in PLWHIV for improvements in metabolic profile.

- **Sensory function**

The results showed one study which reviewed physiotherapy interventions that entailed individualised progressive exercises, manual therapy, taping and health education (Pullen, 2017). Pullen, (2017) examined pain outcomes using the numeral rating scale outcome measure in PLWHIV who had received physiotherapy for pain

management. The study reviewed data from the medical records of 46 patients who had received physical therapy. The results showed that 65.2% (n=30) had experienced a reduction in pain, 28.3% were pain-free (n=13), there was no change in 15.2% (n=7), and 6.5% had increased pain (n=3). The findings indicate that physiotherapy interventions in PLWHIV are a safe alternative for pain management (Pullen, 2017). However, the results cannot be generalised on account of the small size of the sample. A case study by Pullen *et al,* (2014) of a patient presenting with upper and lower back pain of 10/10 on a visual analog scale reported no pain after two weeks of massage therapy. Mkandla *et al.* (2016) evaluated the effects of a progressive resistance exercise programme on PLWHIV with HIV-related polyneuropathy. Although the study did not look at the pain outcomes, findings showed the exercise regimen in people with neuropathic pain improves their health-related quality of life.

Pain symptoms are generally prevalent among PLWHIV. Merlin *et al,* (2013) found that pain is associated with functional limitations (mobility, self-care and usual activities) in a prospective cohort of 1903 PLWHIV. Non-pharmacological interventions for pain management in PLWHIV are limited. Researchers need, therefore, to look at the effects of other rehabilitative interventions such as exercise, yoga and massage therapy on pain outcomes. These interventions have shown positive results, and future studies should test the effect of using appropriately powered studies.

5.4.2.2 Massage therapy

Massage therapy is a form of soft tissue manipulation that is done methodically to produce therapeutic benefits (Boyd *et al,* 2016; Kennedy *et al.* 2015). Kennedy and colleagues went further and defined massage therapy as the application of massage that is inclusive of the health promotional and educational components (Kennedy *et al.* 2015). A review of literature in this scoping review revealed one systematic review done in the United States that evaluated the the effects of massage therapy on quality of life, pain and immune parameters in PLWHIV (Hillier *et al,* 2010). Hillier and colleagues found a significant improvement in overall quality of life, immunological markers such as the CD4+ T-cells count, and a significant

improvement in depression (Hillier *et al*. 2010). The intervention entailed massage therapy offered by a trained massage therapist or health professional one to five times a week and lasting 20 to 45 minutes per session for three to four weeks. The findings of this study are consistent with other related systematic reviews and meta-analyses evaluating the efficacy of massage therapy in the management of pain, fatigue and anxiety on medical conditions such as cancer (Rodríguez-Mansilla *et al*. 2017), surgical conditions (Boyd *et al,* 2016) and shoulder pain (Yeun, 2016). Pullen *et al.* (2014) showed two weeks of massage therapy is effective for managing the pain of a patient presenting with upper and lower back pain. Massage therapy is a warranted option for pain management in PLWHIV. The therapist should offer massage therapy for a PLWHIV who presents with soft tissue- related pain and depression.

5.4.2.3 Home-based rehabilitation

Home-based rehabilitation (HBR) involves health-care services rendered at a patient's home to promote, restore and maintain a high level of comfort, function and overall health for the patient (WHO, 2001). Two studies were found that reported HBR in PLWHIV (Cobbing *et al,* 2016a; 2016b). In a scoping review by Cobbing *et al,* (2016a), the identified HBR interventions included aerobic and progressive resistance exercises, a walking programme and a massage therapy programme. The exercises were done two to three times a week for 12 to16 weeks with each session lasting 30 to 60 minutes (Cobbing *et al,* 2016a). The walking programme started with 1000 steps and progressed up to 3000 steps three to five times a week for six months. The interventions were carried out by a physiotherapist, nurse and other members of a multidisciplinary team (Cobbing *et al,* 2016a). In a randomised control study by Cobbing *et al,* (2016b), the intervention was conducted by trained community health workers (CHWs) under the supervision of a physiotherapist. The basic training for CHWs included the theory and study method of research ethics, with practical sessions that included aerobic and resistance exercises and functional rehabilitation (Cobbing *et al,* 2016b). The results from the two studies showed improvement in cardiorespiratory fitness, muscle strength, reduced waist circumference and waist/hip ratios, significant pain reduction and an improvement in the domain of quality of life (Cobbing *et al,* 2016a; 2016b).

Other researchers that have evaluated HBR interventions have also used a randomised-control trial study design, although the HBR interventions and outcomes were different. Jaggers *et al.* (2016) conducted a randomised clinical trial to evaluate the viability of a nine-month home-based exercise-intervention programme aimed to reduce risk factors of cardiovascular disease for sedentary PLWHIV on ART. Participants in both groups received educational material, a weight loss workbook, and a pedometer (Jaggers *et al.* 2016). Additionally, the intervention group received a one-on-one physical activity training session, which gave an overview of physical activity, and also received coaching over the telephone (Jaggers *et al.* 2016). Participants were shown how to use the workbook and the elastic bands for strength training. There was no change in the levels of daily physical activity, nor any significant differences in the physiological and psychological variables. It is unclear why the HBR programme did not improve the participant's levels of physical activity. The authors suggested a group exercise for social interaction or alternatively of incorporating a programme that allows for companionship.

A randomised control trial by Holland *et al.* (2017) compared a home-based and institution-based intervention for chronic obstructive airway disease on the basis of a six-minute walk test. The findings showed similar outcomes for people receiving home-based and institution-based interventions. Rasmussen *et al.* (2016) evaluated the effect of the home-based intervention programme compared to institution-based intervention programmes in patients with stroke. The results showed that home-based interventions mitigate disability and increase the quality of life and are more cost-effective compared to institution-based interventions. The studies suggests that home-based interventions are by no means inferior to institution-based interventions.

Studies reviewing home-based interventions in PLWHIV are recommended as the available evidence is scanty (Cobbing *et al.* 2016a). The benefits of offering HBR as opposed to the alternative institution-based rehabilitation programmes include a reduction in the costs incurred by patients and in the long waiting hours spent in the institutions (Chetty *et al*. 2014; Cobbing *et al.* 2014; Cobbing *et al,* 2013; Motswasele, 2008). HBR is also a component of community-based rehabilitation

(CBR) and has been recommended and proposed as a solution for PLWHIV experiencing HIV-related disability (Cobbing *et al*. 2017; Chetty and Hanass-Hancock 2015; Cobbing *et al,* 2016a; Roos *et al.* 2015). CBR is a multi-sectoral strategy that forms part of community development aimed at promoting rehabilitation, a reduction in poverty, the equalisation of opportunities, and the social integration of people with disabilities (WHO, 2010). It was unforeseen that in this review no studies were found that looked into CBR as an intervention for PLWHIV, yet it has been recommended as one of the interventions. Li *et al.* (2017) recommended that a CBR programme should be affordable, flexible, tailored to individual needs, and should incorporate behavioural change strategies such as those for promoting social support, group therapy, and self-efficacy.

In South Africa, a resource-limited country with a high prevalence of HIV, proliferation of HBR and CBR programmes designed specifically for PLWHIV is required. In developing an HBR programme, a consideration of the needs of PLWHIV and their families is important (McDonnell *et al.* 1994). This allows the rehabilitation process to address challenges relating to the patient's needs and daily activities in their home surroundings (Steihaug *et al,* 2016). Some of these needs include addressing of their impairments, activity limitations and participation restrictions that were established in this scoping review. Therefore, a home-based programme should address these needs. The interventions should include an exercise programme and massage therapy interventions.

5.5 METHODOLOGICAL QUALITY

5.5.1 Systematic reviews

The methodological quality of the nine systematic reviews included in this study was assessed using the PRISMA checklist. The scores ranged from 17 to 27 out of a possible 27. Four studies (44%) scored 100%. Other studies scored 96%, 93%, and 74% respectively. Two studies scored below 74%. Protocol and registration, the risk of bias across studies, and additional analyses were omitted items on the PRISMA checklist. A protocol is important in research as it gives direction on all aspects of the proposed study. As such, it guides against selective-outcome reporting (Liberati *et*

al. 2009). The risk of bias is important as it impacts on the extent of the validity of the results (Viswanathan *et al.* 2012, Liberati *et al.* 2009). Systematic reviews should report all of the findings from the relevant studies. Selective bias and publication bias in small studies lead to an overestimation of the effects of the intervention (Liberati *et al.* 2009). It is common for systematic reviews to omit reporting biases because of the limitations in the scope of the existing tools, the lack of clarity on the total number of tools available for the different types of biases, the levels at which the assessments are undertaken and the guiding principles for reaching risk of bias judgments are not provided (Page *et al.* 2018). Additional analyses are conducted to ascertain the strengths of the findings and should be reported if they were done (Liberati *et al.* 2009).

5.5.2 Randomised Control Trials

Four studies were Randomised Control Trials (RCTs) with scores between 17 and 24 out of 25 items on the Consolidated Standards of Reporting Trials (CONSORT) checklist. Similarly to our study, Stevely *et al.* (2015) used the CONSORT checklist to evaluate compliance in reporting of trials included in their studies. The results revealed that the eligible studies in this review had incomplete reporting of some of the items on the CONSORT checklist. None of the four RCTs did, in fact, indicate the availability of the protocol. Reporting on the availability of the protocol is important as it provides pre-specified details concerning the RCT, thus restricting unplanned changes to the trial methods and to the selective reporting of the outcomes (Moher *et al.* 2010). It is unclear whether these studies had outlined protocols. Three studies were not identified as RCTs in the title. It is worth noting that by identifying a study as an RCT in the title, it is possible to easily ascertain the content of the study and to identify the nature of the study (Moher *et al*. 2010).

The mechanisms of implementation, allocation, concealment, and blinding were not reported in at least two of the eligible studies. It is important that the RCT provides clear details of the mechanisms applied in implementing the random allocation sequence, in concealing the sequence, and also to mention the person who carried this function out (Schulz *et al.* 2010). The binding mechanism needs to specify who was blinded to the intervention studies after the assignment was carried out, in order

to reduce the bias in these studies (Schulz *et al.* 2010). Bias influences the outcomes of a study in that it reports on either a false positive or a false negative(Schulz *et al.* 2010). However, in these studies calculations were carried out to determine the sample size in order to show that the findings of the studies were population-based. The evidence from the RCTs presented in this study is credible although it must be interpreted with caution because of the incomplete reporting of certain aspects that impactn the validity of the results.

5.4.3 Observational studies

Two observational studies were assessed using the STROBE checklist. The results showed that the two studies did not report on the bias. Owing to a lack of randomisation, observational studies are prone to selection bias (Hammer *et al*. 2009). The risk of bias is important as it impacts on the extent of the validity of the results (Viswanathan *et al.* 2012, Liberati *et al.* 2009)

5.5 COMPLEMENTARY AND ALTERNATIVE THERAPIES

There is a growing body of studies that have looked at alternative therapies such as yoga and Tai Chi. Kietrys *et al.* (2018) reported findings from a case series of three people with HIV-related neuropathy following a yoga intervention. The three participants attended yoga classes, each a session of 90 minutes, twice a week for four weeks. The yoga programme entailed yoga philosophy (10 minutes), breathing exercises (10 minutes), postures (50 minutes), relaxation (10 minutes) and meditation (10 minutes). The findings varied in all three cases: pain-related quality of life scores increased by 10% and improvements in several gait parameters were seen after four weeks in all three cases. Two cases showed improvement in mental health scores, while one case showed improvements in the six-minute walk test. A systematic review and meta-analysis by Dunne *et al.* (2018) investigating the effects of yoga interventions found that yoga improves perceived stress and anxiety. However, the findings can not be generalised due to the small number of studies.

Galantino *et al.* (2005) evaluated the effect of Tai Chi compared to aerobic exercise on quality of life differences among PLWHIV disease. A randomised control study

design was chosen that included a total of 51 participants. The intervention group 1 received the aerobic exercise programme, group 2 received Tai Chi and the control group engaged in normal daily activities. The results showed improvement in the quality of life and functional outcomes in the two intervention groups and there were no significant differences between the intervention groups. Yoga and Tai Chi interventions are promising for the management of HIV-related disability. More research is needed, however, in evaluating these interventions with pain as one of the outcome measures.

CHAPTER SIX

CONCLUSION

6.1 CONCLUSION

HIV infection in the era of ART is seen in the same light as other chronic diseases such as hypertension and diabetes that require lifelong medication. Evidence suggests that though people are living longer, their experience of disability is higher and associated with poor adherence to ART. A scoping study describing HIV-related disability, linking the effects of rehabilitative interventions with HIV-related disability was carried out. The study highlighted the presence of disability with the key disability being described on the basis of the ICF framework. A comprehensive search for literature resulted in 27 eligible studies:- 13 studies reported on HIV-related disabilities and 14 studies reported on rehabilitative interventions. The methodological quality assessments showed that the included studies were credible. However, owing to a lack of reporting on items such as blinding and bias, careful interpretation of the results is advised.

A review of the literature showed how the respective impairments are linked to activity limitations and participation restrictions and their influence on the manner in which rehabilitation should be undertaken. Exercise training (aerobic, progressive resistance and combined) is a known intervention with the highest level of evidence. However, good results have also been shown in massage therapy and in approaches to delivering interventions, as in home-based rehabilitation. Though CBR is recommended in South Africa, the study did not find eligible studies evaluating CBR interventions in PLWHIV. A proposed HBR and CBR programme for PLWHIV should include an exercise programme and massage therapy. Studies implementing the identified rehabilitative interventions in multiple health care settings (community, homes, clinics, and health centres) are recommended.

6.2 STUDY LIMITATION

A scoping review process has six phases. The optional last phase involves a consultation process with the stakeholders or experts on the subject matter. This was not done in this study. This particular phase would have validated the findings of

this review. Also, the range of the chosen databases was broad. It is; however, possible that other relevant studies could have been missed. The literature search was conducted in August 2017 and there could have been more recent studies that were missed in this review.

6.3 IMPLICATIONS FOR PRACTICE

The scoping review showed that HIV-related disability affects multiple functions of the body and limits the levels of activity and ability to engage in life activities. The study showed that exercise training interventions and massage therapy mitigate HIV-related disabilities (depression, anxiety, fatigue, muscle weakness, the inability to walk and execute daily tasks) and improve the overall quality of life. Screening and exercise prescription should be done routinely in HIV care by a professional in order to ensure that the disabling effects of HIV infection do not result in poor quality of life and that the benefits of the interventions are maximised. For example, a review of the literature included in this study showed that PLWHIV have weight-maintenance-related challenges (obesity or overweight), and a high prevalence of hypertension, as a result of ART. However, these afflictions can be managed effectively through an exercise programme. Another finding was a high prevalence of pain and breathlessness. When prescribing exercise interventions, the therapist should be aware of how these symptoms will affect the adherence of the patient to the treatment and therefore, the outcomes of the intervention.

As the numbers of PLWHIV continue to increase, the workload and demands made on health-care workers to provide responsive and effective care will also increase. Training community workers to carry out home-based rehabilitation programmes can possibly help reduce the workload and break down the barriers encountered by patients attending health-care services. HBR and CBR interventions have the potential to address public health challenges such as treatment adherence. It is hoped that the identified rehabilitative components will possibly reduce the time spent managing HIV-related disability by improving efficiency. Exercise interventions are safe and every person living with HIV should have a designed programme specific to his/ her needs.

6.4 IMPLICATIONS FOR RESEARCH

This scoping review showed a discrepancy in the reporting of HIV-related disability. There were only a few studies that reported activity limitations and participation restrictions compared to the studies that reported impairments. Furthermore, studies investigating HIV-related disability need to discuss the disability pathways (e.g. how depression affects physical functioning) and interventions need to address disability pathways. We recommend future interventions involve case-by-case consultations with PLWHIV and should clearly outline how they link the interventions to the impairments. In this review, 43% of the studies reviewed the effect of the intervention on quality of life. Future studies evaluating the interventions in this population should consider investigating the health-related quality of life as an outcome of interest.

This scoping review found limited evidence of pain management in PLWHIV. Therefore, studies looking at non-pharmacological interventions for pain, linking pain to function and participation are recommended. No study was found that reported on community-based rehabilitation for PLWHIV, and there were few studies that reported on home-based rehabilitation. Research validating the identified intervention components with the aim of developing a hand booklet for people involved in the rehabilitation of PLWHIV is recommended.

6.5 CONFLICTS OF INTEREST

There was no conflict of interest in undertaking this study**.**

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