

**Physical activity behaviours of persons with HIV and AIDS  
in low-income populations: the design of a context-  
sensitive randomised control trial**

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A thesis submitted in fulfilment of the requirements for the degree of Doctor of  
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in the Department of Sport, Recreation and Exercise Science  
University of the Western Cape



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## Declaration

I hereby declare that “*Physical activity behaviours of persons with HIV and AIDS in low-income populations: the design of a context-sensitive randomised control trial*” is my own work, that it has not been submitted before for any other degree in any other university, and that the sources I have used have been indicated and acknowledged as complete references.

**Smart Z Mabweazara**

**10/ 11/ 2018**



**Signed** \_\_\_\_\_



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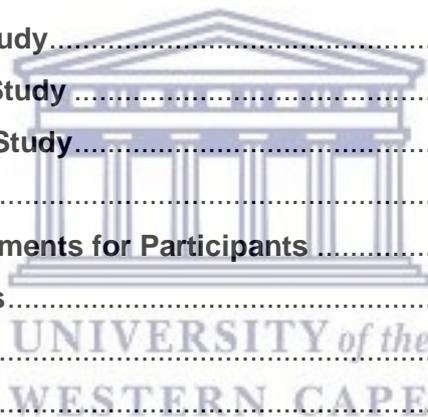
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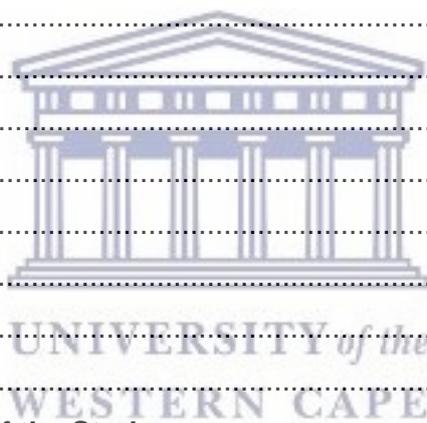
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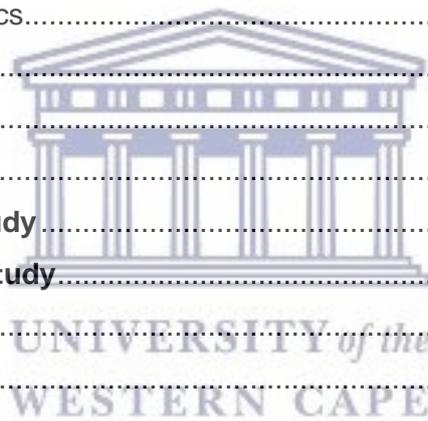
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## List of Abbreviations

ADLs	Activities of daily living
APEASE	Affordability, Practicability, Effectiveness and cost-effectiveness, Acceptability, Side effects and safety, Equity
ART	Antiretroviral therapy
BCT	Behaviour change technique
BCW	Behaviour change wheel
BMI	Body mass index
CAD	Coronary artery disease
CD4	T-helper cells
CD8	T-killer cells
COM-B	Capability, Opportunity, Motivation-Behaviour model
CVD	Cardiovascular disease
DH	Disseminated histoplasmosis
EBBS	Exercise benefits/barriers scale
FGDs	Focus group discussions
FITT	Frequency, Intensity, Time and Type
HAART	Highly active antiretroviral therapy
HAND	HIV associated neurocognitive disorders
HDL-C	High-density lipoprotein cholesterol
HIVAN	HIV-associated neuropathy
HOMA-IR	Homeostatic model assessment for insulin resistance
MHR	Maximum heart rate
LDL-C	Low-density lipoprotein
LTMVPA	Leisure total moderate-to-vigorous physical activity
OGTT	Oral glucose tolerance test
PA	Physical activity
PCP	Pneumocystis pneumonia
PLWH	People living with HIV
PLWHA	People living with HIV and AIDS
PRE	Progressive resistance exercise
PRT	Progressive resistance training

SCT	Social cognitive theory
SES	Socioeconomic status
SRT	self-regulation theory
TB	Tuberculosis
TC	Total cholesterol
TDF	Theoretical Domains Framework
TG	Triglycerides
TMVPA	Total moderate-to-vigorous physical activity
TPB	Theory of planned behaviour
TTM	Transtheoretical model
TWS	Total weekly steps
VAT	Visceral adipose tissue
$\dot{V}O_{2max}$	Maximal oxygen uptake
WHR	Waist-to-hip ratio
WLWHA	Women living with HIV and AIDS
WTMVPA	Work total moderate-to-vigorous physical activity



## Abstract

The Human immunodeficiency virus (HIV) and acquired Immunodeficiency syndrome (AIDS) are serious health issues that continue to affect many nations. Specifically, the sub-Saharan African region has the highest prevalence of HIV and AIDS worldwide. Africans living in informal settlements or townships have the highest prevalence of HIV in South Africa. Persons of low socioeconomic status (SES) in general become socialised into unhealthy behaviours and risk factors at early ages, and experience poor health outcomes. Physical activity (PA) is one cost-effective, non-pharmacological approach that has been reported as conjunctive therapy for HIV to effectively address these impairments.

**Aim:** The aim of the study was to develop a contextualized intervention that promotes PA among persons living with HIV and AIDS (PLWHA) of low SES.

**Methods:** A mixed methods approach was used. Studies included (1) a systematic review which assessed (a) specific and useful intervention techniques that were previously used in successful PA interventions (b) relevant behaviour change theories used to develop the intervention content, (2) a narrative review which examined the available literature on PA, social support and SES with a view to inform the design of effective PA interventions for PLWHA of low SES, (3) a cross sectional study which aimed at determining if age, body weight, height, gender, waist-to-hip ratio (WHR), educational attainment, employment status, CD4+ cell count, and body mass index (BMI) could predict overall PA among PLWHA of low SES in Cross roads Township in the Western Cape Province, South Africa (4) a cross-sectional study which (a) examined the PA profile of PLWHA of low SES based on PA domains and intensity and (b) determined whether employment status and level of education can predict PA among PLWHA of low SES in Cross roads Township in the Western Cape Province, South Africa (5) a mixed methods study which investigated the benefits and barriers of PA for HIV-positive women of low SES using the Exercise Benefits/Barriers Scale and focus group discussions, (6) a study which sought to develop a contextualised intervention for promoting PA among PLWHA of low SES and (7) a crossover study conducted at a community centre caring for HIV positive Black African Xhosa-speaking women of low SES in Nyanga Township in the Western Cape Province in South Africa.

**Results:** The systematic literature review showed that the following techniques, namely, 'provide feedback on performance', 'goal setting (behaviour)', and 'plan social support/social change' were the most frequently used behavioural change techniques in interventions focusing on promoting PA for the management of chronic diseases amongst individuals of low SES. The review also showed that the Transtheoretical model of behaviour change and the Social Cognitive theory were the common theoretical frameworks of most study interventions.

The narrative review showed that social support played a crucial role in promoting PA amongst PLWHA. The narrative literature review provided insights into the relationships between PA, social support and SES, and informed the design of the PA intervention for PLWHA of low SES.

The first cross-sectional study determined the relationship between educational attainment, age, body weight, height, gender, waist-to-hip ratio, employment status, CD4 count, BMI and PA levels among PLWHA of low SES. The results of the multiple linear regression analysis in the study showed that educational attainment ( $\beta = 0.127$ ;  $p = 0.00$ ), employment ( $\beta = -0.087$ ;  $p = 0.01$ ), and gender ( $\beta = 0.235$ ;  $p = 0.00$ ) significantly predicted PA. Gender had the greatest effect, followed by educational attainment and employment status.

The second cross-sectional study examined PA by domain and intensity and determined whether employment status and level of education could predict PA among PLWHA of low SES. The results showed that the participants engaged more in work-related PA [160.11 (SD=346.95) min/wk], followed by transport-related PA [115.21(SD=142.04) min/wk], and lastly in leisure-related PA [40.84 (SD=110.37) min/wk]. Participants also engaged more in moderate-intensity PA [265.86 (SD=335.45) min/wk] than in vigorous-intensity PA [50.29 (SD=205.30) min/wk]. Employment status was a significant predictor of overall PA when controlling for age, CD4 count and education level.

The primary purpose of the concurrent mixed method study was to investigate the benefits and barriers of PA for HIV-positive women of low SES using the Exercise Benefits/Barriers Scale and focus group discussions. The results of the study showed that the participants' barriers to PA were associated with HIV-related symptoms, medications, depression, aging, finances, time-constraints, personal living environments, a lack of knowledge about the value of PA, and a lack of motivation to engage in PA.

Next, a PA intervention was developed using the Behaviour Change Wheel (BCW). The purpose of this exercise was to develop a contextualised intervention for promoting PA among PLWHA of low SES employing 14 behavioural change techniques. The results of the exercise showed that the intervention for PLWHA of low SES would be more likely to succeed by (a) using the Transtheoretical model of behaviour change and the Social cognitive theory as the underpinning theoretical frameworks (b) targeting cost-free convenient physical activities, such as walking, home or community-based exercises or activities of daily living (ADLs) (c) using education, rewards, training, modelling and enablement, as intervention functions (d) involving service provision as policy priorities, and (e ) incorporating a direct face-to-face mode of delivery.

To evaluate the effectiveness of the developed PA intervention, a six-week, randomised controlled crossover trial was piloted amongst a sample of 21 HIV

positive Xhosa-speaking women of low SES. The results showed that participants exposed to the PA intervention had significant increases in PA, as measured by the total amount of moderate-to-vigorous intensity PA (TMVPA) ( $p = .027$ ), the total number of weekly steps (TWS) ( $p = .032$ ), as well as exercise self-efficacy ( $p = .000$ ) from pre-test to 6 weeks.

**Conclusion:** In future, researchers are advised to contextualise PA interventions and to use systematic methods of intervention design that are informed by prior research and are sensitive to the setting where they wish to implement their interventions.

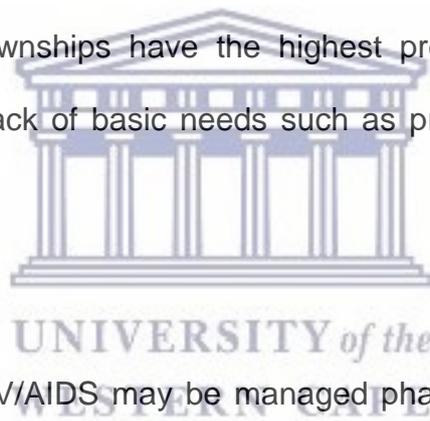
**Key words:** Physical activity; Self-efficacy; HIV; AIDS; Low SES; Social support; exercise



# Chapter One: Statement of the Problem

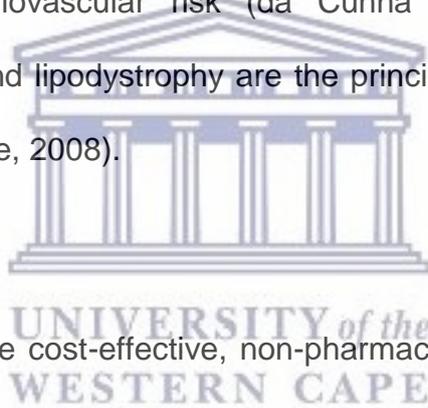
## 1.1 Introduction

The human immunodeficiency virus (HIV) and acquired Immunodeficiency syndrome (AIDS) are serious health issues that continue to affect many nations (UNAIDS, 2017). It is estimated that 36.7 million people were living with HIV and AIDS in 2016 (UNAIDS, 2017). Eastern and Southern Africa have the highest prevalence, with approximately 19.4 million infected in 2016 (UNAIDS, 2017). Black Africans living in informal settlements or townships have the highest prevalence of HIV in South Africa, possibly due to a lack of basic needs such as preventative health services (Shisana et al., 2014).



Impairments caused by HIV/AIDS may be managed pharmacologically (Passaes & Sáez-Ciri3n, 2014), non-pharmacologically or by self-care strategies (Modeste & Majeke, 2010). The introduction of pharmacologic therapy to manage HIV/AIDS changed the landscape of HIV/AIDS globally, as patients with end-stage disease recovered, and began to live their lives again - a biblical analogy referred to as “the Lazarus effect” (Beyrer, Davis, & Celentano, 2008). As such, the use of highly active antiretroviral therapy (HAART) has been associated with significant improvements in the prognosis of the disease (Hima Bindu & Naga Anusha, 2011). Medical advancements have made it possible for people living with HIV and AIDS (PLWHA) to live longer (Platt et al., 2016).

However, pharmacological interventions may be fraught with unwanted adverse effects, which are associated with medication non-adherence (Fonsah et al., 2017). The use of HAART is associated with marked adverse effects, independent of HIV status (Hima Bindu & Naga Anusha, 2011). HAART has been associated with teratogenicity risk in pregnant women (Prestes-Carneiro, 2013), an increase in both body fat mass and body mass index (BMI) (Denué, Ikunaiye, & Denué, 2014), lipodystrophy and increased blood pressure (Nduka, Stranges, Kimani, Sarki & Uthman, 2016) and cardiovascular risk (da Cunha et al., 2015). In Africa, neuropathy, neutropenia and lipodystrophy are the principal adverse drug reactions caused by HAART (Nwokike, 2008).



Physical activity (PA) is one cost-effective, non-pharmacological approach that has been reported to effectively address the impairments caused by HAART (Monroe et al., 2015). PA is important for maintaining good health and quality of life among PLWHA (Rehm & Konkle-Parker, 2016). These benefits include improved metabolic profile, cardiorespiratory fitness and improved quality of life (Jaggers & Hand, 2016).

Socioeconomic status (SES) is a major health indicator (Kim & Park, 2015). PLWHA of low SES are associated with poorer health outcomes and unhealthy behaviours (WHO, 2011). Persons of low SES experience poor health and exposure to risk factors at earlier ages, and become socialised prematurely into unhealthy behaviours

(Peretti-Watel, Fressard, Bocquier, & Verger, 2016). Persons of low SES may have less access to medical care, and are more likely to have a poor diet, abuse alcohol, smoke tobacco and engage less in PA (Aneshensel, Phelan, & Bierman, 2013).

Most PA interventions for persons of low SES have not specifically targeted the management of HIV (Webel, Moore, Hanson, & Salata, 2013). Examples of chronic conditions often targeted using PA interventions for persons of low SES settings are cancer, diabetes, cardiovascular disease and obesity (Rosamond et al., 2000; Clark, Hampson, Avery, & Simpson, 2004; Jenum et al., 2006). Moreover, evidence from the literature suggests that most PA interventions have been developed and evaluated outside the African-context, and are less likely to target underserved subgroups (Michie, Jochelson, Markham, & Bridle, 2009; Ashford, Edmunds, & French, 2010; Williams & French, 2011).



Little attention has been paid to the factors associated with promoting PA behaviour for PLWHA of low SES (Webel et al., 2013). This hampers our understanding of the factors that influence the adoption of PA behaviour amongst this population and, thus, provides strong motivation for the development and implementation of a context-sensitive PA intervention.

## **1.2 Statement of the Problem**

The sub-Saharan region is reported to have the highest prevalence of HIV and AIDS (UNAIDS, 2011). Pharmacological interventions for the management of HIV and AIDS are often costly and may be fraught with unwanted adverse effects (Roubenoff,

et al., 1999). PA is one key accessible and affordable management strategy that may be used to address impairments caused by HIV (Nicholas, et al., 2007b). Most PA interventions have not targeted the management of HIV and AIDS and have not been tailored for persons of low SES (Webel, et al., 2013). Furthermore, little attention has been given to the behavioural change techniques associated with PA promotion amongst PLWHA of low SES. Therefore, there is insufficient evidence to draw the guidelines of best practice for PA interventions for the management of HIV and AIDS amongst persons of low SES.

Moreover, PA is one key accessible and affordable management strategy that may be used to address impairments caused by HIV (Monroe et al., 2015) and the health disparities caused by low SES. Since most PA interventions have not targeted the management of HIV/AIDS and have not been tailored for persons of low SES (Webel et al., 2013), there is a need for the development of evidence-based PA interventions that are specifically contextualised for PLWHA of low SES.

### **1.3 Aim of the Study**

The aim of this study was to develop and implement a contextualized intervention of physical activity for persons living with HIV/AIDS of low socioeconomic status.

## 1.4 Objectives of the Study

The objectives of the study were:

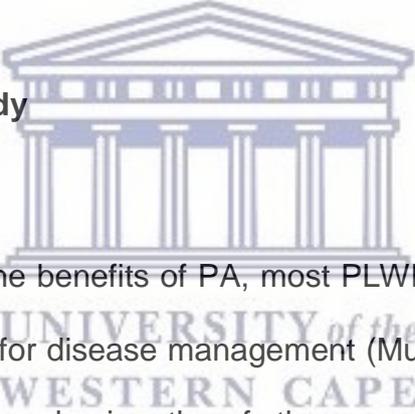
1. To review the specific intervention techniques in an updated taxonomy of behaviour change techniques that were found to be successful in changing PA behaviour.
2. To review the relevant behaviour change theories used to develop the intervention content.
3. To review the available literature on PA, social support and SES for PLWHA with a view to informing the design of an effective PA intervention for PLWHA of low SES.
4. To determine if age, body weight, height, gender, waist-to-hip ratio (WHR), educational attainment, employment status, CD4+ cell count and body mass index (BMI) can predict overall PA among PLWHA.
5. To examine the PA profile of PLWHA based on PA domains and PA intensity.
6. To determine whether employment status and level of education can predict PA among PLWHA of low SES.
7. To assess the perceived benefits and barriers to exercise amongst women living with HIV and AIDS (WLWHA) of low SES.
8. To explore the barriers and exercise preferences for engaging in PA amongst WLWHA of low SES.
9. To develop and evaluate a contextualised intervention for promoting PA among WLWHA of low SES.

## 1.5 Hypotheses of the Study

The following hypotheses were stated:

1. Age, body weight, height, gender, waist-to-hip ratio, educational attainment, employment status, CD4+ cell count, and body mass index will all predict overall PA among PLWHA.
2. Employment status and level of education will predict PA among PLWHA.
3. Participants exposed to the intervention will have significant increases in PA after six weeks of exposure to the intervention compared to those in the standard care group.

## 1.6 Significance of the Study



In spite of the evidence of the benefits of PA, most PLWHA in Africa do not engage in adequate amounts of PA for disease management (Murenzi, 2011). In Africa, HIV and AIDS are diseases predominantly of the poor (Ogunmola, Oladosu, & Olamoyegun, 2014; Kasirye, 2016). Persons of low SES engage in less PA (Aneshensel, Phelan & Bierman, 2013). PLWHA are more likely to be of low SES, and are more likely to be inactive (Brennan, Brownson, & Hovmand, 2012). The design of effective PA promotion programmes is essential for PLWHA of low SES (Webel et al., 2013). This is because PA is an appropriate intervention for reducing many modifiable risk factors of cardiovascular disease, as well as counteracting some of the effects of HAART (Jagers, Dudgeon, Blair, Sui, Burgess, Wilcox, & Hand, 2013). PA interventions that require regular attendance at a facility are not ideal for populations that are financially disadvantaged, due to barriers related to

transportation, access, and cost (Jaggers et al., 2013). Consequently, health practitioners need to develop PA interventions that are applicable and match the African context.

For PLWHA, this study provides a simple evidence-based exercise program for managing the adverse effects of HAART and the virus itself. The study also provides strategies for garnering social support and ways of overcoming the barriers to exercise, especially for persons of low SES. Policy makers are also encouraged to promote rehabilitative services, home care services, social and psychological support, and opportunities for physical and nutritional support for PLWHA (Moradi et al., 2014).

### **1.7 Study Delimitations**

The following inclusion criteria were applied in the study, namely:

- Participants were males and females, who ranged in age from 18 to 40 years.
- Participants were HIV positive.
- Participants must have had no hospitalisations within the previous 4-week period, prior to the start of the study.
- Participants must be of low SES.

The following exclusion criteria was applied in the study, namely:

- Participants not granting consent.
- Participants not mentally sound.
- Participants in the late stages of HIV/AIDS.

## 1.8 Translation of Documents for Participants

Most of the documents presented to the participants, such as the questionnaires and the PA manual, were not translated into the appropriate ethnic language, because they were interviewer-administered, and participants preferred them in the English language. Interviewers were proficient isiXhosa-speaking postgraduate students and a social worker who worked with the participants at a community centre. In practice, it has been stated that most researchers do not have the necessary language skills required to communicate with a linguistically diverse population (Murray & Wynne, 2001). However, if we are to access the 'hidden voices' of the participants, attention must be given to how we can bridge the linguistic and cultural divide between researcher and participant (Murray & Wynne, 2001). The use of interpreters, in the form of assistants who administered the questionnaires, assisted the participants to understand the PA manual, and conducted research made it possible to access the thoughts, feelings and experiences of non-English speaking populations (Murray & Wynne, 2001).

## 1.9 Definitions of Terms

**Self-efficacy:** In this study, self-efficacy is defined as judgement of one's ability to successfully perform the behaviour in question (Bandura, 1986).

**Social support:** For the purposes of this study, social support is defined as a "network of interpersonal relationships that provide companionship, assistance, and emotional nourishment" (Pender, Murdagh, & Parsons, 2006, p.226).

**Physical activity:** Physical activity is defined as bodily movements triggered by the activation of skeletal muscles, accompanied by increased energy demand and metabolism (Romancini, Nardo, Herold, de Assis Primentel, & Pupulin, 2012).

**Low-income communities:** In the context of this study, low-income communities are disadvantaged and resource-poor communities that are commonly characterised by high levels of crime and unemployment, poor housing and infrastructure (Galorbades, Shaw, Lawlor, Lynch, & Smith, 2006).

**People living with HIV/AIDS (PLWHA):** PLWHA refers to people infected with the human immunodeficiency virus (HIV) that causes AIDS (UNAIDS, 2011).

**Socioeconomic status (SES):** SES is defined as the combined level of one's financial and social status (Baker, 2014).

## 1.10 Thesis Layout

The thesis is subdivided into ten Chapters. Chapter One is the statement of the problem and Chapter Two the literature review. Chapters Three to Nine are the individual studies that were conducted in order to meet the aim and objectives of the study. The chapters are presented as follows:

Chapter One: Is the statement of the problem and Gives an overall synopsis of the thesis.

Chapter Two: Is the literature review.

Chapter Three: Is a systematic literature review of the behavioural change techniques and theoretical frameworks in PA, for the management of chronic conditions among persons of low SES (published).

- Chapter Four: Is a narrative review of literature on PA, social support and SES targeting PLWHA of low SES (in press).
- Chapters Five: Is a study that assesses the physical, demographic and socioeconomic predictors of PA among PLWHA of low SES (under review).
- Chapter Six: Is a study that assesses the PA behaviours of PLWHA of low SES and specifically focuses on PA domain, intensity and PA sociodemographic correlates (under final review).
- Chapter Seven: Is a qualitative study that explores participant preferences for PA, and barriers to engaging in PA for PLWHA of low SES (published).
- Chapter Eight: Describes the development of the contextualized PA intervention programme for PLWHA of low SES based on a comprehensive framework (under review).
- Chapter Nine: Is a study that evaluates the efficacy of the PA intervention (in press).
- Chapter Ten: Gives the final conclusion of the study.

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## Chapter Two: Literature Review

### 2.1 Introduction

HIV/AIDS is a serious global public health problem, because it suppresses the immune system and exposes infected individuals to opportunistic infections, neurological diseases and muscular atrophy (Leyro, Babson, & Bonn-Miller, 2014; dos Santos et al., 2016). Highly active antiretroviral therapy (HAART) has increased the life-expectancy of people living with HIV/AIDS (PLWHA) and has reduced the number of deaths caused by HIV infection by about 33% (dos Santos et al., 2017).

However, HAART with protease inhibitors is associated with adverse effects (Lazarotto, Deresz, & Sprinz, 2010; De Cock, Jaffe, & Curran, 2012). Most of the adverse effects affect metabolic processes and increase the risk of metabolic syndromes, such as insulin resistance, hyperglycaemia and the redistribution of body fat (lipodystrophy) (Roberts, Hevener, & Barnard, 2013). Other conditions include diarrhoea, nausea, vomiting, agitation and insomnia (da Cunha, Maselli, Stern, Spada, & Bydlowski, 2015).

PA is a relatively cost-free therapy for the management of HIV and AIDS, which may prove expedient for persons of low SES. This is especially applicable for South Africa (SA), where black Africans living in informal settlements or townships have the highest prevalence of HIV/AIDS (Shisana et al., 2014). Physical activity (PA) is deemed a useful non-pharmacological treatment, with benefits that counteract the

adverse effects of HAART (Yahiaoui, McGough, & Voss, 2012; Borges-Cosic, 2015; Cutrono et al., 2016).

Socioeconomic status (SES) is the relative position of an individual or a group to others in society based on education, income, occupation, wealth, and place of residence (Public Health Agency of Canada, 2009). Higher SES is related to better health, and has a strong impact on living conditions such as safety, housing, and food security (Public Health Agency of Canada, 2009). PLWHA of higher SES have been reported to have more personal resources, access to private medical services, and are not dependant on state social services (Public Health Agency of Canada, 2009).



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## **2.2 Burden of HIV/AIDS in Sub-Saharan Africa**

In 2016, an estimated 36.7 million people were living with HIV globally (UNAIDS, 2017). Even though sub-Saharan Africa accounts for only a small proportion of the global population (12%), 71% of the worldwide burden of HIV originates in sub-Saharan Africa (Kharsany & Karim, 2016). Approximately 19.4 million people living with HIV (PLWH) are in Eastern and Southern Africa (UNAIDS, 2017). Females account for more than 59% of PLWH. In 2016, there were 6.1 million PLWH in Western and central Africa, with women accounting for 56% (UNAIDS, 2017). The Middle East and North Africa recorded 230 000 PLWH (UNAIDS, 2017).

In South Africa, an estimated 7.06 million people were living with HIV in 2017 (Statistics South Africa, 2017). Thus, in 2017, an estimated 12.6% of the total

population was HIV positive. The HIV prevalence among South African youths aged 15-24 years declined over time from 7.3% in 2002 to 4.6 in 2017 (Statistics South Africa, 2017).

## **2.3 HIV and AIDS**

AIDS is associated with a decrease in the number of CD4+ cells, the T-helper lymphocytes in the blood (Gottlieb et al., 1981). After infection, it is reported that CD4+ cell numbers usually rise to near-normal levels in 3 to 4 months (Levy, 1993). Thereafter, a progressive decline of CD4+ cells is evident throughout the lifelong course of HIV infection (Levy, 1993). The point at which an individual develops symptoms of the disease is characterised by CD4+ cell counts usually lower than 300 cells per  $\mu\text{l}$  (immunosuppression) and increased levels of HIV (viral load) in the blood (Levy, 1993). This usually signals the development of AIDS (Levy, 1993). The accompanying reduction in immunologic control eventually eliminates the potential for any immune response to opportunistic infections (Levy, 1993).

### **2.3.1 Clinical Symptoms of HIV Infection**

The reduction in the CD4+ cells that is associated with HIV, and the accompanying immunodeficiency, results in the development of clinical signs and symptoms (Okoye & Picker, 2013). The World Health Organisation (WHO) has since classified HIV/AIDS into four clinical stages (WHO, 2005) based on the signs and symptoms manifested, as shown in Table 1.

Table 1

*WHO Clinical Stages of HIV/AIDS*

Clinical Stage	Clinical Conditions or Symptoms
Primary HIV Infection	<ul style="list-style-type: none"> <li>Asymptomatic</li> <li>Acute retroviral syndrome</li> </ul>
Clinical Stage 1	<ul style="list-style-type: none"> <li>Asymptomatic</li> <li>Persistent generalized lymphadenopathy</li> </ul>
Clinical Stage 2	<ul style="list-style-type: none"> <li>Moderate unexplained weight loss (&lt;10% of presumed or measured body weight)</li> <li>Recurrent respiratory infections (sinusitis, tonsillitis, otitis media, and pharyngitis)</li> <li>Herpes zoster</li> <li>Angular cheilitis</li> <li>Recurrent oral ulceration</li> <li>Papular pruritic eruptions</li> <li>Seborrheic dermatitis</li> <li>Fungal nail infections</li> </ul>
Clinical Stage 3	<ul style="list-style-type: none"> <li>Unexplained severe weight loss (&gt;10% of presumed or measured body weight)</li> <li>Unexplained chronic diarrhoea for &gt;1 month</li> <li>Unexplained persistent fever for &gt;1 month (&gt;37.6°C, intermittent or constant)</li> <li>Persistent oral candidiasis (thrush)</li> <li>Oral hairy leukoplakia</li> <li>Pulmonary tuberculosis (current)</li> <li>Severe presumed bacterial infections (e.g., pneumonia, empyema, pyomyositis, bone or joint infection, meningitis, bacteremia)</li> <li>Acute necrotizing ulcerative stomatitis, gingivitis, or periodontitis</li> <li>Unexplained anaemia (haemoglobin &lt;8 g/dL)</li> <li>Neutropenia (neutrophils &lt;500 cells/μL)</li> <li>Chronic thrombocytopenia (platelets &lt;50,000 cells/μL)</li> </ul>
Clinical Stage 4	<ul style="list-style-type: none"> <li>HIV wasting syndrome, as defined by the CDC (see Table 1, above)</li> <li><i>Pneumocystis</i> pneumonia</li> <li>Recurrent severe bacterial pneumonia</li> <li>Chronic herpes simplex infection (orolabial, genital, or anorectal site for &gt;1 month or visceral herpes at any site)</li> <li>Esophageal candidiasis (or candidiasis of trachea, bronchi, or lungs)</li> <li>Extrapulmonary tuberculosis</li> <li>Kaposi sarcoma</li> <li>Cytomegalovirus infection (retinitis or infection of other organs)</li> <li>Central nervous system toxoplasmosis</li> <li>HIV encephalopathy</li> <li>Cryptococcosis, extrapulmonary (including meningitis)</li> <li>Disseminated non-tuberculosis mycobacteria infection</li> <li>Progressive multifocal leukoencephalopathy</li> <li>Candida of the trachea, bronchi, or lungs</li> <li>Chronic cryptosporidiosis (with diarrhoea)</li> <li>Chronic isosporiasis</li> <li>Disseminated mycosis (e.g., histoplasmosis, coccidioidomycosis, penicilliosis)</li> </ul>

Table 1

*WHO Clinical Stages of HIV/AIDS*

Clinical Stage	Clinical Conditions or Symptoms
	<ul style="list-style-type: none"> <li>• Recurrent nontyphoidal <i>Salmonella</i> bacteremia</li> <li>• Lymphoma (cerebral or B-cell non-Hodgkin)</li> <li>• Invasive cervical carcinoma</li> <li>• Atypical disseminated leishmaniasis</li> <li>• Symptomatic HIV-associated nephropathy</li> <li>• Symptomatic HIV-associated cardiomyopathy</li> <li>• Reactivation of American trypanosomiasis (meningoencephalitis or myocarditis)</li> </ul>

(Adapted from AIDS Education and Training Center Program, 2014).

### 2.3.2 Opportunistic Infections and HIV

Opportunistic infections (OIs) usually occur in individuals with a CD4+ cell count lower than 200 cells per  $\mu\text{l}$  (Zanoni & Gandhi, 2014). Opportunistic infections are the primary cause of death in persons infected by HIV (Xiao, Du, Tian, Su, Yang, & Zhao, 2016). One such infection is pneumocystis jirovecii (Tasaka, 2015). Toxoplasmosis is a protozoal infection of the central nervous system, which is the most common in individuals with advanced HIV disease (Nissapatorn & Sawangjaroen, 2011). Tuberculosis (TB) is another frequently occurring bacterial infection (Kleina, Fjodorova, Dabužinskienė, Nazarovs, & Mahmajeva, 2017). Of all the opportunistic infections, TB is the chief cause of death among HIV-infected persons (Ford et al., 2016). Frequently occurring fungal infections that cause death in AIDS are cryptococcal meningitis, pneumocystis pneumonia (PCP), disseminated histoplasmosis (DH) and aspergillosis (chronic and invasive) (Denning, 2016). Neoplastic and premalignant diseases that are associated with HIV include Karposi's sarcoma, non-Hodgkin's lymphoma and invasive squamous cell carcinoma of the cervix (Rogena et al., 2015).

The most common hematological conditions amongst PLWHA include anaemia, thrombocytopenia and leucopenia (Vishnu & Aboulafia, 2015). The classical HIV-associated nephropathy (HIVAN) occurs more frequently among individuals of African descent, and its clinical manifestations include nephrotic proteinuria, hematuria, rapidly progressive renal failure, and hypertension (Da Silva et al., 2016). Pruritus is the most common dermatological condition reported among PLWHA (Mankahla & Mosam, 2012; Kaushik et al., 2014).

### 2.3.3 Non-AIDS-Related Illness in Persons Living with HIV/AIDS

HAART has led to a reduction in HIV morbidity and mortality (Lima et al., 2009). In essence, PLWHA who are initiated into HAART are likely to have an increase in their CD4+ cell count (Wood et al., 2004). Nowadays, non-AIDS-related illnesses are the chief causes of morbidity and mortality in PLWHA who are on HAART (Scarpino et al., 2013). However, prolonged exposure to HAART makes them vulnerable to a variety of age-associated morbidities, and chronic low-level inflammation (d'Ettorre et al., 2014).

HAART (especially use of protease inhibitors) is associated with many adverse effects, including metabolic abnormalities (Osegbe, Soriyan, Ogbenna, Okpara, & Azinge, 2016). Metabolic abnormalities include hypertriglyceridemia, hypercholesterolemia, and insulin resistance/type 2 diabetes mellitus (Carr et al., 1998; Vergis, Paterson, Wagener, Swindells, & Singh, 2001). Other metabolic abnormalities, referred to as HAART-associated morphologic and metabolic

abnormality syndrome (HAMMAS) or HIV-associated lipodystrophy syndrome (HLS), include fat redistribution (lipodystrophy), lipoatrophy and/or fat accumulation (Panse et al., 2000; Fauci & Lane, 2001). These metabolic abnormalities can cause atherosclerotic cardiovascular disease (CVD) (Osgbe et al., 2016). As such, atherosclerotic CVD is commonly seen in HAART-treated PLWHA (Osgbe et al., 2016). Additional factors that lead to increased cardiovascular risk among PLWHA, include chronic immune activation, accelerated aging, increased viral load, and the adverse effects of HAART (Ceccarelli, d'Ettoire, & Vullo, 2013).

It has been suggested that chronic inflammation, incomplete immune reconstitution, and residual viral replication might be the contributing factors to increased coronary artery disease (CAD) in PLWHA (d'Ettoire et al., 2012; Ceccarelli et al., 2013). This association between inflammation, virus replication, and HAART is also apparent in HIV-related metabolic diseases, where viral replication can cause proatherogenic increases in serum lipids, systemic inflammation and hypercoagulation, and reduce endovascular reactivity (Arildsen, Sørensen, Ingerslev, Østergaard, & Laursen, 2013; Casaretti et al., 2015).

An association between CVD, osteopenia/osteoporosis, kidney disease, immune activation and vitamin D deficiency has also been reported (d'Ettoire et al., 2014). Cardiovascular, metabolic, bone, and kidney damage is associated with the proinflammatory state (d'Ettoire et al., 2014). This is prompted by hypovitaminosis D, the adverse effects of viral replication on osteoblast and osteoclast function, and the adverse effects of ART on bone turnover and kidney function (Stone, Dockrell,

Bowman, & McCloskey, 2010; Pinzone et al., 2013). Additionally, neurological conditions, such as HIV-associated neurocognitive disorders (HAND) also manifest, because of the interactions between HIV, ART, and chronic immune activation (d'Ettorre et al., 2014).

## **2.4 Physical Activity and its Role in Regulating Inflammation**

PA is known to improve health by influencing on the clinical course of several diseases, through potentiating both the immune system and the metabolic processes (Ploeger, Takken, De Greef, & Timmons, 2009; Gleeson et al., 2011). Regular moderate-intensity aerobic exercise is related to the decreased occurrence of metabolic disease (d'Ettorre et al., 2014). In addition, regular PA decreases the amount of excess fat, thereby, minimising the inflammation that accompanies obesity (Bergman, 2013). Aerobic exercise, in particular, has been found to reduce the level of inflammation in diseases such as chronic heart failure, atherosclerosis and diabetes (Pedersen & Bruunsgaard, 2003; Petersen & Pedersen, 2005).

Sedentary behaviour is associated with the development of inflammation (d'Ettorre et al., 2014). This is because physical inactivity leads to the build-up of visceral fat, which is followed by an augmented discharge of adipokines and the infiltration of proinflammatory immune cells into adipose tissue (d'Ettorre et al., 2014). These processes eventually lead to the development of insulin resistance, atherosclerosis, and neurodegeneration (Walsh et al., 2011a; Walsh et al., 2011b). The use of PA as non-pharmacological therapy is synonymous with 'exercise as medicine' and helps to reduce the chronic inflammation (d'Ettorre et al., 2014).

However, excessive PA may negatively affect the immune system and reduce the capacity to defend against harmful pathogens (d'Ettoire et al., 2014). Haskell et al. (2007) caution that, when dealing with PLWHA, the appropriate exercise prescription must be taken into consideration relative to exercise type, intensity, frequency and duration. For example, chronic high-intensity exercise has been found to weaken the immune system, even among HIV-free individuals (Peake, Neubauer, Walsh, & Simpson, 2017). For PLWHA, moderate-intensity exercise is seen as more appropriate and is routinely prescribed (Bopp, Phillips, Fulk, & Hand, 2003).

#### 2.4.1 Physical Activity in Persons with HIV/AIDS

There is abundant evidence to show that PA is beneficial for PLWHA (Jagers & Hand, 2016; dos Santos et al., 2017; Nosrat, Whitworth, & Ciccolo, 2017). Ogalha et al. (2011) reported a decrease in fat mass, resting heart rate, waist circumference, and serum glucose, as well as an increase in muscle mass, CD4+ cells, metabolic markers, and key indicators of quality of life (QoL) i.e., both physical and mental health. A study on 50 physically inactive PLWHA on HAART showed that 12-weeks of moderate-intensity exercise (i.e., brisk walking), led to a significant improvement in fitness and immune activation (Longo, Bonato, & Bossolasco, 2014).

One crucial aspect to focus on, particularly in individuals with HIV, is the maintenance and/or improvement in muscle mass in order to preserve muscle trophism and functional status (d'Ettoire et al., 2014). In this regard, Sakkas et al. (2009) reported that 1-repetition maximum (1-RM) strength increased in all muscle

groups in PLWHA after progressive resistance exercise training (PRT). Thoni et al. (2002) showed that aerobic exercise had a beneficial impact on lipid disorders and the build-up of central adipose tissue in PLWHA, because it caused a significant reduction in visceral adipose tissue (VAT), total abdominal fat, total cholesterol (TC), triglycerides (TG) and TG/HDL-C. Additionally, cardiovascular risk at 10 years decreased from 1.12 to 0.97 (Thoni et al., 2002).

Nosrat et al. (2017) reported that both aerobic and resistance exercise have positive mental health effects for PLWHA. d'Ettorre et al. (2014) asserted that the pleasure derived from engaging in PA relates to three main factors: the production of endorphins, the production of catecholamines, and the changes in brain function. Endorphins cause feelings of pleasure and greater pain tolerance (d'Ettorre et al., 2014). Catecholamines elevate cardiac output, increase the release of glucose into the blood and, together with endorphins, reduce anxiety and psychological stress (d'Ettorre et al., 2014). For PLWHA, especially those on HAART, using PA is very important (d'Ettorre et al., 2014).

Vancampfort et al. (2017) found that lower levels of PA in PLWHA are related to older age, lower levels of educational attainment, lower CD4+ cell count, and the presence of lipodystrophy. Frequent bodily pain, depression and opportunistic infections were also associated with low PA levels (Vancampfort et al., 2017).

A variety of factors affect PA participation in PLWHA, and these factors should be taken into consideration when designing interventions (Buscail et al., 2016).

Moreover, promoting self-efficacy, motivation for PA and assisting PLWHA to understand the benefits of PA are recommended as viable strategies for PA promotion (Vancampfort et al., 2017).

A recent meta-analysis has reported that PLWH spend less time engaging in PA per day compared to other populations with various chronic diseases (Vancampfort et al., 2016). PLWH recorded 5899 steps per day, which is below the recommended 10 000 steps per day for accumulating health benefits (Vancampfort et al., 2016). Figure 1 shows the potential benefit (PRO) and pitfalls (CONS) of HAART, and the role of PA in PLWHA.



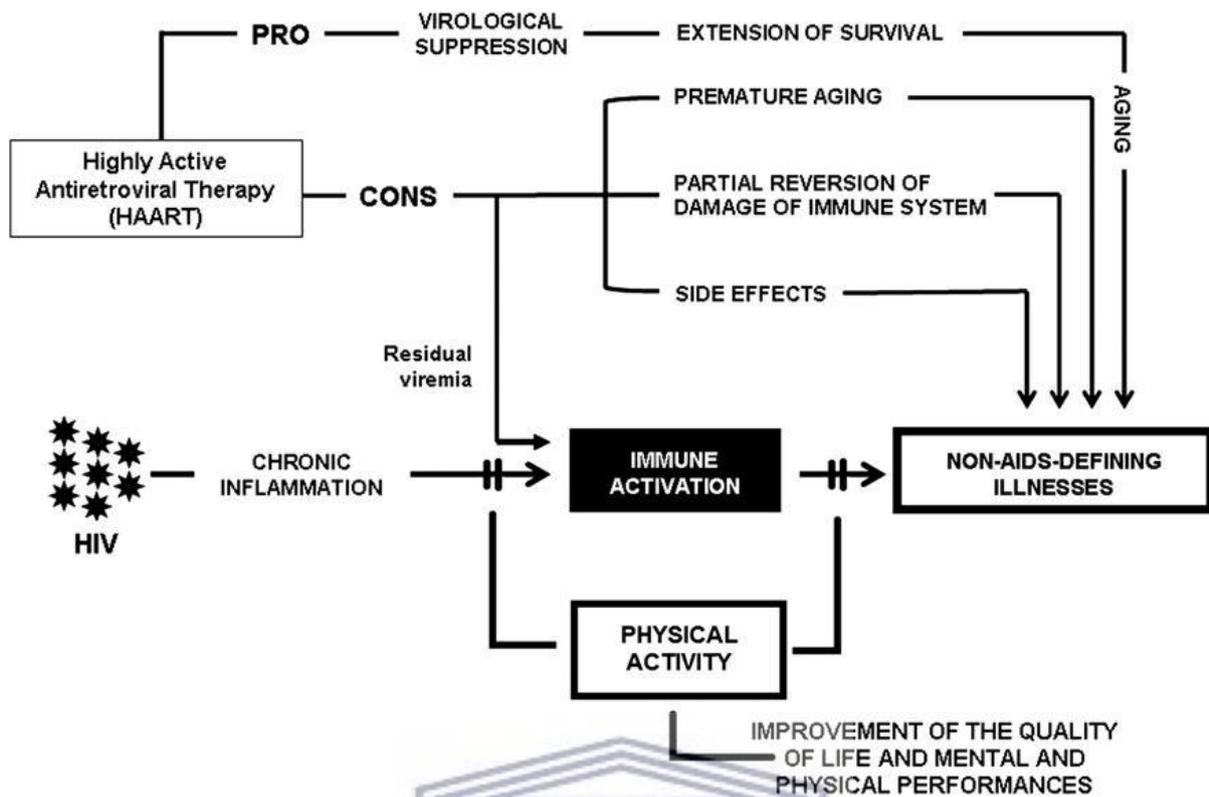


Figure 1

*Potential Benefits and Pitfalls of HAART and the Value of Physical Activity in PLWHA. (Adopted from d'Ettorre et al., 2014, with permission).*

Most PA interventions targeting persons of low SES have not specifically addressed the management of HIV/AIDS (Webel, Moore, Hanson, & Salata, 2013). Furthermore, little attention has been paid to the psychosocial and economic variables associated with PA behaviour for PLWHA of low SES (Webel, et al., 2013). In this regard, there is a need to develop contextualised PA interventions for PLWHA in the sub-Saharan region, because of the limited access to medication and related health resources.

#### 2.4.2 Strategies and Techniques for Promoting Physical Activity

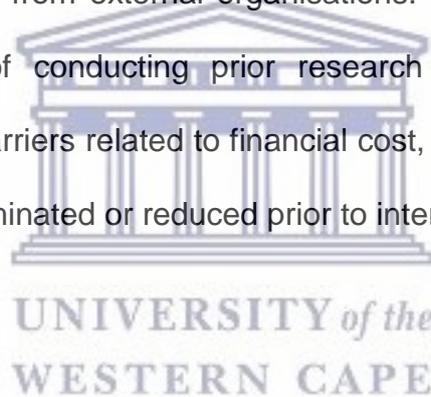
The strategies employed in interventions to promote PA are an important aspect of public health for the prevention and management of various chronic diseases (Bonevski, Guillaumier, Paul, & Walsh, 2014). Several studies have investigated the efficacy of community-based PA interventions (Brand et al., 2014), however, only a few of these studies have focused on PA interventions aimed at persons of low SES (Buscail et al., 2016). PA is instrumental in the primary and secondary prevention of numerous chronic conditions (Buscail et al., 2016).

Different strategies have been used to promote PA in different settings and populations. A systematic review on the effectiveness of interventions focusing on PA, nutrition, and weight management in students at tertiary institutions reported that interventions that were equal to or less than 12 weeks resulted in more positive results than those longer than 12 weeks (Plotnikoff et al., 2015). It has also been reported that repeated face-to-face contact with the intervention researchers may enhance vigilance and provide motivation and support that improves health outcomes (Elfhag & Rössner, 2005). Interventions on PA in which participants received feedback on performance were more effective than those in which participants only received educational material (Plotnikoff et al., 2015).

For PA interventions aimed at individuals of low SES, some researchers conducted formative research (Kruger et al., 2012; Buscail et al., 2016). For example, Buscail et al. (2016) conducted a community-based intervention to promote PA in a low-income neighbourhood in France. The researchers started by assessing the barriers to PA and used their findings to define the strategies to promote PA. Selected strategies to promote PA included PA at community centres, improving communication relating to

PA, and adjusting the environment to be PA-friendly (Buscail et al., 2016). Most interventions that have been successful in promoting PA have involved the designated community in the intervention design process and in the implementation (Wilbur et al., 2008; Mead, Gittelsohn, Roache, Corriveau, & Sharma, 2013; Philips et al., 2014).

Taylor, Baranowski and Young (1998) stated that meaningful participation of the community in the intervention design process implies that the intervention priorities, content, and the way the intervention is implemented emanates from the community rather than being enforced from external organisations. Taylor et al. (1998) further mention the pertinence of conducting prior research on the needs, attitudes, preferences, and unique barriers related to financial cost, transportation and/or child-care issues that can be eliminated or reduced prior to intervention implementation.



Other researchers have focused more on the behavioural change techniques (BCTs) employed in PA interventions (Michie et al., 2013). Howlett, Trivedi, Troop and Chater (2015) state that the difficulty in assessing the efficacy of behaviour change interventions is in the vague description of the intervention content and the BCTs. In order to address this challenge, a comprehensive taxonomy of BCTs was developed (Michie et al., 2013).

Greaves et al. (2011) conducted a systematic review of reviews of PA and dietary intervention content. It was reported that effective interventions made use of social

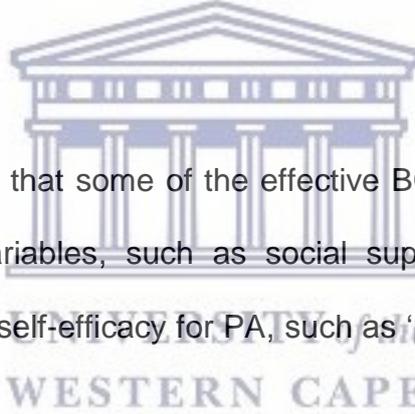
support and precisely described the BCTs (Greaves et al., 2011). The use of goal-setting, self-monitoring, providing feedback on performance, reviewing goals, and making use of a high-contact time were all related to effective interventions (Greaves et al., 2011).

Olander et al. (2013) conducted a systematic review to identify BCTs related to self-efficacy for PA. The techniques, namely, 'prompt self-monitoring of behavioural outcome' and 'planning social support/social change' were related to increases in self-efficacy and PA behaviour (Olander et al., 2013). The largest increases in PA behaviour were related to the following techniques, namely, 'teaching [the participants] to use prompts/cues', including 'prompt practice' and 'providing prompt rewards contingent on effort or progress towards the desired behaviour'. Four BCTs were reported to be related to increases in self-efficacy for PA (Olander et al., 2013). These were 'action planning', 'planning social support/social change', 'prompting self-monitoring of behavioural outcome', and 'time management'.

Greaves et al. (2011) mention that effective BCTs hardly work independently, and should be part of a logical intervention model. In designing an intervention, researchers should put in place a methodical approach to intervention design, such as "intervention mapping" (Bartholomew, Parcel, Kok, Gottlieb, & Fernandez, 2016) or employ other systematised methods of intervention design, such as the behaviour change wheel (Michie, van Stralen, & West, 2011). Such methodological approaches assist the intervention developers in selecting specific BCTs for influencing the

behaviour in question, and in contextualising the intervention for the targeted population within the specific setting (Michie et al., 2011).

Grieves et al. (2011) recommend that, if one plans to utilise established BCTs, a precise plan for intervention development should be put in place. The plan should be based on a methodological examination of factors that permit and promote behaviour change in the appropriate setting (Grieves et al., 2011). The plan should also identify the factors likely to cause behaviour change, and the specific BCTs that are likely to work for the intended population and setting (Grieves et al., 2011). Adapting the appropriate BCTs may be crucial for different ethnic groups and underserved populations, particularly individuals of low SES (Grieves et al., 2011).



Olander et al. (2013) noted that some of the effective BCTs in the promotion of PA were related to certain variables, such as social support, e.g., 'planning social support/social change' and self-efficacy for PA, such as 'prompting self-monitoring of behavioural outcome'.

## **2.5 Theoretical Basis of Physical Activity Interventions**

The use of theory to inform intervention design is one factor that is associated with desirable behaviour change (Michie, Johnston, Francis, Hardeman, & Eccles, 2008; Michie & Prestwich, 2010). Interventions that are grounded in theory have shown promise in promoting positive behaviour change (Stacey, James, Chapman, Courneya, & Lubans, 2015). In a scoping narrative review, Larkin, Kennedy and

Gallagher (2015) summarised the theories commonly used in PA interventions. Some of the theories are explained below.

### 2.5.1 Self-Regulation Theory

Self-regulation is said to be the effortful capacity to plan and attain adaptive results through goal-oriented behaviour, usually attained by postponing gratification (Carver & Scheier, 1982). Olson and McAuley (2015) further stated that self-regulation encompasses goal setting, planning, self-monitoring, and self-rewarding. In essence, the theory states that individuals with low self-regulatory ability are less capable of developing adaptive goals and monitoring progress towards attaining their goals (Larkin et al., 2015). Self-regulation according to Kanfer (1970a; 1970b; 1971) included self-monitoring, self-evaluation and self-reinforcement. Seven dimensions have since emanated from these first three domains, namely informational input, self-monitoring, motivation for change, commitment to reach the goal, development of a plan to reach the goal, working according to the plan, and re-evaluation of the plan (Miller & Brown, 1991).

### 2.5.2 Self-Efficacy Theory

Self-efficacy refers to how an individual perceives his ability to perform actions necessary to achieve a pre-determined activity or goal, e.g., to exercise alone (Bandura, 1977). The main sources for self-efficacy include prior success, attainment imitation and modelling, and verbal and social persuasion (Bandura, 1986; 1977). It has been shown that PA interventions that focus on self-efficacy alone are

inadequate (Allison & Keller, 2004). Interventions should rather combine other elements to promote PA, such as social support and goal-setting (Larkin et al., 2015).

### 2.5.3 Social Cognitive Theory

Self-efficacy, a key construct of social cognitive theory (SCT), includes confidence to overcome barriers to successful behaviour change, as well as the ability to perform and assess behaviour under a range of personal, social, and environmental conditions (Bandura, 2004). It has been posed that this theory may be effective for short-term behaviour change, other than for maintaining the behaviour over a long period (Joseph et al., 2013). The theory pursues the idea that learning happens in a social environment (Larkin et al., 2015), and as an individual observes others in action they gain knowledge of the rules, skills, tactics, beliefs, and attitudes (Bandura, 1986). The individual also gains competence for engaging in behaviours by seeing others perform, and they in turn engage in the learnt behaviour in line with their beliefs (Bandura, 1986). Thus, self-regulation becomes a pertinent factor in the learning process, and self-regulated individuals can identify goals and adopt tactics for attaining their goals (Larkin et al., 2015). The key elements of self-regulation are goal-setting, self-observation, self-assessment, and self-reinforcement (Larkin et al., 2015). Knowledge of health risks and benefits precede all SCT constructs, with self-efficacy influencing behaviour directly or indirectly (Bandura, 2004).

### 2.5.4 Theory of Planned Behaviour

The essence of this theory is in one's intent to partake in a desired behaviour (Larkin et al., 2015). One's intent to indulge in a behaviour reflects the effort one is willing to put towards engaging in the desired behaviour (Biddle & Mutrie, 2008). As such, if the intent to engage in PA is strong, the chances of one engaging in PA are also increased (Larkin et al., 2015). Factors that determine the intention include attitude, subjective norms, and the degree of perceived behavioural control (Larkin et al., 2015). Attitude is informed by beliefs about PA and the expected outcomes of being physically active (Larkin et al., 2015). Subjective norms are informed by beliefs held by significant others and the motivation to comply with others (Larkin et al., 2015). Perceived behavioural control is informed by control variables and power over control factors (Larkin et al., 2015).



#### 2.5.5 Transtheoretical Model

The Transtheoretical model (TTM) of behaviour change comprises four constructs, namely, the stages of change, the processes of change, self-efficacy, and decisional balance (Pirzadeh, Mostafavi, Ghofranipour, & Feizi, 2015). The stages of change are precontemplation, contemplation, preparation, action, and maintenance (Larkin et al., 2015). Some versions of the TTM (Prochaska & Marcus, 1994), have also considered a final stage referred to as termination, while others have made use of a relapse stage (Biddle & Mutrie, 2008).

This theory is one of the most common for understanding PA behaviour (Pirzadeh, Mostafavi, Ghofranipour, & Feizi, 2015). This model assists in classifying people at

various stages of change, thereby helping them to change their behaviour by employing different strategies and processes suitable for each stage (Pirzadeh et al., 2015).

The second construct of the TTM is the processes of change. This construct includes cognitive and behavioural processes (Prochaska, DiClemente, & Norcross, 1992). The 10 processes are grouped into two high-order factors signifying cognitive (i.e., conscious raising, dramatic relief, self-reevaluation, environmental reevaluation, self-liberation) and behavioral (i.e., social liberation, counter-conditioning, stimulation control, reinforcement management, and helping relationships) processes (Kang, Lee, & Kim, 2014). The third construct is self-efficacy and it shows the amount of confidence a person has in maintaining the desired behaviour change (Bandura, 1977). The last construct is balance in decision-making. Decision-making balance is about identifying the 'pros and cons' that influence behaviour, and when the pros exceed the cons, then change is likely to occur (Pirzadeh et al., 2015). Strategies used in promoting PA include promoting knowledge about PA, teaching about the risks of inactivity, teaching about the benefits of PA, and incorporating the use of social support and rewards (Dallow & Anderson, 2003; Taylor et al., 2007).

## **2.6 Social Support and Physical Activity**

Ahmed and Lemkau (2007) conceptualise social support as a feeling of being cared for, loved, valued and esteemed or being able to rely on others, if need be. In line with this assertion, Cohen and Syme (1985) posited that social support is a resource provided by others, with structure and function being two vital components of the

concept. The structure of social support, sometimes referred to as the social support network, refers to the presence, magnitude, composition, and quantity of relationships (e.g., a social support group of significant others or family) (Cohen & Syme, 1985). Kahn (1979) posited three functions of social support. The first function, instrumental support, implies receiving an expression of positive support from someone; the second called informational support, refers to being affirmed through behaviours, perceptions, or expressed views by someone, and the third, referred to as tangible support, implies receiving symbolic or material aid.

Social support can also be expressed in terms of motivational support and modelling support (Hashim, 2012). Aspects such as encouragement and praise for participation in PA refer to motivational support, whereas modelling support refers to the provision of support by a role model (Hashim, 2012). Social support has many forms, including, emotional (e.g., encouragement, praise, etc.), instrumental (e.g., equipment, financial, etc.) or informational support (e.g., advice, instruction, etc.) (Stroebe & Stroebe, 1996; Heaney & Israel, 2008). These can be provided by different persons (providers) within one's social network (e.g., friends, family, teachers) (Stroebe & Stroebe, 1996; Heaney & Israel, 2008). Table 2, shows the possible roles of each social support dimension in PA.

Table 2

*Possible Roles of Different Social Support Dimensions in the Promotion of Physical Activity.*

Type of Social Support	Example
Emotional support	Empathy from others to be physically active. You feel that they 'are on your side'.
Informational support	Information and advice given by others concerning exercise, such as details of a local running event.
Instrumental support	Direct help provided by others, such as driving someone to a sports centre or buying them a bicycle for transportation.

Adapted from: Biddle and Mutrie (2008)

Understanding the role of social support in PA promotion amongst PLWHA can assist researchers design improved interventions (Beverly & Wray, 2010).



Family members who provide social support influence the level of PA engagement (Scarapicchia et al., 2017). The association between marital status and PA (Engbergm et al., 2012) has also emphasized the value of spousal support in PA promotion. In this regard, PA interventions targeting PLWHA of low SES, should attempt to recruit couples in order to foster both motivation and adherence. PA participation in groups has also been shown to be an important factor in influencing PA behaviour (Kassavou, Turner, & French, 2013).

Motivational and Instrumental social support were found to be significant predictors of PA among adolescents (Hashim, 2012). Social support from family and friends were also found to positively relate to PA (Morrisey, Janz, Letuchy, Francis, & Levy, 2015). Forouzan, Shushtari, Sajjadi, Salimi, & Dejman (2013) found that relatives of PLWHA were more likely to be sources of support than non-relatives.

Persons from low-income communities with smaller social networks were also reported to be less physically active (Shelton, McNeill, Puleo, Wolin, Emmons, & Bennet, 2011). Living with a chronic condition, such as HIV/AIDS, reduces the number and quality of social interactions (Saki, Kermanshahi, Mohammadi, & Mohraz, 2015), possibly due to HIV/AIDS-related stigmatisation. This stigma causes many PLWHA to restrict activities outside of their home, especially those involving social engagement and interaction (Yang, Lee, & Kim, 2015). Stigma can be counteracted by positive support from family and friends (Yadav, 2010).

Forouzan et al. (2013) state that HIV/AIDS does not only negatively influence physical health, but also affects mental and social well-being. This is because of the stigmatization and discrimination of society, (Kontomanolis, Michalopoulos, Gkadaris, & Fasoulakis, 2017), particularly in developing countries (Peltzer & Ramlagan, 2011). Major sources of support, such as employment, income, and family and friends, might be lost when involving PLWHA (Dejman et al., 2015). Individuals without adequate social support have less motivation for self-care and increased rates of depression, morbidity and mortality (Riegel & Carlson, 2002; Dunbar, Clark, Quinn, Gary, & Kaslow, 2008; Stamp et al., 2016). Improved

wellbeing, enhanced immune function, good psychological health, reduced pain, and less clinical symptoms are all associated with greater perceived social support (Lutgendorf, Antoni, Scheniderman, & Fletcher, 1994; Copertaro et al., 2014). Conversely, HIV/AIDS progresses faster due to reduced social support and high levels of stress (Leserman et al., 1999; 2002; Yi, Chhoun, Suong, Thin, Brody, & Tuot, 2015).

The implication is that interventions should not be a financial burden for PLWHA. Furthermore, researchers must make every effort to design interventions that recruit family members to promote PA participation. Participation in PA is dependent on social support (Stenfield, Ainsworth, & Quesenberg, 1999), and social support is critical for enhancing and maintaining the health-related quality of life of PLWHA in resource-poor settings (Schonnesson, 2002; Paxton, 2002). Evidence also points to higher levels of social cohesion linked with greater participation in PA (Yip, Sarma, & Wilk, 2016).

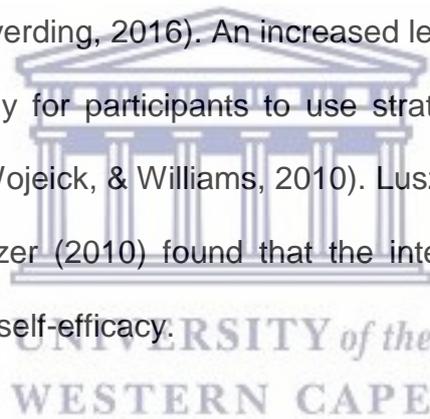
## **2.7 Self-Efficacy and Physical Activity**

Self-efficacy relates to one's perceived confidence in her/his ability to carry out a specific behaviour. For example, in the PA domain, someone with high exercise self-efficacy will partake in PA in spite of inclement weather, whereas a person possessing low self-efficacy may only do so when the weather is pleasant (Kim & Cardinal, 2010). A recent systematic review has concluded that higher levels of self-efficacy among PLWHA facilitate PA participation (Vancampfort et al., 2017). The significance of the self-efficacy construct is shown by its incorporation beyond the

SCT to other theories of behaviour change, which include TPB (Ajzen, 1991), the Integrated Behavioral Model (Fishbein, 2000), the Transactional Model of Stress and Coping (Lazarus & Cohen, 1977), and the TTM (Prochaska & Velicer, 1997; Glanz, Rimer, & Viswanath, 2008).

### 2.7.1 Research Findings on Self-Efficacy and Physical Activity

Self-efficacy has received the most consistent support of any psychosocial factor, as a strong determinant of PA behaviour (Ashford, Edmunds, & French, 2010), and even among individuals with chronic conditions, such as cancer and HIV/AIDS (Ungar, Wiskemann, & Sieverding, 2016). An increased level of exercise self-efficacy is reported to make it likely for participants to use strategies to improve their PA levels (Anderson, Winett, Wojeick, & Williams, 2010). Luszczynska, Mallach, Pietron, Mazurkiewicz and Schwarzer (2010) found that the intention to engage in PA in youth increases along with self-efficacy.



Self-efficacy beliefs are further thought to impact upon a person's decision to engage in PA, their affective experiences and enjoyment of the activity, and the effort they put towards attaining their goal (Bandura, 1986; Martin & Gill, 1995). Some barriers to PA among PLWHA relate to a lack of capacity to engage in PA and a lack of exercise self-efficacy. Among PLWHA, certain stereotypes are barriers to PA participation, which also relate to low self-efficacy levels (Roos, Myezwa, & van Aswegen, 2015; Montoya, Wing, Knight, Moore, & Henry, 2015). As such, there is a need to include techniques that aid in increasing exercise self-efficacy in interventions that promote PA among PLWHA.

## 2.7.2 Self-efficacy Beliefs and Enjoyment

Understanding self-efficacy beliefs and enjoyment are crucial, because self-efficacy is a cognitive factor that affects behaviour through beliefs in personal agency (Bandura, 1997), while enjoyment is an affective factor that influences behaviour through hedonic motivation, i.e., the experience and expectation of pleasure or displeasure (Williams & Evans, 2014).

Self-efficacy beliefs influence the level of enjoyment one gets from partaking in an activity (Samson & Solomon, 2011). A PA promotion intervention showed that self-efficacy and enjoyment at both baseline and at six months can predict PA at 12 months (Lewis, Williams, Frayeh, & Marcus, 2016). Similarly, self-efficacy beliefs among adult women were associated with elevated mood states after a PA intervention (Jerome et al., 2002). McAuley et al. (2005) showed that individuals with higher self-efficacy scores also reported higher positive affect scores. When an individual perceives himself or herself to have increased self-efficacy, this may lead to increases in PA behaviour, in part, by increasing perceived enjoyment from PA (Lewis et al., 2016). Greater perceived enjoyment from PA may lead to higher ratings of self-efficacy, which may lead to a greater chance of increasing PA behaviour (Lewis et al., 2016). Self-efficacy can enhance positive emotional experiences related to engaging in PA, thereby increasing the chances of individuals adopting PA (McAuley et al., 2005).

Within the context of PA promotion, Samson and Solomon (2011) pointed out the importance of the sources of efficacy beliefs. Self-efficacy beliefs emanate from four

main sources, namely, past performance accomplishments, social/verbal persuasion, vicarious experience/modelling, and interpretation of physical/emotional states (Bandura, 1997). Social/verbal persuasion can be in the form of feedback from significant others (Samson & Solomon, 2011).

### 2.7.3 Social Support as a Source of Self-efficacy

Social support is a means of social or verbal persuasion that influences efficacy beliefs (Samson & Solomon, 2011). It has been reported that inspiration from friends, family, and hospital staff influences an individual's self-efficacy for PA (Peterson et al., 2008). Many people become interested in PA that they view as being inherently enjoyable, such as interactions with other people who are also performing the activities (Devereux-Fitzgerald, Powell, Dewhurst, & French, 2016). As such, group activities are likely to be satiating and become customary through repetition (Lally & Gardner, 2013). Perhaps, this is one of the reasons why women are inclined to engage more in PA that involves walking groups (Kassavou et al., 2013). Additionally, participation in PA is more likely to happen when significant others approve, when people have larger social networks and when social norms reinforce PA (Koeneman, Verheijden, Chinapaw, & Hopman-Rock, 2011).

Similarly, among adolescent girls, social support from friends was associated with an increased capacity for overcoming barriers to PA (Beets, Pitetti, & Forlaw, 2007; Dishman, Saunders, Motl, Dowda, & Pate, 2009). Among athletes, social/verbal persuasion, in the form of pre-competition pep-talks, has been categorised as one of

the most efficient techniques for promoting efficacy beliefs (Feltz, Short, & Sullivan, 2008).

## **2.8 Socioeconomic Status**

Different socioeconomic groups make use of different levels of PA resources, such as knowledge, motivation, and the social and physical environment (Lee & Kim, 2016). It is no easy task to promote PA among persons of low socioeconomic status (SES) (World Health Organisation, 2013). Low SES is also related to an increased burden of cardiovascular disease (CVD) and all-cause mortality (Bergström et al., 2015; Rawshani, Svensson, Rosengren, Eliasson, & Gudbjörnsdottir, 2015).

Evidence also points to leisure-time PA in adults (Troost, Owen, Bauman, Sallis, & Brown, 2002) and in young people (Sallis, Prochaska, & Taylor, 2000) being related to higher levels of education and SES. Wold and Hendry (1998) noted that the PA behaviours of higher social classes tend to track into adulthood, while those of lower social classes are more associated with youth itself and barely track into adulthood. This finding may be linked to the economic and social access to exercise activities, equipment, facilities, and transport for accessibility.

It is generally accepted that underserved or disadvantaged populations carry a disproportionate burden of the HIV/AIDS epidemic (Wetle & Scanlan, 2014). The HIV/AIDS epidemic and SES influence each other, and both have cultural and political dimensions (Kumer, Abbas, Fausto, Robbins, & Cotran, 2005). In developed countries, HIV/AIDS is largely a disease of poverty with low-income persons being

more likely to be infected than those who live above the poverty datum line (CDC, 2012).

Furthermore, low socioeconomic classes have limited resources that lead to socioecological barriers, which can impact access to proper health education and, consequently, overall public health (Beltran, Harrison, Hall, & Dean, 2011). Barriers include low employment rates, living with a stigmatised disease and dealing with stress caused by financial problems (Webel, Moore, Hanson, & Salata, 2013).

Due to reduced access to primary health services and preventive services, low-income persons are not likely to have health coverage or to receive adequate treatment and care for HIV/AIDS (Wood et al., 2002). A relationship has been established between low SES and premature mortality from HIV/AIDS (Cunningham et al., 2005). This situation is aggravated by a scarcity of research focusing on health behaviours in low-income communities, especially in Africa, resulting in a widespread paucity of scientific evidence about the effectiveness of interventions for changing health behaviours in this population (Michie, Jochelson, Markham, & Briddle, 2009).

PLWHA in low-income communities have been reported to be less likely to engage in PA (Brennan, Brownson, & Hovmand, 2012). Amongst PLWHA of low SES, not meeting the recommended daily PA is usually related to caregiver responsibilities, time dedicated to childcare, manual labour as an occupation, lack of transportation, unsafe neighbourhoods, strict work schedules and living in temporary residences

(Seefeldt, Malina, & Clark, 2002). PA interventions that require an individual to regularly attend an exercise facility are not ideal for socioeconomically disadvantaged PLWHA, because of the barriers that relate to financial burdens, stigmatisation, discrimination and a lack of transport to access health and exercise facilities (Jaggers et al., 2013). Determinants of PA amongst lower socioeconomic classes include higher education, increased health education (especially the health benefits of PA), strong social norms of active leisure, having access to transportation, and an environment that reinforces PA (Dishman, Oldenburg, O'Neal, & Shepard, 1998).

Pharmacological interventions that may alleviate some problems related to HIV and antiretroviral therapy are associated with financial costs and potential toxicities (Fillipas, Cicuttini, Holland, & Cherry, 2013). Regular PA may be one cost effective method for PLWHA of low SES in overcoming the side effects of HAART (Ogalha et al., 2011). PA interventions should particularly focus on women of low SES, because they have been found to be less physically active than men (Crespo, Ainsworth, Keteyian, Heath, & Smit, 1999).

## **2.9 Conclusion**

There is a paucity of studies focusing on the promotion of PA among PLWHA in sub-Saharan Africa. SES plays a crucial role in influencing PA participation and behaviour. The use of appropriate theoretical frameworks to inform PA interventions is important in guiding the BCTs that will most likely influence the adoption and maintenance of PA among persons of low SES. Certain correlates of PA, such as

social support and self-efficacy, play a crucial role in PA promotion and can enhance the effectiveness of a PA intervention. Most importantly, the use of formative research and a clear intervention design will most likely work when implemented in the correct manner.

The following Chapter describes a systematic review that was conducted to evaluate the theoretical rationale and BCTs that were aimed at increasing PA participation amongst low-income populations for the management of chronic disease, including HIV/AIDS.



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## Chapter Three: Physical Activity Interventions for the Management of Chronic Disease in Low-Income Populations: A Systematic Review

Mabweazara, S. Z., Leach, L. L., & Ley, C. (2016). Physical activity interventions for the management of chronic disease in low-income populations: A systematic review. *African Journal for Physical Activity and Health Sciences*, 22(2.1), 348-364.

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### Abstract

The objectives of the study were to conduct a systematic literature review examining the specific intervention techniques in an updated taxonomy of behaviour change techniques that were included in successful interventions to change physical activity behaviour in low-income individuals, to assess the relevant behaviour change theories that underpinned the interventions, and to examine the relationship between behaviour change theory and intervention content. The study was a systematic literature review by narrative synthesis, examining relevant studies from 1980 to 2014. Data sources for the review included the following electronic databases: Medline, PubMed and Google Scholar. The eligibility criteria for the selected studies included in the review were only randomised controlled trials aimed at increasing physical activity among low-income adults. The outcome measure for the study was physical activity. Eleven studies met the inclusion criteria. 'Providing feedback on performance', 'goal-setting (behaviour)', and 'planning social support/social change' were the most frequently used behavioural change techniques. Among the existing theories, the Transtheoretical model of behaviour change and the Social Cognitive theory were the common theoretical frameworks to form the basis of most study interventions. Interventions to increase physical activity in low-income persons had positive effects on changing physical activity behaviour. Policy makers and physical activity practitioners should engage effective and context-sensitive behavioural change techniques and advocate for theoretically grounded interventions in order to increase physical activity behaviour in low-income populations.

Key words: Physical activity, behavioural change technique, interventions

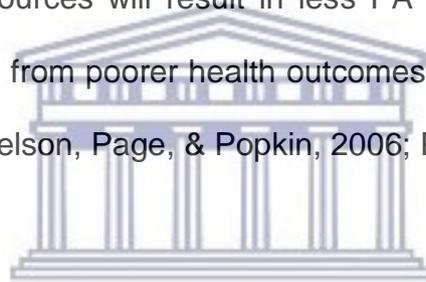
### 3.1 Introduction

Chronic diseases of lifestyle are typified by a lengthy incubation period, an extended period of illness, an intricate and poorly understood etiology, and a resilient resistance to remedy (Powell, Carspen, Koplan, & Ford, 1989). Low-income populations are at an increased risk of chronic disease (U.S. Department of Health and Human Services, 1996; Centers for Disease Control and Prevention, 2002) and all-cause mortality (Lantz, House, Lepkowski, Williams, Mero, & Chen, 1998). This is more likely so, because this population has been reported to be more likely to smoke (Scottish Government, 2008), lead a sedentary lifestyle (Stamatakis, 2006), and consume a poor diet (Drewnowski & Spector, 2004) compared to populations of higher socioeconomic status.

The health benefits of regular physical activity (PA) are well documented in the literature (Lee & Paffenbarger, 2000; Kokkinos & Myers, 2010; Jones, Hawkins, Mullin, Nepusz, Naughton, Sheraan et al., 2012). Habitual PA reduces the risk of chronic disease, and has been closely linked with a reduced risk of cardiovascular disease (United States Department of Health Services, 2008), decreased coronary events (Manson et al., 1999), disease control in persons with type 2-diabetes mellitus and insulin insensitivity (Wareham, Wong & Day, 2000; Mayer-Davis et al., 1998), mental, physical health benefits (United States Department of Health and Human Services, 1996), an enhanced quality of life (Pate, Pratt, Blair, Haskell, Macera, Bouchard et al., 1995) and an extended lifespan (Lissner et al., 1996; Lee & Paffenbarger, 2000). Given the foregoing, it is crucial that effective techniques and a sound theoretical base be identified for the implementation of sustainable PA

interventions. This is particularly so for low-income populations, because it has been reported that the lower one is on the income continuum, the higher the likelihood of disease and early death (National Center for Health Statistics, 2012).

People from low-income communities are burdened by unhealthy behaviours that are detrimental to their health (Pampel, Krueger, & Denney, 2010). Low-income neighbourhoods have fewer PA resources i.e., fewer parks, green spaces, bike paths and recreational facilities, making it difficult for the inhabitants to lead physically active lifestyles (Estabrooks, Wallin, & Milner, 2003). Understandably, limited access to such resources will result in less PA and, consequently, lead to such communities suffering from poorer health outcomes, such as obesity and heart disease (Gordon-Larsen, Nelson, Page, & Popkin, 2006; Pampel et al., 2010).



Research that analyses the effectiveness of behaviour change interventions across different societal settings and populations is scarce (Michie, Jochelson, Markham, & Bridle, 2009). Specifically, a paucity of data has been reported on the effectiveness of health promotion interventions in low-income and socially excluded persons (Michie et al., 2009). Albarracin, Gillette, Earl, Glasman, Durantini and Ho (2005) further note that the effects of health behaviour change interventions are dependent on gender, age, ethnicity and other population-specific factors. The implications are that standard interventions cannot be applied across populations with the assurance that they will be effective implicitly.

Given that most low-income populations are sedentary (Shelton, McNeill, Puleo, Wolin, Emmons, & Bennet, 2011), and that among other health-related behaviours, PA behaviour has been recommended as a mediator of the link between social position and health outcomes (Whitley, Batty, Hunt, Popham, & Benzeval, 2014), PA interventions for low-income populations can be a major means of reducing health disparities. Therefore, this review analyses the intervention techniques and the theoretical basis of the interventions that are aimed at increasing PA participation amongst low-income populations. Specifically, the review aims to assess:

- (a) the specific intervention techniques, in an updated taxonomy of behaviour change techniques (Michie, Ashford, Sniehotta, Dombrowski, Bishop, & French, 2011), that were found to be successful in changing PA behaviour.
- (b) the relevant behaviour change theories used to develop the intervention content.

### **3.2 Methodology**

Electronic databases (Medline, PubMed and Google Scholar) were searched for publications from January 1980 to April 2014. Searches were conducted in 2014 and the eligibility of each study was determined by the authors. The databases were searched using the following search terms: chronic conditions, chronic diseases, low socioeconomic status, resource-poor, low-income, PA, PA interventions, exercise and training. Abstracts were double-checked against the inclusion criteria and, where necessary, the full text was retrieved. Three experts in the field of PA and health were also emailed for possible studies to include in the review.

Manual searches were conducted on bibliographies of published systematic reviews obtained from the search strategy. Where the individual authors were unsure about the suitability of certain studies, the final decision regarding inclusion or exclusion of the study was resolved by joint discussion and consensus among the authors collectively. The PEDro scale was used by the reviewers to assess the methodological quality of the included studies. The scale is based on the Delphi consensus list: a criteria list for quality assessment of randomized controlled studies (RCTs) for conducting systematic reviews developed by the Delphi consensus (Verhagen, de Vet, de Bie, Kessels, Boers, Bouter et al., 1998). The scale has been found reliable to serve this purpose (Maher, Sherrington, Herbert, Moseley, & Elkins, 2003). Studies that did not reach a cut-off of five points were excluded from subsequent analysis. Table 1 shows the results of the included studies after being critically appraised using the PEDro scale.

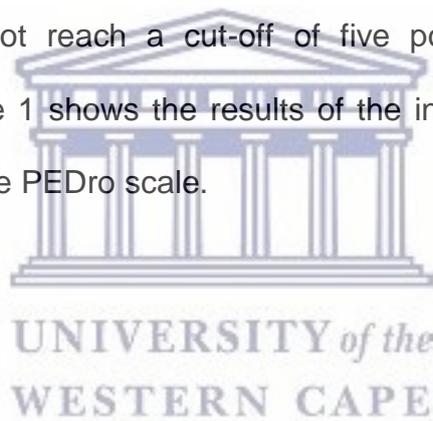


Table 1. Results of the PEDro rating after critical appraisal.

Study	1	2	3	4	5	6	7	8	9	10	11	Total
		✓		✓			✓	✓	✓	✓	✓	7
Albright et al. (2005)	✓	✓		✓				✓	✓	✓	✓	6
Emmons et al. (2005)	✓	✓		✓				✓	✓	✓	✓	6
Webel et al. (2013)	✓	✓		✓				✓	✓	✓	✓	6
Hovell et al. (2008)	✓	✓	✓	✓			✓	✓	✓	✓	✓	8
Whitehead et al. (2007)		✓		✓				✓	✓	✓	✓	6
Pekmezi et al. (2009a)	✓	✓	✓	✓			✓	✓	✓	✓	✓	8
Pekmezi et al. (2009b)	✓	✓		✓				✓	✓	✓	✓	6
Marcus et al. (2013)	✓	✓		✓			✓	✓	✓	✓	✓	7
Dutton et al. (2007)	✓	✓		✓				✓	✓	✓	✓	6
Keyserling et al. (2008)	✓	✓	✓	✓		✓		✓	✓	✓	✓	8



### 3.2.1 Inclusion Criteria

The inclusion criteria for this study were:

1. Population: adults (18+ years), males and females, clinical and non-clinical conditions, from a low-income communities.
2. Interventions: any interventions promoting PA or adherence for the management of chronic disease.
3. Outcome: increased PA or adherence for the management of chronic diseases.
4. Language: English only.
5. Methodological criteria: Only RCTs and cluster RCTs.

6. Studies with a rating of 5 points or more on the PEDro scale.

### **3.2.2 Exclusion Criteria:**

1. Reviews were excluded.
2. Interventions were excluded that did not explicitly state that the intervention purpose was to initiate, increase, or maintain PA adherence for the management of chronic conditions.
3. Interventions not focusing on low-income or low socioeconomic populations were excluded.

### **3.2.3 Data Extraction**



The first author (SZM) coded the intervention content using a taxonomy of behaviour change techniques that was found reliable for coding behaviour change techniques in intervention trials (Michie et al., 2011). After the initial coding, the second author (LLL) then looked for any discrepancies and checked for accuracy. When interventions targeted any other behaviour other than physical activity, only the techniques and results for the PA intervention were recorded.

### **3.3 Data Analysis**

This systematic review employed a narrative synthesis in analysing the selected studies. The studies were described according to the country in which they were conducted, the behavioural change techniques employed in the interventions, the

behaviour change theories underpinning the study, intervention content, sample size of the study, low-income descriptor, delivery mode, study context, follow-up, outcome of the intervention, mode of PA assessment and the general effect of the intervention. Behavioural change theories were identified, if the study explicitly stated the theory underpinning the study. The results were described to reveal the behavioural change techniques employed in the studies and the frequency of their use.

### **3.4 Results**

Figure 1 shows the flowchart of studies included in the review. Nine of the eleven studies had strong fundamental theories that underpinned the substance of the interventions. The theoretical framing of the interventions by Keyserling et al. (2008) and Lowther et al. (2002) was not clear. In terms of examining the association between theory and intervention content, a strong connection between theory and intervention content was evident, especially in studies that employed the Transtheoretical model of behaviour change (TTM) and the Social Cognitive theory (SCT). Table 2 shows the underpinning theoretical framework and the corresponding study. A variety of techniques were employed in the interventions in each of the studies. The number of techniques employed across the studies ranged from 5 to 12. Table 3 shows the frequency of use of each technique in the 11 studies.

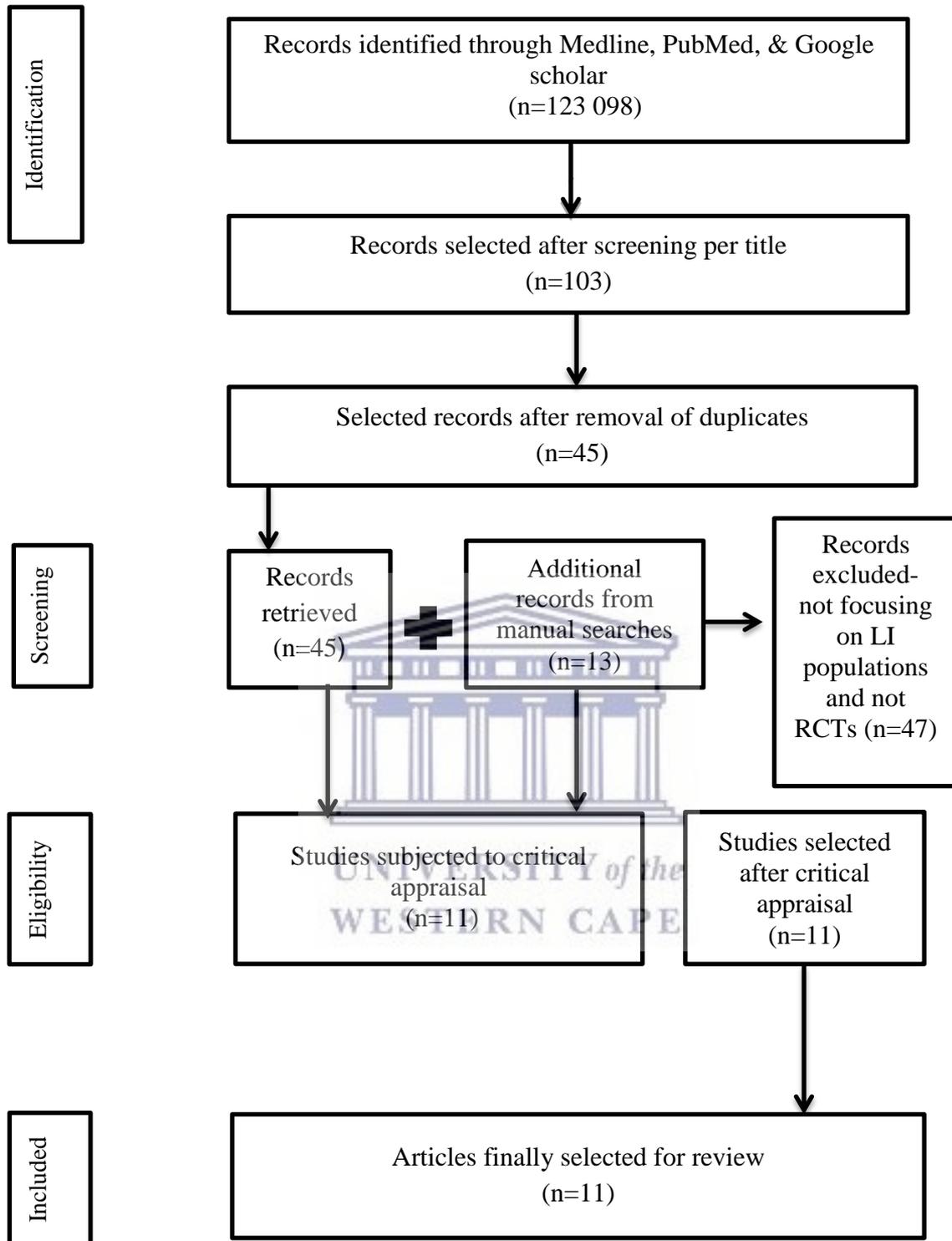
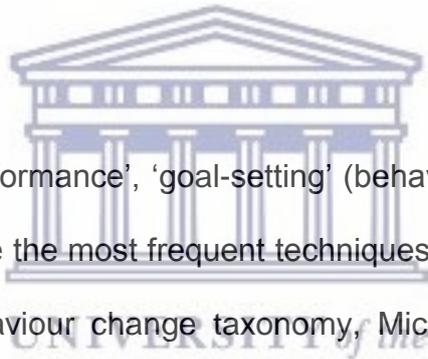


Figure 1. Flowchart of studies included in the review. (LI = low-income)

### 3.5 Discussion

The present review aimed to assess the specific intervention techniques included in the selected studies that strived to change PA behaviour in low-income populations. In addition, the review also sought to assess the theories used to develop the interventions and examine the association between theory and intervention content. The review identified 11 studies containing PA interventions, with only two studies (Emmons et al., 2005; Keyserling et al., 2008) focusing on both PA and dietary interventions. The Studies employed a variety of methods to recruit and engage low-income participants. As in the Bull et al. (2014) review, most studies were conducted in the USA.



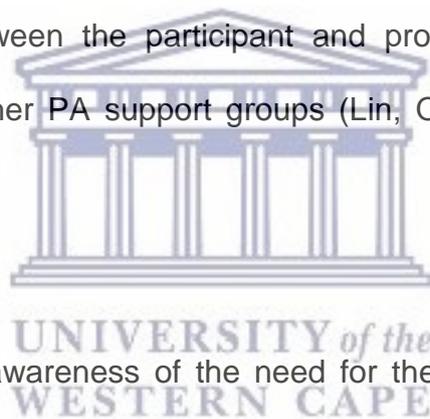
'Providing feedback on performance', 'goal-setting' (behaviour), and 'planning social support/social change' were the most frequent techniques that were employed in the interventions. In their behaviour change taxonomy, Michie et al. (2011) describe 'providing feedback on performance' as a technique that involves providing the participant with information regarding their own recorded behaviour or commenting on a participant's behavioural performance and a set goal, or a discrepancy between one's own performance in relation to others'. For example, Dutton et al. (2007) used this technique when they reviewed the current PA habits of each participant based on their last visit. The results of the review were used to guide the participant's future progress and to set individualised goals. Giving feedback on performance gives the participant a platform to reflect on, that will ultimately determine the future direction of their actions pertaining to the behaviour in question (Bandura, 1971). As such, this technique reinforces targeted behaviour (e.g., increasing PA or adhering to PA) and

is in line with Bandura's Social Learning theory that causes participants to develop thoughts or hypotheses about the types of behaviours most likely to succeed. Consequently, when participants are given feedback about their performance, it serves as an unarticulated way of informing them about what they must do, so that they gain beneficial outcomes from indulging in the behaviour in question (Bandura, 1971).

Michie et al. (2011) have described 'goal-setting' (behaviour) as a technique in which the participant is encouraged to make a behavioural resolution (e.g., to exercise more in the following week). An example is the strategy employed by Keyserling et al. (2008). The authors stated that, during the first counselling session, the counsellor and the participant developed an action plan and, then, they negotiated two to three specific PA goals. A goal is "what an individual is trying to accomplish; it is the object or aim of an action" (Locke, Shaw, Saari, & Latham, 1981, p. 126). Collaborative goal-setting for behaviour change has been viewed as a process by which the caregiver and patient agree on a health-related goal (Bodenheimer & Handley, 2009). This particular behavioural change technique affects the participant's performance by directing the participant's attention towards goal-relevant activities, and energising participants to perform better and with greater persistence, thereby leading to the building of skills on how to achieve the goals (Locke & Latham, 2002).

Michie et al. (2011) have described 'planning social support/change' as a technique that involves prompting the participant to plan how to elicit social support from other

people in order to help him/her achieve their target behaviour or outcome. In their intervention group, Marcus, Dunsinger, Pekmezi, Larsen, Bock, Gans et al. (2013) emphasised the use of social support as a strategy for increasing PA. The role of social support has been found to be positively related to the level of PA participation (Sharma, Sargent, & Stacey, 2005; Asare & Sharma, 2010). For example, Sharma et al. (2005) reported that social support from friends was a significant predictor for PA among African American women. Social support in community settings is an example of a behavioural change technique that exploits social networks to reinforce PA behaviour (Heath, Parra, Sarmiento, Andersen, Owen, Goenka et al., 2012). Strategies for utilising this technique include the creation of buddy systems, behavioural contracts between the participant and programme leaders, and the formation of walking or other PA support groups (Lin, O'Connor, Whitlock, & Beil, 2010).



There has been growing awareness of the need for theory-driven research in the process of health behaviour change (Sparling, Owen, Lambert, & Haskell, 2000). Consequently, a number of articles have focused on the need to use theory to inform behaviour change programmes (Glanz & Bishop, 2010; Painter, Borba, Hynes, Mays, & Glanz, 2008). Glanz, Burke and Rimer (2011) have further stated that health behaviour theories offer a number of benefits which can be viewed as: tools for moving beyond intuition to designing and evaluating health interventions that are founded on an understanding of why people engage in certain health behaviour; a basis for programme planning and development that is consistent with the current emphasis on using evidence-based interventions; a road map for studying problems, developing appropriate interventions, identifying indicators and evaluating impacts; a

guide to help explain the processes for changing health behaviour and the influences of the many forces that affect it; and a compass to assist planners identify the most suitable target audiences, methods for fostering change and outcomes for evaluation.

The findings of the present review revealed that the SCT and the TTM were the most commonly employed theoretical foundations to inform interventions. The SCT is one of the most extensively applied theories to health promotion (Sparling, et al. 2000). It is based on the principle of reciprocal determinism which refers to the way behaviour and the environment continuously interact and influence each other. The theory holds that two basic cognitions are vital for the prediction of a-behaviour change. Outcome expectancy, the first cognition, is defined as a person's assumption that a given behaviour will lead to certain outcomes (e.g., 'if I exercise, I will lose weight'). Self-efficacy, the second cognition, is a conviction that one can successfully execute the required behaviour to produce a desired outcome (e.g., 'I 'am capable of exercising to the extent that I will lose weight').

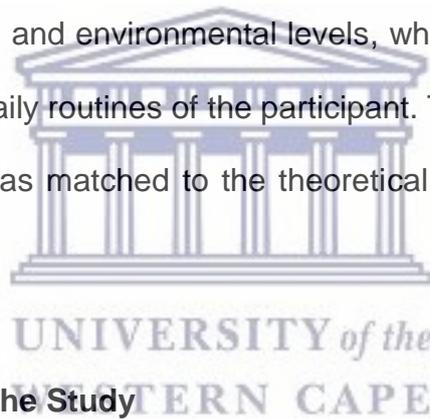
The TTM, on the other hand, describes five different stages of motivational readiness which appear to be common to most behaviour change processes (i.e., precontemplation, contemplation, preparation, action and maintenance) (Sparling et al., 2000). A major contribution of this model is that people in different stages are shown to use different processes to move to the next stage (Sparling et al., 2000). In line with the principles of the TTM, Albright et al. (2005) made use of interactive teaching techniques and behavioural principles to teach participants how to become

more active by moving them from the contemplation stage to preparation into the action stage of motivational readiness. The researchers also employed brief structured counselling conducted via telephone and mail, and used theoretically grounded counselling strategies to match the participant's current stage of change.

In terms of the association between theory and intervention content, a clear link was evident in most studies. Whitehead et al. (2007) used the TTM and made use of stage-targeted, exercise promotion material specific to precontemplation, contemplation, preparation and action/maintenance. In the study by Albright et al. (2005), where the TTM was also employed, the use of behavioural skill-building classes was meant for informing and motivating participants to be physically active.

Use of the SCT was also evident in the study by Emmons et al. (2005). The intervention employed a socio-contextual approach that targeted multiple levels of influence on behaviours, with special emphasis to low literacy skills. The researchers used intervention materials that included strategies, images, messages and vocabulary that were inclusive and non-stereotyping for the participants, as well as specific tactics to reach participants with limited literary skills (e.g., plain language, simple graphics, and stories). The researchers also provided participants with a tailored prescription for the recommended health behaviour changes. Project messages also explicitly acknowledged that health behaviour is influenced by context. Their intervention also encouraged the establishment of social support networks. All of these strategies are linked to the SCT.

The study by Webel et al. (2013), the only study that targeted participants with HIV/AIDS, also clearly showed a link between intervention content and theoretical framework. The study employed the Socioecological model to develop the intervention. The Socioecological model is grounded on findings that a single cause for health behaviours is unlikely. Instead, processes that lead to these behaviours include combinations of factors at numerous environmental levels (Webel et al., 2013). As such, socioecological factors at the individual, interpersonal and environmental levels of one's ecosystem are of significance when attempting to change self-management behaviours (Webel et al., 2013). Thus, the intervention designed by Webel et al. (2013) used structured sessions to make small changes at the individual, interpersonal and environmental levels, which could be self-monitored and incorporated into the daily routines of the participant. Table 2 shows examples of how intervention content was matched to the theoretical framework of some of the studies.



### **3.6 Key Contributions of the Study**

The review has identified successful behavioural change techniques that can be implemented to promote PA in low-income populations. The review also managed to affirm the theoretical foundations that underpin the behavioural intervention techniques for the promotion of PA in low-income communities. It also revealed that there is a scarcity of RCT studies that aim to promote PA among low-income persons. Most importantly, the review showed that there was no RCT study set in the African continent that was aimed at increasing PA for the management of chronic conditions in low-income communities.

### 3.7 Recommendations for Future Research

More research focusing on the promotion of PA among low-income persons must be conducted, especially in an African setting. Studies must also start focusing on the employment of PA to manage various chronic conditions, such as diabetes, obesity, heart disease, etc., but especially debilitating conditions, such as HIV/AIDS, that appear to be endemic to low-income communities.

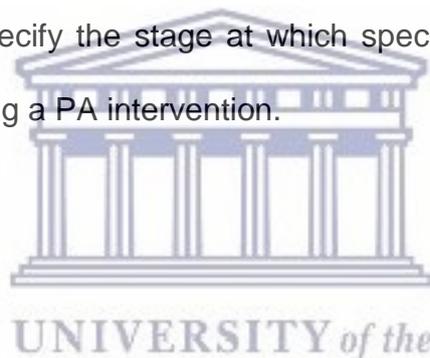
Table 2. Studies with underpinning theoretical framework and associated strategy.

Study	Underpinning Theoretical Framework	Example of strategy employed
Whitehead et al. (2007)	TTM	Use of stage-targeted, exercise promotion material specific to precontemplation, contemplation, preparation and action/maintenance.
Albright et al. (2005)	TTM	Use of interactive teaching and behavioural principles to educate the participants on how to become active by moving them from the contemplation stage to preparation into action.
Emmons et al. (2005)	SCT	Use of project messages that emphasised that health behaviour is influenced by context.
Webel et al. (2013)	Socioecological Model	Used structured sessions to make small changes at the individual, interpersonal and environmental levels.
Hovell et al. (2008)	Operant Learning Theory	Use of aerobic exercises amounting to 390-minute sessions/week for 6 months coupled with individualised feedback and “hands-on” exercise education.
Marcus et al. (2013)	TTM and SCT	Use of behavioural strategies for increasing PA e.g., social support.
Dutton et al. (2007)	TTM and SCT	Use of components from SCT and TTM including self-efficacy, motivational readiness, decisional balance and social support.
Pekmezi et al. (2009b)	TTM and SCT	Emphasis on behavioural strategies for increasing PA and social support and use of PA manuals matched to the participant’s current level of motivational readiness.

PA presents a cheap, non-pharmacological approach to the treatment and management of chronic conditions that might lessen the financial burden common to

health systems in low-income communities. RCTs meant to promote PA participation in low-income communities must also be specific in terms of the underpinning theoretical framework and how it is used to inform the intervention and impact the different outcome variables. Studies conducted within the African setting should make use of both the SCT and the TTM as their reference frameworks. Of particular importance is the identification of context-sensitive behavioural change techniques that are applicable in economically deprived communities. South African researchers in particular, should aim at using the SCT and the TTM, together with the associated behavioural change techniques, to develop context-sensitive PA interventions to manage HIV/AIDS, a pandemic which is very prevalent in the country. Researchers are also encouraged to specify the stage at which specific intervention techniques are used when implementing a PA intervention.

### **3.8 Conclusion**



Providing feedback on performance, goal-setting (behaviour) and planning social support/social change are the most frequently used behaviour change techniques to increase PA amongst individuals of low-income socioeconomic status. Other behavioural techniques that were identified as successful interventions were prompting self-monitoring of behavioural outcomes, providing information about where and when to perform the behaviour, using follow-up prompts, barrier identification/problem solving, prompt review of behavioural goals, prompt self-monitoring of behaviour, action planning, providing rewards contingent on successful behaviour, providing instruction on how to perform the behaviour, relapse prevention/coping planning, motivational interviewing, prompt reviewing of outcome

goals, providing information on the consequences of behaviour to the individual, setting graded tasks, environmental structuring, model/demonstrate behaviour, providing information on the consequences of behaviour in general, facilitating social comparison, teaching use of prompts/cues and time management.

The SCT and the TTM are effective and the most frequently employed theoretical frameworks for informing PA interventions in low-income communities. A clear link between theoretical framework and intervention content is evident in most PA interventions for low-income persons. Therefore, there is a potential for researchers to employ these techniques and theories to inform interventions that aim to promote PA for the management of chronic conditions. This is especially so for chronic illnesses, such as HIV/AIDS, that is already an economic burden to African health systems. Policy makers and PA practitioners should advocate for theoretically grounded interventions with effective techniques to increase PA behaviour in low-income populations.

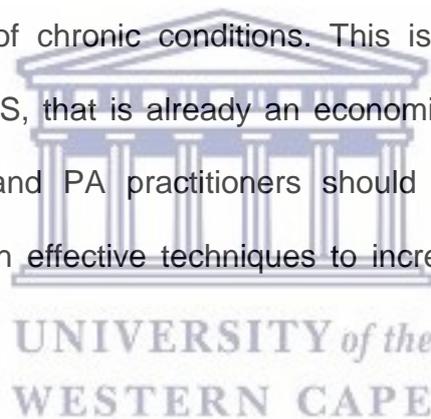


Table 3. Frequency of the use of behavioural change techniques in the 11 studies.

Technique	Frequency	Study
Provide feedback on performance	8	Keyserling et al. (2008); Albright et al. (2005); Webel et al. (2013); Hovell et al. (2008); Whitehead et al. (2007); Pekmezi et al. (2009b); Marcus et al. (2013); Dutton et al. (2007).
Goal-setting (behaviour)	7	Keyserling et al. (2008); Albright et al. (2005); Webel et al. (2013); Whitehead et al. (2007); Pekmezi et al. (2009a); Pekmezi et al. (2009b); Marcus et al. (2013).
Plan social support/social change	7	Keyserling et al. (2008); Albright et al. (2005); Emmons et al. (2005); Pekmezi et al. (2009a); Pekmezi et al. (2009b); Marcus et al. (2013); Dutton et al. (2007).
Prompt self-monitoring of behavioural outcomes	6	Keyserling et al. (2008); Albright et al. (2005); Webel et al. (2013); Pekmezi et al. (2009a); Pekmezi et al. (2009b); Marcus et al. (2013).
Provide information on where and when to perform the behaviour.	5	Keyserling et al. (2008); Albright et al. (2005); Emmons et al. (2005); Pekmezi et al.

		al. (2009a); Dutton et al. (2007).
Use of follow-up prompts	5	Keyserling et al. 2008; Pekmezi et al. (2009a); Whitehead et al. (2007); Pekmezi et al. 2009(b); Marcus et al. (2013).
Barrier identification/Problem solving	4	Keyserling et al. (2008); Albright et al. (2005); Webel et al. (2013); Dutton et al. (2007).
Prompt review of behavioural goals	4	Albright et al. (2005); Webel et al. 2013; Whitehead et al. (2007); Dutton et al. (2007).
Prompt self-monitoring of behaviour	4	Pekmezi et al. (2009a); Pekmezi et al. (2009b); Marcus et al. (2013); Dutton et al. (2007).
Action planning	4	Keyserling et al. (2008); Emmons et al. (2005); Webel et al. (2013); Dutton et al. (2007).
Provide rewards contingent on successful behaviour	4	Hovell et al. (2008); Pekmezi et al. (2009a); Pekmezi et al. (2009b); Marcus et al. (2013).
Provide instruction on how to perform the behaviour	4	Keyserling et al. 2008; Pekmezi et al. (2009b); Hovell et al. (2008); Marcus et al. (2013).
Relapse prevention/coping planning	3	Albright et al. 2005; Whitehead et al. (2007); Pekmezi et al. (2009a).
Motivational interviewing	3	Emmons et al. (2005); Pekmezi et al. 2009(a); Dutton et al. (2007).
Prompt review of outcome goals	3	Webel et al. (2013); Whitehead et al. (2007); Dutton et al. (2007).
Provide information on the consequences of behavior to the individual	2	Albright et al. (2005); Emmons et al. (2005).
Set graded tasks	2	Keyserling et al. (2008); Albright et al. (2005).
Environmental structuring	2	Webel et al (2013); Dutton et al. (2007).
Model/Demonstrate behaviour	2	Keyserling et al. (2008); Hovell et al. (2008).
Provide normative information about others behaviour	2	Pekmezi et al. (2009a); Marcus et al. (2013).
Provide information on the consequences of behaviour in general	1	Albright et al. (2005).
Facilitate social comparison	1	Albright et al. (2005).
Teach use of prompts/cues	1	Webel et al. (2013).
Time management	1	Hovell et al. (2008).

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## Chapter Four: Physical Activity, Social Support and Socioeconomic Status Amongst People Living with HIV and AIDS: A Review.

Mabweazara, S. Z., Ley, C., & Leach, L. L. (2018). Physical activity, social support and socioeconomic status amongst persons living with HIV and AIDS of low socioeconomic status: A review. *African Journal of AIDS Research*, 17(2), 203-212. <https://doi.org/10.2989/16085906.2018.1475400> . Manuscript published

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### Abstract

Physical activity can be used for the effective and comprehensive management of HIV and AIDS. Social support and socioeconomic status (SES) are two factors that shape PA behaviours. Individuals of low SES carry a disproportionate burden of the HIV and AIDS epidemic. In addition, limited resources constitute socioecological barriers predisposing such individuals to physical inactivity. The purpose of this narrative review is to examine the available literature on physical activity, social support and SES and to generate recommendations for designing and implementing physical activity interventions targeting people living with HIV and AIDS (PLWHA) of low SES. The review uses literature from Google, Google Scholar, and PubMed on physical activity of PLWHA, social support for physical activity, and SES and physical activity. Qualitative and quantitative studies in English were included from 1970 to 2016. The results show that social support plays a major role in promoting physical activity and counteracting the barriers to physical activity in PLWHA of low SES. The results on the role of social support and the influence of SES on physical activity of PLWHA are integrated in order to help design appropriate physical activity interventions for PLWHA of low SES. Well-designed interventions should utilise social support and be contextualised for PLWHA of low SES, whose living conditions present multiple barriers to physical activity.

Keywords: exercise, chronic disease, HIV/AIDS, aerobic exercise, anaerobic exercise

## 4.1 Introduction

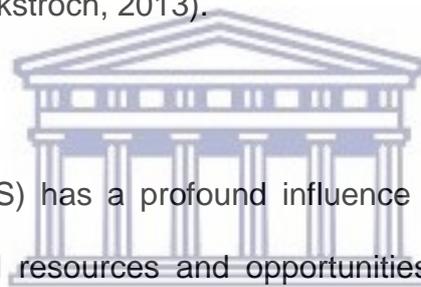
In 2016, an estimated 36.7 million people were living with HIV globally (UNAIDS, 2017). Even though sub-Saharan Africa accounts for only a small proportion of the global population (12%), 71% of the worldwide burden of HIV originates in sub-Saharan Africa (Kharsany & Karim, 2016). A staggering 19.4 million people living with HIV and AIDS (PLWHA) are in Eastern and Southern Africa, with females accounting for more than 59% of PLWHA (UNAIDS, 2017).

Even though highly active antiretroviral therapy (HAART) is considered the primary treatment for HIV and AIDS, it is still associated with numerous adverse effects (Soula, Maria, Elisabeth, & Louise, 2013). Adverse effects of HAART include disorders of lipid and glucose metabolism, and irregular distribution of body fat deposits (Jain, Ramteke, Raparti, & Kalra, 2012). Consequently, health practitioners involved in the management of HIV and AIDS are advised to monitor the side-effects of HAART (Kandi, 2016). Physical activity (PA) can be used to manage and ameliorate the adverse effects related to HAART (Farias, Dutra, Lima, & Voltarelli, 2016).

PA has been employed as an adjunct therapy for several disorders, inclusive of psychiatric, neurological, metabolic, cardiovascular, pulmonary and oncological conditions (Pedersen & Saltin, 2015). The World Health Organisation (WHO) defines PA as any body movement produced by skeletal muscles that requires energy expenditure (Musumeci, 2016). Exercise, on the other hand, is defined as PA comprising planned, structured and repeated body movements carried out in order to

enhance one or more components of health-related physical fitness, i.e., body composition, cardiovascular and muscular fitness (American College of Sports Medicine, 2014). PA can be accrued in four spheres, namely, leisure/recreation, transport, occupational/school and household activities.

In the African context, people of low SES carry the overwhelming burden of HIV/AIDS (Bhutta, Sommerfeld, Lassi, Salam, & Das, 2014). Furthermore, cardiovascular risk screening for PLWHA is usually overlooked in sub-Saharan African countries, often due to a lack of primary healthcare personnel and resources (Thienemann, Sliwa, & Rockstroch, 2013).



Socioeconomic status (SES) has a profound influence on PA behaviour in that it impacts access to societal resources and opportunities that, ultimately, influence health behaviours and health outcomes (Ferraro & Schippee, 2009; Umberson, Crosnoe, & Reczek, 2010). SES is defined as the aggregation of one's financial and social circumstances (Baker, 2014). Indicators of SES include education, income and type of employment (Galobardes, Shaw, Lawlor, & Lynch, 2006). Individuals from low socioeconomic neighbourhoods have limited resources, which impact negatively on public health (Beltran, Harrison, Hall, & Dean, 2011). Societal barriers in such communities include low employment rates, living with a stigmatised disease and, inter alia, dealing with stress caused by financial insecurity (Webel, Moore, Hanson, & Salata, 2013).

PLWHA in low-income communities are associated with poorer health outcomes, such as poor mental health (Evans, 2016), increased risk of chronic disease such as diabetes (Shulman et al., 2016), and poor dietary habits (Konttinen, Sarlio-Lähteenkorva, Silventoinen, Männistö, & Haukkala, 2013). Baker (2014) reported that there is a positive relationship between SES and health.

Social support, like SES, is another important determinant of PA (Smith, Banting, Eime, O'Sullivan, & van Uffelen, 2017). Social support can be thought of as an individual's perception of being cared for and appreciated by others (Whitaker-Azmitia, 2016). It has long been acknowledged that social support is a mediator of health outcomes (Lai & Ma, 2016). An enhanced health status is associated with positive and satisfactory social support (Wright, 2016). Social support is lacking when the members of a support network avoid communicating or providing satisfactory support (Gomes et al., 2016). This often occurs when an individual is seeking support for a stigmatized health condition, such as HIV and AIDS (Wright & Rains, 2013; Yi et al., 2015).

The significance of socio-ecological factors, such as SES and social support, in effective HIV/AIDS management has been recognised in research (Wegbreit, Bertozzi, De Maria, & Pardian, 2006). However, rarely have studies focused on the relationship between PA and low SES among PLWHA, and the influence of social support on PA. This paper seeks to review the available literature on PA, social support and SES of PLWHA with a view to informing the design of effective PA interventions for PLWHA of low SES.

## 4.2 Methods

A narrative literature review was adopted to cover the topic comprehensively (Collins & Fauser, 2005). Qualitative and/or quantitative studies in English only from 1970 to 2016 were included. The review used relevant available literature from Google, Google Scholar and PubMed. The search included studies that contained the following key terms, namely, 'HIV' or 'AIDS', 'physical activity', 'exercise', 'social support', 'resource-poor', 'low-income', 'underserved', and 'socioeconomic status'. Studies included in the review must have involved PLWHA, persons of low SES, social support and PA.

## 4.3 Results



The review included a variety of sources including peer-reviewed journal articles, books, fact-sheets and reports. In total, 94 sources were analysed using the review procedure described above. From these studies, 62 dealt with PLWHA, 62 with issues pertaining to PA, 29 with issues pertaining to social support and 16 with issues pertaining to SES. In addition, 27 literature reviews were included of which seven were systematic reviews, one was a meta-analysis (Dishman, Oldenburg, O'Neal, & Shepard, 1998), one was a systematic review and meta-analysis (O'Brien, Tynan, Nixon & Glazier, 2016) and 19 were narrative literature reviews. Thirteen studies were cross-sectional, 16 were randomised controlled trials and 10 were peer-reviewed articles on African participants. Three of the sources were from books and other sources were either fact-sheets or reports.

#### 4.4 Discussion

The benefits of PA in the general population include reducing mortality, preventing chronic disease and enhancing psychological health or quality of life (McKinney et al., 2016). A longitudinal study with more than 11 000 PLWHA has shown that PA is associated with increased CD4 count, improved lipid and glucose levels, and minimal prevalence of heart disease and comorbidities (Willig et al., 2016). Such findings have prompted researchers to recommend PA as effective treatment for metabolic and cardiovascular syndromes associated with HAART (Mocumbi, 2015). Using PA is especially relevant in sub-Saharan Africa, where the prevalence of HIV is the highest globally (UNAIDS, 2016) and alternative strategies of self-care are warranted, especially for those of low SES (Chang, Wang, & Fang, 2017).

A recent meta-analysis showed that resistance exercise was effective in improving muscular strength and CD4+ count among PLWHA (Poton, Polito & Farinatti, 2016). In older adults (>60 years), sedentary and living with HIV, a one-year resistance exercise programme increased muscle strength (Souza, Jacob-Filho, Santarem, Zomignan, & Burattini, 2011). A systematic review of randomised controlled trials (RCTs) showed that resistance exercise safely increased body weight and limb girth (Fillipas, Cherry, Cicuttini, Smirneos, & Holland, 2015). Also, muscle strength and physical function increased following an eight-week programme of progressive resistance exercise (3 days per week, 1 hour per day, and at 80% of one-repetition maximum [1-RM]) in individuals infected with HIV (Roubenoff et al., 1999; Strawford et al., 1999). Progressive resistance exercise in a 12-week RCT also significantly improved health-related quality of life in PLWHA (Mkandla, Myezwa, & Musenge,

2016). Safe exercise intensities for resistance training in PLWHA often start at 50-60% of 1-RM, and gradually increase to 75-80% of 1-RM after 4-12 weeks of training (Grace, Semple, & Combrink, 2015). These results suggest that properly planned resistance exercise can increase muscle mass in HIV-infected individuals, and may be a useful adjunct therapy for restoring lean muscle mass in patients with HIV-wasting.

Similar to resistance training, aerobic exercise has also been investigated in PLWHA. A RCT with 30 age-matched PLWHA over 8-weeks of moderate-intensity aerobic exercise (60-79% heart rate reserve) found a significant effect on blood pressure (both systolic and diastolic), maximal oxygen consumption ( $\dot{V}O_{2max}$ ) and CD4+ count (Ezema et al., 2014). The benefits of aerobic exercise were also shown for cardiorespiratory fitness over 12 weeks (Jaggers & Hand, 2014), and for exercise intensity ranging from 40-60% oxygen reserve ( $\dot{V}O_{2R}$ ) (Grace et al., 2015). Aerobic exercise performed five times per week is safe, and can enhance cardiorespiratory fitness, muscular strength, body composition, and quality of life of PLWHA (O'Brien et al., 2016). Therefore, for medically stable adults infected with HIV, aerobic exercise is also a safe and appropriate adjunct therapy for managing the disease (O'Brien et al., 2016).

Furthermore, concurrent resistance training and aerobic exercise were also investigated (references). Twenty weeks of combined aerobic and resistance training showed an increase in CD4+ count in PLWHA (Garcia et al., 2014). Concurrent aerobic (walking at 67 to 70% of maximum heart rate) and resistance training at 65%

1-RM performed thrice weekly over 12 weeks showed that participants improved in cardiorespiratory endurance (6-minute walk test), as well as in LDL cholesterol, BMI, bone mineral density and waist circumference (Bonato et al., 2012). Concurrent strength and endurance training were also effective in improving overall health, quality of life and cardiopulmonary status in PLWHA (Gomes Neto, Ogalha, Andrade, & Brites, 2013). Thus, a combination of moderate-intensity aerobic and resistance training that involves using large muscles, such as walking, cycling, jogging, playing certain sports/games and routine gardening, may all be recommended for PLWHA (Jaggers & Hand, 2016; Yarasheski et al., 2001). Table 1 shows the physiological and psychological benefits of PA for PLWHA.



Table 1. Physiological and psychological benefits of physical activity for PLWHA

Physiological improvements for PLWHA	Psychological improvements for PLWHA
<ul style="list-style-type: none"> <li>•Regular PA is known to improve health by impacting on the clinical course of several diseases through potentiating both the immune system and the metabolic processes (Gleeson et al., 2011).</li> <li>•Regular moderate intensity aerobic exercise is related to a decreased occurrence of metabolic diseases (d'Ettoire et al., 2014).</li> <li>•Regular PA is related to a decrease in fat mass, resting heart rate, waist circumference, and serum glucose, as well as an increase in muscle mass, CD4+ cells and metabolic markers (Ogalha et al., 2011).</li> <li>•Regular moderate intensity exercise (i.e., brisk walking), leads to a significant improvement of fitness and immune activation (Longo, Bonato &amp; Bossolasco, 2014).</li> <li>•Regular PA improves muscle mass in order to preserve muscle trophism and functional status (d'Ettoire et al., 2014) by improving muscle strength (Sakkas et al., 2009).</li> <li>•Thoni et al. (2002) showed that aerobic exercise has a beneficial impact on lipid disorders and the build-up of central adipose tissue in PLWHA, because it causes a significant reduction in visceral adipose tissue, total abdominal fat, total cholesterol, high-density lipoprotein cholesterol (HDL-C), triglycerides (TG) and TG/HDL-C ratio. Additionally, cardiovascular risk at 10 years decreased from 1.12 to 0.97.</li> <li>•Progressive strength and aerobic training increase cross-sectional muscle area (Grinspoon et al., 2000)</li> <li>•Regular aerobic exercise lowers the time to fatigue and reduces BMI and fat mass (Smith et al., 2001).</li> <li>•Light intensity aerobic exercise increases VO<sub>2</sub> peak and HDL and reduces fat, cholesterol and triglycerides (Thoni et al., 2002).</li> <li>•Progressive strength and aerobic training increase muscular endurance and total muscle mass (Hand et al., 2008).</li> <li>•Aerobic and resistance training increase muscular strength (Dolan et al., 2006).</li> <li>•Aerobic and resistance training increase cardiorespiratory fitness (Fillipas et al., 2006).</li> <li>•Progressive strength and aerobic training cause an acute increase in growth hormone and soluble tumor necrosis factor receptor 2 and an acute decrease in cortisol (Dudgeon et al., 2010).</li> <li>• Resistance and aerobic training cause improvements in insulin sensitivity (Yarasheski et al., 1985).</li> <li>•Aerobic and resistance training cause increases in lean muscle mass, glucose uptake, HDL cholesterol and reduce total cholesterol, C-reactive protein, interleukin-6 and triglycerides (Lindegaard et al., 2008).</li> </ul>	<ul style="list-style-type: none"> <li>• d'Ettoire et al. (2014) assert that the pleasure derived from engaging in PA relates to three main factors: the production of endorphins, the production of catecholamines, and the changes in brain function. Endorphins cause feelings of pleasure and greater pain tolerance (d'Ettoire et al., 2014). Catecholamines elevate cardiac output, increase the release of glucose into the blood and, together with endorphins, reduce anxiety and psychological stress (d'Ettoire et al., 2014).</li> <li>• Aerobic exercise reduces depression (Neidig et al., 2003).</li> <li>• Aerobic and resistance training increase cognitive function (Fillipas et al., 2006).</li> <li>• Moderate intensity aerobic exercise improves the mental health of PLWHA (Neidig et al., 2003).</li> <li>• Moderate-intensity aerobic exercise is associated with significant reductions in anxiety and depression (Schlenzing et al., 1989).</li> <li>• Galantino et al. (2005) reports that combined aerobic and resistance training can alleviate confusion, bewilderment, and tension anxiety on the profile of mood states of PLWHA.</li> <li>• Fillipas et al. (2006) report that HIV-infected men who participate in combined aerobic and resistance training improve in self-efficacy.</li> <li>• Aerobic exercise improves quality of life (Perez-Moreno et al., 2007).</li> </ul>

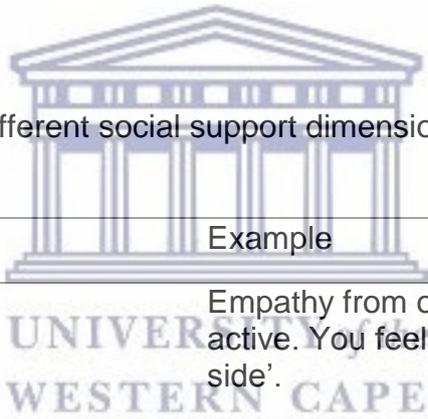
Notwithstanding the beneficial effects of PA for PLWHA, some precautions need to be considered when prescribing exercise (Grace et al., 2015). Exercise should not be too intense ( $>80\% \dot{V}O_{2max}$ ) or last beyond 90 minutes, due to its immunosuppressive effects (Derman et al., 2010). Ultimately, the training programme needs to be tailored and specific for each individual depending on the disease progression, the current health risks and available resources (Farias et al., 2016).

Living with a condition such as HIV reduces the number and quality of social interactions (Radley, 1994). HIV and AIDS progress faster due to reduced social support, and are associated with higher levels of stress (Yi et al., 2015). Major sources of social support, such as employment, financial security and societal care from family and friends might be lost when they concern PLWHA (Hall, 1999; Bechtel & Swartzberg, 1993; Roberts-Pittman, 2006). PLWHA are reported to have low levels of emotional social support (Li, Lin, Liang, & Ji, 2016).

Women living with HIV are reported to receive far lower levels of emotional and social support compared to men (Li et al., 2016). An inverse relationship was reported between social support and the reported barriers to PA participation amongst pregnant women (Da Costa & Ireland, 2013). Amongst pregnant women, social support from family and friends was vital in easing the challenges of participating in PA (Cioffi et al., 2010). These findings among women are in line with the perception that women are bound to rely more on social support than men (McLaughlin, Vagenas, Pachana, Begum, & Dobson, 2010).

Social support is critical for enhancing and maintaining PA (Sternfeld, Ainsworth, & Quesenberg, 1999), as well as health-related quality of life of PLWHA in resource-poor settings (Schönnesson, 2002; Paxton, 2002). Among adults in community-based PA interventions, evidence exists of the effectiveness of social support for increasing PA and physical fitness (Kouvonen et al., 2011). For example, middle-aged women who participated in a weight loss programme involving PA, and who got social support from family and friends were more likely to lose weight (Kiernan et al., 2012). Three functions of social support were posited by Kahn (1979) and adapted by Biddle and Mutrie (2008), as illustrated in Table 2.

Table 2. Possible roles of different social support dimensions in the promotion of physical activity.



Type of Social Support	Example
Emotional support	Empathy from others to be physically active. You feel that they 'are on your side'.
Informational support	Information and advice given by others concerning exercise, such as details of a local running event.
Instrumental support	Direct help provided by others, such as driving someone to a sports centre or buying them a bicycle for transportation.

Adapted from: Biddle and Mutrie (2008)

Community-based PA interventions that include group activities are cost-effective and useful, particularly where participants know each other, share ideas about PA, and motivate each other to engage in or maintain PA (Roux et al., 2008; Anderson, Bovard, Wang, Beebe & Murad, 2016). Social support provided by friends was

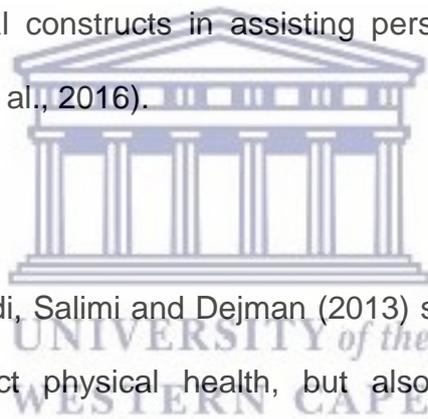
strongly associated with leisure-related PA in older adults (Orsega-Smith, Payne, Mowen, & Godbey, 2007). Community facilities, such as churches or community centres, can be ideal settings for PA programmes, especially in low SES communities (CDC, 2011). Such facilities provide a readily available infrastructure for PA where individuals can participate as a cohesive group, as well as a means of support from social workers, pastors, etc., (CDC, 2011). A positive relationship was reported between church-based social support and participating in PA (Kanu, Baker, & Brownson, 2008).

A strong association between marital status and PA reinforces the value of spousal support or support from significant others in promoting PA (King, Kierman, Ahn, & Wilcox, 1998). Consequently, PA interventions targeting PLWHA of low SES should attempt to recruit couples rather than a single partner in order to facilitate participation and adherence (Barnett, Guell, & Ogilvie, 2013). Furthermore, PA practitioners need to develop interventions that recruit family members and friends in order to promote PA participation, especially among PLWHA (Simonik et al., 2016). Family support is particularly vital for promoting moderate-to-vigorous PA and in reducing physical inactivity (Hsu et al., 2011).

An important mechanism by which social support works to enhance PA is through social bonds and being part of a social network, which plays an important part in enhancing psychological well-being (Qiao, Nie, Tucker, Rennie, & Li, 2015). Psychological well-being increases health-related self-care, which includes regularly engaging in PA (Kawachi & Berkman, 2001). Increased social support can elevate self-esteem, self-efficacy and perceived control of the environment (Hajloo, 2014).

According to Social Learning Theory, social support strengthens self-efficacy and assists individuals overcome impediments to behaviour change (Bandura, 1977). Therefore, PA interventions for persons of low SES should be informed by behaviour change theories that embrace social support and self-efficacy.

A systematic literature review by Mabweazara, Ley and Leach (2016) provides evidence of the effectiveness of Social Cognitive Theory and the Transtheoretical Model of behaviour change in fostering successful PA interventions for persons of low SES. These theories include social support and self-efficacy, thus showing the importance of psychosocial constructs in assisting persons of low SES to adopt regular PA (Mabweazara et al., 2016).



Forouzan, Shushtari, Sajjadi, Salimi and Dejman (2013) state that HIV and AIDS do not only negatively impact physical health, but also psychosocial well-being, because of the associated negative attitude, discrimination, and stigmatization. This is particularly apparent in developing countries, such as those in sub-Saharan Africa (Peltzer & Ramlagan, 2011). The inclusion of HIV education in PA interventions may lead to more people being tested and disclosing their HIV status, increased social support and the associated benefits (Khamarko & Myers, 2013).

Among PLWHA, low educational levels and stigmatisation are significantly associated with lower social support (Lifson et al., 2015). The implication is that PA interventions aimed at PLWHA of low SES should strive to enhance social support

as a health management strategy. Thus, understanding the role of social support in promoting PA amongst PLWHA can assist researchers design context-sensitive interventions to enhance the health-related quality of life of the participants (Ley, Barrio, & Leach, 2015).

Socioeconomic factors are not only major determinants of health, but also influence participation patterns in PA (World Health Organisation, 2003). Levels of participation in PA differ widely depending on SES (Collins, 2004). Several studies show that PA levels tend to be low in socioeconomically disadvantaged groups, and that it is not easy to promote PA in such groups (World Health Organisation, 2013). Amongst PLWHA of low SES, the inability to meet the recommended daily PA requirements for adults is, amongst other factors, usually related to caregiver responsibilities, time dedicated to childcare, unsafe neighbourhoods, strict work schedules and living in temporary dwellings (Seefeldt, Malina, & Clark, 2002). PA interventions are generally not suitable for PLWHA who are socioeconomically disadvantaged, because of the barriers related to unemployment and associated financial constraints, stigmatisation and inaccessible or absent transportation (Jaggers et al., 2013).

The determinants of PA amongst persons of lower SES include greater awareness and advocacy, access to transportation, increased health education (especially of the health benefits of PA), strong social norms that promote active leisure behaviour, and a conducive environment for PA (Dishman et al., 1998).

As such, PA interventions aimed at engaging persons of low SES, should have an educational component, where participants are taught cost-effective, home-based exercises and activities that can be performed independently (Clegg, Barber, Young, Forster, & Iliffe, 2012). Such interventions should also be gender-sensitive and culturally appropriate, especially since women of low SES are less physically active than men (Crespo, Ainsworth, Keteyian, Heath, & Smit, 1999).

As such, standard PA interventions cannot be applied to persons of low SES with the assurance that they will work uniformly (Mabweazara et al., 2016). PA interventions for PLWHA of low SES should, therefore, be contextualised in order to be appropriate and relevant.



#### **4.5 Lessons Learned and Implications for Physical Activity Interventions for People Living with HIV and AIDS of Low Socioeconomic Status**

PA interventions should preferably include a combination of moderate-intensity aerobic and resistance exercises that involve large muscles, such as walking, cycling, jogging, carefully selected sports/games and routine gardening (Jaggers & Hand, 2016).

PA interventions for PLWHA should utilise social support and enhance social support, e.g., using group activities such as group aerobics (Anderson et al., 2016). Community centres and churches are ideal settings for PA programmes, as they already have suitable infrastructure in place for encouraging PA, as well as the

professional support, e.g., social workers, dieticians, ministers, etc. Furthermore, active participation of the spouse, family, friends and workmates should be encouraged in promoting PA (Cioffi et al., 2010).

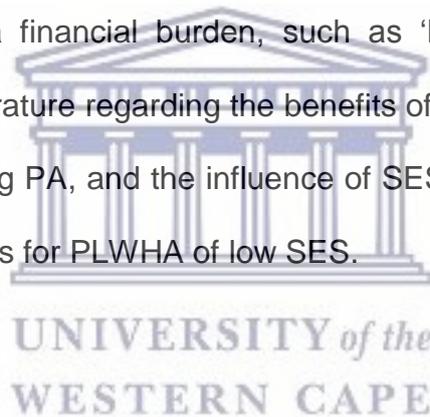
PA interventions need to be considered within the context of the individual's activities of daily living, because physical inactivity is usually related to caregiver responsibilities, time dedicated to childcare, and manual labour as an occupation (Seefeldt et al., 2002). PA interventions should be affordable (e.g., home-based or walking interventions) and not financially burdensome (Ogalha et al., 2011; Bonato et al., 2012).

Persons of low SES are usually less educated and in need of knowledge that supports PA participation (Knox, Esliger, Biddle, & Sherar, 2013). Therefore, health education needs to be included (e.g., pertaining to the health benefits of PA, and mitigating the barriers to PA) (Dishman et al., 1998). Additionally, PA interventions should be gender (Crespo et al., 1999) and SES-sensitive (Everson-Hock et al., 2013). The use of anti-stigma campaigns and HIV education may lead to more people being tested and disclosing their HIV status, increased social support and access to the associated benefits (Khamarko & Myers, 2013).

Equally important, PA programmes should be theoretically-based. The Social Cognitive Theory and the Transtheoretical Model of behaviour change were found to be effective in enhancing social support and promoting regular PA for individuals of low SES (Mabweazara et al., 2016).

## 4.6 Conclusion

The review shows that regular PA is safe and beneficial for PLWHA of low SES. Low SES has a profound influence on PA behaviour in that it impacts access to societal resources and opportunities that, ultimately, influence health behaviours and health outcomes. Enhanced social support can be beneficial for the adoption of healthy behaviours, such as engaging in regular PA. Social support is generally lack in individuals with a stigmatized health condition, such as HIV and AIDS. As such, there is an urgent need for PA promotion interventions that target PLWHA of low SES and teach strategies for garnering social support, whilst encouraging cost-free activities, which are not a financial burden, such as 'brisk-walking'. This review synthesised the current literature regarding the benefits of PA for PLWHA, the role of social support for enhancing PA, and the influence of SES on PA, in order to design appropriate PA interventions for PLWHA of low SES.



## 4.7 Recommendations

Researchers are encouraged to develop cost-free PA interventions that are not financially burdensome. These should preferably include a combination of moderate-intensity aerobic and resistance exercises that involve large and small muscles. PA interventions for PLWHA should utilise social support and enhance social support networks, e.g., using group activities such as group aerobics. Community centres and churches are ideal settings for PA programmes, as they already have suitable infrastructure in place for encouraging PA, as well as the professional support, e.g., social workers, dieticians, ministers, etc. Equally important, PA programmes should

be theoretically-informed. The Social Cognitive Theory and the Transtheoretical Model of behaviour change may be effective in enhancing social support and promoting regular PA for PLWHA of low SES.



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## Chapter Five: Physical, Demographic and Socioeconomic Predictors of Physical Activity Among People Living with HIV of Low Socioeconomic Status

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[Note: The format of this chapter is presented in line with the journal guidelines]

### Abstract

Physical activity (PA) is beneficial for the health of people living with HIV and AIDS (PLWHA). The objective of this study was to determine if age, body weight, height, gender, waist-to-hip ratio (WHR), educational attainment, employment status, CD4+ cell count, and body mass index (BMI) can predict overall PA among PLWHA of low socioeconomic status (SES). The study sample consisted of 978 HIV-infected South African patients. PA data was collected using the Global Physical Activity Questionnaire. Backward multiple linear regression modelling was used to determine the relative influence of variables (age, body weight, height, gender, waist-to-hip ratio, educational attainment, employment status, CD4+ count, and BMI) on total moderate-to-vigorous PA (TMVPA). Alpha level was set at  $<0.05$ . The mean age of the participants was 38.2 (SD = 8.76) years for men and 33.9 (SD = 8.53) years for women. PA was significantly higher in men [480.2 (SD = 582.9) min/wk] than amongst women [369.35 (SD = 222.53) min/wk]. The results of the multiple linear regression analyses showed that educational attainment ( $\beta = 0.127$ ;  $p = 0.00$ ), employment ( $\beta = -0.087$ ;  $p = 0.01$ ), and gender ( $\beta = 0.235$ ;  $p = 0.00$ ) significantly predicted TMVPA. Gender had the greatest effect, followed by educational attainment and employment status. There is a need for PA programmes that are designed to (a) target women (b) strengthen programmes via education that promotes PA and (c) engage the unemployed into PA, especially PLWHA of low SES.

Key words: Physical activity; exercise; socioeconomic status; HIV; AIDS

## 5.1 Introduction

Physical activity plays an important protective and therapeutic role in the prevention and management of chronic illnesses such as cardiovascular disease (Sygit, Sygit & Pietrzak, 2016). PA has also been reported to be beneficial for numerous physiological body systems and can lessen most of the risk factors for non-communicable diseases (Cooper & Hancock, 2012).

It has been suggested that PA is a cost-effective approach to prevent and manage chronic diseases (Giannini, Mohn, & Chiarelli, 2006). This finding has particular implications for chronic conditions, such as HIV/AIDS, that burden third world economies and where pharmacological therapies are associated with exorbitant financial costs and potential toxicities (Fillipas, Cicuttini, Holland, & Cherry, 2013). Moreover, evidence has shown that proper PA is an effective alternative therapy for managing HIV/AIDS and the comorbidities associated with HAART (Jaggers & Hand, 2014).

Given that PA is a cost-effective alternative therapy for the management of HIV/AIDS, and that persons of low socioeconomic status (SES) are disproportionately burdened by HIV/AIDS (Ogunmola, Oladosu, & Olamoyegun, 2014), perhaps PA can be used to bridge the socioeconomic disparities of health for people living with HIV and AIDS (PLWHA) of low SES. Understanding the physical and sociodemographic predictors of PA among PLWHA can be a first step towards understanding factors that affect their PA behaviour. The information generated from such research can be used in the design of contextualised PA interventions for

PLWHA of low SES. Given the foregoing, the aim of this study was to determine if age, body weight, height, gender, waist-to-hip ratio (WHR), educational attainment, employment status, CD4+ cell count, and body mass index (BMI) could predict overall PA among PLWHA.

## **5.2 Materials and Methods**

### **5.2.1 Sampling and Participants**

A secondary study utilising data from a larger cross-sectional study was conducted. Convenient sampling was used to select HIV-infected patients at a community health clinic in Cape Town, South Africa. Participants were 18 years or older and had not changed their antiretroviral therapy (ART) within the past six months. Inclusion and exclusion criteria are reported in detail in Dave et al. (2011). The Research Ethics Committee of the Faculty of Health Sciences of the University of the Western Cape approved the study. Before participating in the study, procedures and risks were explained to the participants. Participants then gave written informed consent to participate in the study. A total of 1035 patients consented to participate in the study. Participants with missing data were excluded, which reduced the sample to 978 participants.

### **5.2.2 Data Collection**

Trained field workers administered a questionnaire to the participants to obtain sociodemographic data, medical history, diabetes risk factors, family history,

smoking, alcohol, and current medication. Subjects' clinical records were reviewed and information extracted on weight, ART regimen, time on ART, CD4+ count, viral load, renal function, oral glucose tolerance test (OGTT), blood pressure measurements, lipodystrophy and a neuropathy examination. The clinical status and anthropometry data of the participants have been reported previously (Dave et al., 2011).

### **5.3 Measurements**

#### **5.3.1 Physical Activity**

The PA data was collected using the Global Physical Activity Questionnaire (GPAQ). The GPAQ consists of 16 questions designed to estimate an individual's level of PA in 3 domains (work, transport and leisure time), and time spent in sedentary behaviour (Bull, Maslin, & Armstrong, 2009). The GPAQ has been found to be valid and reliable for assessing PA among adults (Bull et al., 2009).

### **5.4 Data Analysis**

Data was analysed using the Statistical Package for the Social Sciences (SPSS), version 23 (IBM, New York, USA). Frequency distributions were calculated for all predictors and for the outcome variable. Sub-categories of the 'employment' variables were dummy coded to produce two groups coded as "1" (employed: inclusive of employed individuals and full time homemakers) and "0" (unemployed: inclusive of unemployed individuals, pensioners and those on a disability grant).

Educational attainment was coded as follows: 1: never went to school; 2: primary schooling up to standard 5/grade 7; 3: schooling from standards 6-8/grades 8-10/form 1 to 4; 4: schooling from standards 9-10/grades 11 -12/form 5 to 6; 5: post-school Tertiary/Diploma.

Participant's age, gender, educational attainment, employment status, body weight, height, waist-to-hip ratio, CD4+ cell count and BMI were considered as potential predictors for PA. An independent sample *t*-test was first performed to determine the significant differences in the variables between men and women. Spearman's correlation analysis was then used to determine relationships between body weight, BMI, waist-to-hip ratio, age, CD4+ cell count, gender and total moderate-to-vigorous physical activity (TMVPA). Correlations were interpreted using Dancey and Reidy's (2004) categorization criteria. Backward multiple linear regression modelling was used to determine the relative influence of variables (age, body weight, height, gender, waist-to-hip ratio, educational attainment, employment status, CD4+ cell count, and BMI) on TMVPA. Alpha level was set at  $<0.05$ .

## 5.5 Theory

Individuals of low socioeconomic status (SES), especially those living in informal settlements or townships have the highest prevalence of HIV in South Africa (Shisana & Simbayi, 2002).

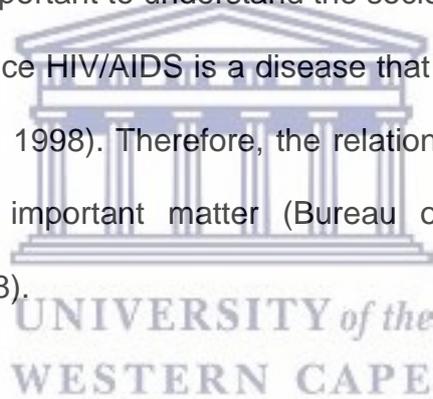
One of the principal causes of mortality amongst PLWHA are co-morbidities associated with chronic cardiometabolic diseases (Antiretroviral Therapy Cohort

Collaboration, 2010). Low SES is known to exacerbate these co-morbid conditions, in part, due to poor diet and low levels of PA, resulting in increased visceral fat mass accumulation and obesity (Jaggers & Hand, 2014). Evidence suggests that PA is a relatively inexpensive and effective therapy for PLWHA (Jaggers & Hand, 2014). This may be especially important for persons of low SES, who are less likely to engage in PA (Brennan, Brownson, & Hovmand, 2012). These individuals generally have a higher overall health risk status, more adverse chronic disease risk factors and poorer health outcomes (Kawachi, Kennedy, & Wilkinson, 1999).

The adverse effects of pharmacological therapy for HIV/AIDS affects fat metabolism (Grunfeld et al., 2010). As such, PLWHA are reported to have significantly more abdominal fat than age-matched HIV-uninfected individuals (Shah et al., 2012). Obesity has become a major issue among PLWHA, especially black women (Amorosa et al., 2005). Yahiaoui and Voss (2015) have mentioned that it is necessary to understand the role of PA in minimising or preventing obesity among PLWHA. This is of particular significance among PLWHA of low SES who are at a greater risk of being obese, especially women (McLaren, 2007). The harmful effects of antiretroviral therapy and the incidence of obesity among PLWHA calls for the use of alternative therapies, such as exercise, to manage the resultant metabolic abnormalities (Yahiaoui & Voss, 2015). In order to design PA interventions that address this issue, there is a need to understand the relationship between age, body weight, height, waist-to-hip ratio, BMI and PA among PLWHA of low SES.

Resistance exercise has been found to be both safe and effective for improving muscle strength and body composition among PLWHA (Yarasheski et al., 2001), and low-intensity aerobic exercise has been associated with significant improvements in cardio-respiratory fitness and serum high-density lipoprotein cholesterol in the same population (Jaggers & Hand, 2014).

Accordingly, there is a need to understand factors that affect the PA behaviours of PLWHA in order to be able to design informed and context-sensitive PA interventions. There are, however, few studies concerning PA in HIV-positive persons. It is particularly important to understand the socioeconomic correlates of PA for PLWHA of low SES, since HIV/AIDS is a disease that is embedded in social and economic inequities (Perry, 1998). Therefore, the relationship between employment status and health is an important matter (Bureau of Labour Statistics, U.S. Department of Labour, 2008).



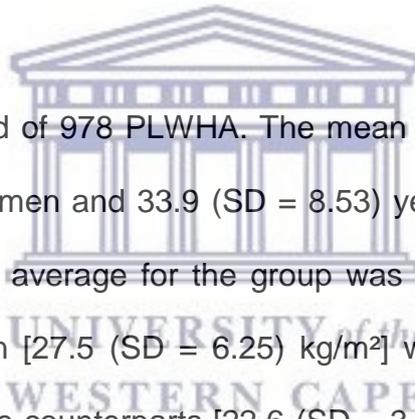
In terms of sociodemographic variables, Webel et al. (2015) examined the influence of gender and age amongst PLWHA and reported that middle-aged men are likely to engage in PA than women. In the general population, unemployed individuals have been reported to be less physically active than employed individuals (Macassa et al., 2016). Non-HIV infected persons with higher education levels are reported to have higher prospects of engaging in PA (Brown & Roberts, 2011). With regard to physical variables, Smith et al. (2001) reported that aerobic exercise training safely lowers weight, BMI and abdominal girth in PLWHA. Mustafa et al. (1999) reported that HIV-positive homosexual men showed an increase in CD4+ cell count with regular

exercise. However, Smith et al. (2001) found no significant differences in CD4+ cell count between an exercising and non-exercising group of PLWHA.

In spite of a growing emphasis on the importance of PA in promoting health factors related to PA, PA among PLWHA in South African adults remains unclear. To the best of our knowledge, no study has investigated the combined influence of physical, demographic and socioeconomic determinants of PA among PLWHA of low SES.

## 5.6 Results

### 5.6.1 Sample Characteristics



The study sample consisted of 978 PLWHA. The mean age of the participants was 38.2 (SD = 8.76) years for men and 33.9 (SD = 8.53) years for women. In terms of educational attainment, the average for the group was Standard 9-10/Form 5 to 6 [3.12 (SD = 0.92)]. Women [27.5 (SD = 6.25) kg/m<sup>2</sup>] were significantly heavier in terms of BMI than their male counterparts [22.6 (SD = 3.46) kg/m<sup>2</sup>]. CD4+ cell count was higher in women [369.35 (SD = 222.53) cells/μL] than in men [312.31 (SD = 234.27) cells/μL]. TMVPA in men (480.2 (SD = 582.9) min/wk] was significantly higher than that of women [369.35 (SD = 222.53) min/wk]. Table 1 shows the physical characteristics of the participants.

Table 1

*Physical Characteristics of the Participants (n=978)*

Variables	Men		Women		Total		<i>p-value</i>
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	
Age (y)	218	38.2 (8.76)	760	33.9 (8.53)	978	34.9 (8.76)	0.000
Height (m)	215	1.69 (0.06)	749	1.57 (0.06)	964	1.60 (0.07)	0.000
Weight (kg)	216	65.2 (11.0)	748	68.7 (16.5)	964	67.9 (15.2)	0.000
BMI (kg/m <sup>2</sup> )	215	22.6 (3.46)	748	27.5 (6.25)	963	26.4 (6.10)	0.000
WHR	213	0.90 (0.06)	742	0.84 (0.11)	955	0.85 (0.11)	0.000
CD4+ (cells/ $\mu$ L)	185	312.31 (234.27)	673	369.35 (222.53)	858	357.0 (226.2)	0.003
TMVPA (min/wk)	218	480.2 (582.9)	760	269.0 (331.5)	978	316.1 (410.6)	0.000

\*Significant  $p < 0.05$

TMVPA=total vigorous to moderate physical activity; m=metre; kg=kilogram; kg/m<sup>2</sup>-kilogram per metre square; BMI = body mass index; WHR = waist hip ratio.



### 5.6.2 Correlation Analysis

The bivariate correlation analyses showed that there was a significant relationship between TMVPA and height ( $r = 0.173$ ,  $p = 0.000$ ,  $n = 964$ ), and an inverse relationship for employment ( $r = -0.132$ ,  $p = 0.000$ ,  $n = 978$ ). The results also showed that there was no significant correlation between TMVPA and age ( $r = 0.002$ ,  $p = 0.955$ ,  $n = 978$ ), CD4+ count ( $r = -0.013$ ,  $p = 0.712$ ,  $n = 858$ ), body weight ( $r = -0.004$ ,  $p = 0.907$ ,  $n = 964$ ), BMI ( $r = -0.074$ ,  $p = 0.021$ ,  $n = 963$ ), WHR ( $r = 0.019$ ,  $p = 0.553$ ,  $n = 955$ ), and education ( $r = 0.095$ ,  $p = 0.003$ ,  $n = 978$ ).

Table 2 shows the Pearson correlation matrix between body weight, body mass index, waist-to-hip ratio, age, CD4+ count, gender, and TMVPA.



Table 2

*Pearson Correlation Matrix Showing Relationships Between Body Weight, Body Mass Index, Waist-to-hip ratio, age, CD4+ count, Gender, and Moderate-to-vigorous Physical Activity (n = 978)*

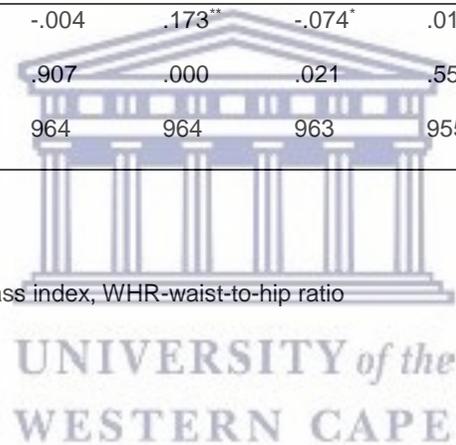
Variables		Age	CD4+	Weight	Height	BMI	WHR	Education	Employment	TMVPA
Age	Pearson Correlation	1	-.038	.092**	.073*	.067*	.204**	-.403**	.025	.002
	Sig. (2-tailed)		.272	.004	.024	.036	.000	.000	.439	.955
	N	978	858	964	964	963	955	978	978	978
CD4+ count	Pearson Correlation	-.038	1	.138**	-.046	.157**	.104**	.020	-.027	-.013
	Sig. (2-tailed)	.272		.000	.184	.000	.003	.558	.431	.712
	N	858	858	847	847	846	838	858	858	858
Body weight	Pearson Correlation	.092**	.138**	1	.215**	.909**	.154**	.071*	-.106**	-.004
	Sig. (2-tailed)	.004	.000		.000	.000	.000	.027	.001	.907
	N	964	847	964	963	963	955	964	964	964
Height	Pearson Correlation	.073*	-.046	.215**	1	-.201**	.133**	-.023	-.119**	.173**
	Sig. (2-tailed)	.024	.184	.000		.000	.000	.471	.000	.000
	N	964	847	963	964	963	954	964	964	964
BMI	Pearson Correlation	.067*	.157**	.909**	-.201**	1	.100**	.073*	-.051	-.074*
	Sig. (2-tailed)	.036	.000	.000	.000		.002	.024	.114	.021
	N	963	846	963	963	963	954	963	963	963
WHR	Pearson Correlation	.204**	.104**	.154**	.133**	.100**	1	-.139**	-.005	.019
	Sig. (2-tailed)	.000	.003	.000	.000	.002		.000	.876	.553

	N	955	838	955	954	954	955	955	955	955
Education	Pearson Correlation	-.403**	.020	.071*	-.023	.073*	-.139**	1	-.114**	.095**
	Sig. (2-tailed)	.000	.558	.027	.471	.024	.000		.000	.003
	N	978	858	964	964	963	955	978	978	978
Employment	Pearson Correlation	.025	-.027	-.106**	-.119**	-.051	-.005	-.114**	1	-.132**
	Sig. (2-tailed)	.439	.431	.001	.000	.114	.876	.000		.000
	N	978	858	964	964	963	955	978	978	978
TMVPA	Pearson Correlation	.002	-.013	-.004	.173**	-.074*	.019	.095**	-.132**	1
	Sig. (2-tailed)	.955	.712	.907	.000	.021	.553	.003	.000	
	N	978	858	964	964	963	955	978	978	978

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

TMVPA-Total moderate-to-vigorous physical activity, BMI-body mass index, WHR-waist-to-hip ratio



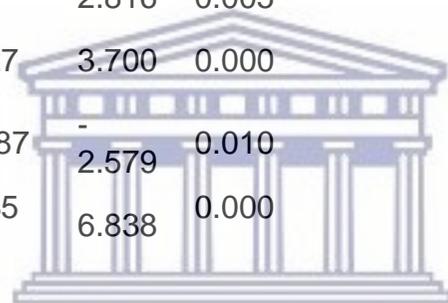
### 5.6.3 Regression Analysis

The results of the multiple linear regression analyses to predict TMVPA using age, CD4+ count, gender, height, body weight, body mass index, waist-to-hip ratio, education and employment showed that education, employment, and gender significantly predicted TMVPA. Table 3 shows the results of the multiple linear regression analyses. Education, employment status, and gender accounted for 7.8% of variance ( $R^2= 0.078$ ;  $p = 0.000$ ). The generalised equation used to predict TMVPA from education, employment, and gender was:  $TMVPA = 216.143 + 56.599$  (education)  $- 73.465$  (employment)  $- 235.485$  (gender: 1 = men, 0 = women) obtained from coefficients table. Education, employment status and gender significantly predicted TMVPA  $F(9, 827) = 7.734$ ,  $p < 0.001$ ,  $R^2= 0.068$  at  $p < 0.05$ . The results of the regression analyses showed us that being male were predictive of increased TMVPA. Males had 235.485 more minutes of TMVPA per week than females. Being employed was also predictive of increased TMVPA. Unemployed individuals had 73.469 less minutes of TMVPA per week than employed individuals. Educational attainment was also predictive of TMVPA. An increase in educational attainment meant an increase in TMVPA by 56.599 minutes per week. Gender had the greatest effect ( $\beta = 0.235$ ;  $p = 0.00$ ), followed by educational attainment ( $\beta = 0.127$ ;  $p = 0.00$ ) and employment ( $\beta = -0.087$ ;  $p = 0.01$ ). BMI, height, waist-to-hip ratio, CD4+ count and age did not predict TMVPA.

Table 3

*Multiple Linear Regression Analysis to Predict Total Moderate-to-vigorous Physical Activity from Body Weight, Body Mass Index, Waist-to-hip ratio, Age, CD4+ count, and Gender (n = 978)*

	Regression coefficients					Model summary					
	B	SE	$\beta$	t	p	R	R <sup>2</sup>	F	df <sub>1</sub>	df <sub>2</sub>	p
Criterion: TMVPA						0.274	0.075	22.529	3	833	0.000
Intercept	216.143	76.752		2.816	0.005						
Education	56.599	15.298	0.127	3.700	0.000						
Employment	-73.469	28.486	-0.087	2.579	0.010						
Gender	235.485	34.439	0.235	6.838	0.000						



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$p < 0.05$

## 5.7 Discussion

The aim of this study was to establish if age, body weight, height, gender, waist-to-hip ratio, educational attainment, employment status, CD4+ cell count, and BMI significantly predicted TMVPA among PLWHA. It was found that education, employment status and gender significantly predicted TMVPA.

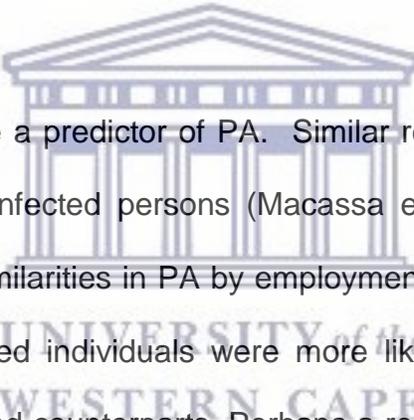
Gender was found to have the greatest effect on TMVPA. Webel et al. (2015) examined patterns of free-living exercise in adults with HIV by gender and age and reported that middle-aged men exercised more regularly than women. Similarly, an earlier study indicated that men are more likely to engage in PA more than women (Litchman et al., 1992). Married people and females in general, engage in less exercise (Humphreys & Ruseski, 2009).



In African settings, men generally tend to be employed, and provide for the family, while women do household chores and take care of the children. Thus, given a low-income environment, where most of the men will be involved in active occupations, it is expected that men will have higher PA levels than females, because the latter will spend most of the day involved in activities that are more sedentary. Particularly, Bellows-Rieken & Rhodes (2007) have noted that PA changes during parenthood may be moderated by gender, with mothers experiencing the largest decline, as women are traditionally the primary caregivers. Moreover, Verhoef and Love (1994), reported that for women who are mothers, the amount of leisure time available to them was one of the

most important predictors of participation in PA. The implication of this finding for PLWHA in low-income settings is that, PA interventions should focus more on motivating women into PA participation and that women could gain more from PA interventions than men.

For employment, one might argue that the results maybe confounded by clinical status. The results showed that there was no correlation between CD4+ cell count and employment.



Employment was found to be a predictor of PA. Similar results have been reported in other studies with non-HIV infected persons (Macassa et al., 2016). Macassa et al. (2016) inquired into the dissimilarities in PA by employment status among economically active individuals. Unemployed individuals were more likely to be physically inactive when likened to their employed counterparts. Perhaps a reason for this finding might be that, individuals who earn an income are generally better able to afford time for PA (North Carolina Institute of Medicine Task Force on Prevention, 2009) and they can afford to pay the expenses associated with being a member of a fitness and wellness club. Health insurance and healthcare also become more accessible with the availability of monetary resources (North Carolina Institute of Medicine Task Force on Prevention, 2009).

Employed PLWHA of low SES are also more likely to be able to afford health resources and products (e.g., diet and medical insurance) which might in turn positively influence their physical and mental quality of life. As such, they are then more able to engage in PA than those who are unemployed.

In addition, job security might also enhance their self-esteem and self-efficacy to exercise, thus, placing them in a better position to engage in PA, because job security is related to higher quality of life for employed PLWHA (Rueda et al., 2012). Being employed may mean that they have to walk to and from work daily, and this positively influences their physical activity compared to those who are unemployed.

It has been reported that differences in income generally make the greatest disparities for health (North Carolina Institute of Medicine Task Force on Prevention, 2009). Unemployment provides a permanent stress, requiring the person to adapt to the impoverished circumstances (Macassa et al., 2016). The unemployed are in a very difficult situation, exacerbated by their HIV-positive status, absent income status, and social marginalisation, which in turn, leads to feelings of worthlessness (Kapuvary, 2011). It is argued that the stress experienced by unemployed individuals might be the primary cause of seeking other unhealthy behaviours (Macassa et al., 2016). Individuals who are unemployed, especially those of a low-income are more likely to be poor, live in sub-standard housing or in unsafe communities, which restrict participation in PA. These communities often lack access to outdoor recreational facilities, where they can engage in PA.

Educational attainment was shown to be a significant predictor of PA, with higher educational attainment associated with an increase in TMVPA. Brown & Roberts (2011) stated that higher levels of education increase the prospect of engaging in more frequent PA. Shaw and Spokane (2008) reported that among adults with low education levels, being unemployed was related to low levels of PA, whereas the reverse was true for those with a better education.

Frantz & Murenzi (2014) established the PA levels among PLWHA of lower education levels the majority were inactive and mainly engaged in passive leisure-time PA. Moreover, Hui, Hui, & Xie (2014) reported that education level was positively related with PA knowledge amongst adults with Type 2 Diabetes. Educated individuals are in a position to understand the beneficial effects of PA for managing HIV/AIDS and, thus, engage more in PA. Thus, a physical education programme may be more strategic in promoting PA. This finding emphasizes the need to strengthen programmes for physical and health education in promoting PA for PLWHA of low SES who present with low levels of education.

## **5.8 Strengths of the Study**

This study is one of the few that have examined the relationship between SES and PA among PLWHA of low SES in South Africa. The study explained how sociodemographic variables predict PA among PLWHA. This information may be used in the design of PA interventions that are aimed at engaging PLWHA of low SES in PA.

## **5.9 Limitations of the Study**

Use of different instruments in data collection makes comparison between studies limited. A limitation was the lack of objective measures of PA, such as accelerometry, to support the data from the GPAQ. The GPAQ is a participant recall questionnaire and this type of instrument can be highly unreliable. Furthermore, only a few studies have investigated the combined effects of physical, demographic and socioeconomic variables on PA among PLWHA of low SES which further limits comparison with other studies.

## **5.10 Recommendations**

It is important to understand how the physical and sociodemographic determinants of PA influence specific PA patterns and behaviours. This information can prove valuable when identifying specific techniques that target PA domains of particular communities.

## **5.11 Conclusion**

The results of this study revealed that among PLWHA of low SES, gender, education and employment were significant predictors of PA. Accordingly, there is a need for PA programmes and policies that are designed to (a) target women (b) strengthen programmes for physical and health education that promote PA and (c) engage the unemployed in regular PA, especially those with HIV. PA interventions for PLWHA

should take cognisance of the societal health disparities that exist in order to be applicable and context-sensitive.



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## Chapter Six: Physical Activity Behaviours of People Living with HIV of Low Socioeconomic Status: Domain, Intensity and Sociodemographic Correlates

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### Abstract

Physical activity (PA) is healthy for People Living with HIV and AIDS (PLWHA). This study examined the PA profile of 978 PLWHA based on PA domains and PA intensity. The study also sought to determine whether employment status and level of education can predict PA among PLWHA of low SES. PA and sociodemographic data of 978 PLWHA of mean age 35 (8.77) years were collected using the global physical activity questionnaire and a sociodemographic questionnaire. Results showed that, participants engaged more in work-related PA [160.11 (SD = 346.95) min/wk], followed by transport-related PA [115.21(SD = 142.04) min/wk], and lastly in leisure-related PA [40.84 (SD = 110.37) min/wk]. Participants also engaged more in moderate-intensity PA [265.86 (SD = 335.45) min/wk], than in vigorous-intensity PA [50.29 (SD = 205.30) min/wk]. Employment was a significant predictor of overall PA controlling for age, CD4+ count and education level. The model explained 2.5% of the variance ( $R^2 = 0.025$ ) on overall PA and tested significantly at a alpha level  $<0.01$  ( $p < 0.001$ ). PA interventions for this population should be domain- and intensity-specific. Researchers promoting healthy lifestyle behaviour change can benefit from determining the factors that facilitate domain-specific PA.

Key words: Physical activity, exercise, socioeconomic status, HIV, AIDS

## 6.1 Introduction

PA has been recommended for the treatment of HIV (Jaggers & Hand, 2014). People living with HIV and AIDS (PLWHA) are living longer, such that HIV/AIDS is now considered a chronic illness (Deeks, Lewin, & Havlir, 2013) that is associated with increased risk of cardiovascular disease (Kendall et al., 2014). Among PLWHA, exercise is effective in reducing disability caused sarcopenia (da Silva Paes et al., 2015). Resistance exercise increases body weight and limb girth (Fillipas, Cherry, Cicuttini, Smirneos, & Holland, 2015) and is effective in improving muscular strength and CD4+ cell count among PLWHA (Poton, Polito, & Farinatti, 2016).

Engaging in leisure-related, work-related, and transport-related PA is patterned along a continuum of socioeconomic status (SES) (Allender, Foster, & Boxer, 2008). Rombaldi, Menezes, Renato Azevedo and Hallal (2010) reported that persons of high SES engaged in significantly more leisure-related PA, whereas persons of lower SES engaged more in work-related PA. In South Africa (SA), differences in SES are prominent and related to historical socio-political considerations (Philip, Tsedu, & Zwane, 2014). Employment status and level of education are commonly used as indicators of SES (Pirkis et al., 2017). This study examined the PA profile of 978 PLWHA based on PA domains and PA intensity. The study also sought to determine whether employment status and level of education can predict PA among PLWHA of low SES.

## 6.2 Methods

### 6.2.1 Sampling and Participants

Referral sampling was used to recruit 978 HIV-infected patients at a community health care centre in Cape Town, SA. Exclusion criteria were reported in detail in Dave et al. (2011). The Research Ethics Committee of the Faculty of Health Sciences at the University of the Western Cape approved the study (Registration number: 14/10/33). Participants gave written informed consent to participate in the study.

## 6.3 Data Collection

### 6.3.1 Sociodemographic and Medical Information

For details on data collection of sociodemographic and medical information, the reader is referred to Dave et al. (2011). CD4+ count was extracted from the subjects' clinical records and categorised according to the World Health Organisation clinical staging of HIV/AIDS (WHO, 2005). Table 1 explains how the categories for employment status and level of education were determined.



## 6.4 Measurements

### 6.4.1 Physical Activity

PA data was collected using the Global Physical Activity Questionnaire (GPAQ) based on work-, transport- and leisure-related PA (Bull, Maslin, & Armstrong, 2009).

## 6.5 Data Analysis

Data was analysed using the Statistical Package for the Social Sciences (SPSS), version 23 (IBM, New York, USA). Descriptive statistics were used to show the levels of PA in terms of domain and intensity. Pearson correlation was used to examine correlations among variables. Linear regression analysis was used to test predictive relationships. Four models were tested for significance with age, CD4+ cell count, level of education and employment status. Age was used as a variable in the regression analysis because, as opposed to sex, age and TMVPA had a statistically significant linear relationship ( $p < .001$ ). All regressions were computed twice using CD4+ cell count as a continuous variable and as a categorical variable. There were no significant differences between the two versions of these models. Therefore, CD4+ cell count was retained as a categorical variable. The predictors were regressed onto four measures of PA, namely, Model 1 predicted overall PA, model 2 predicted work-related PA, model 3 predicted leisure-related PA, and model 4 predicted transport-related PA.

## 6.6 Results

### 6.6.1 Sample Characteristics

The mean age of the participants was 35 (8.77) years, the range was 49 years and the minimum and maximum of the age were 19 and 68 years respectively. The majority of the participants were women (77.71%) who were unemployed (72.7%). Concerning education, 5.9% of the participants never went to school, 17.4% attended school up to Grade 7; 74.3% up to Grade 10, and 2.4% up to Grade 12. The mean CD4+ cell count was 357.05 (226. 20) cells/ $\mu$ L, and 39.5% had a CD4+ cell count <200; 17.2% had a CD4+ cell count of 200 to 350, and 43.2% >350. Table 1 shows the domain-specific mean PA scores across the categorical variables.

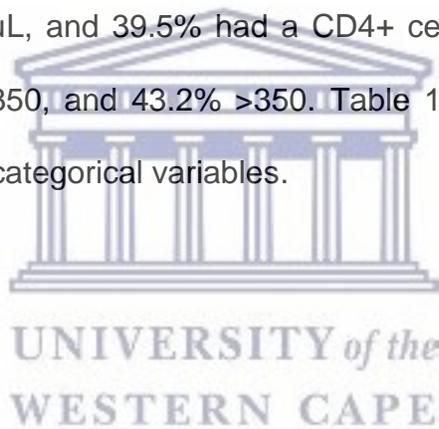


Table 1

*Domain-specific Mean Physical Activity Scores Across the Categorical Variables (n=978)*

<b>Variable</b>	<b>Overall PA Mean (SD) min/wk</b>	<b>Work-related PA Mean (SD) min/wk</b>	<b>Transport-related PA Mean (SD) min/wk</b>	<b>Leisure-related PA Mean (SD) min/wk</b>
<b>Sex</b>				
Men (n = 218; 77.7%)	480.3 (583.0)	279.3 (583.7)	127.5 (130.7)	73.4 (157.8)
Women (n = 760; 22.3%)	269.1 (331.6)	125.9 (258.3)	111.7 (145.0)	31.5 (90.4)
<b>CD4+ cell count (cells/<math>\mu</math>L)</b>				
Level 1 (n = 339; 39.5%)	316.7 (447.0)	167.8 (363.6)	101.9 (103.5)	50.0 (125.2)
Level 2 (n = 148; 17.2%)	337.0 (404.2)	154.6 (345.1)	141.9 (194.2)	40.5 (111.4)
Level 3 (n = 371; 43.2%)	313.1 (397.8)	154.7 (348.4)	121.0 (151.6)	37.4 (101.6)
<b>Education</b>				
Level 1 (n = 58; 5.9%)	227.2 (406.8)	118.2 (369.3)	96.3 (115.5)	12.8 (32.5)
Level 2 (n = 170; 17.4%)	289.1 (302.9)	144.0 (263.8)	108.1 (121.8)	37.1 (91.9)
Level 3 (n = 370; 74.3%)	286.4 (356.8)	139.7 (304.5)	107.3 (115.0)	39.4 (106.7)
Level 4 (n = 357; 2.4%)	375.6 (499.1)	199.4 (418.2)	129.5 (176.4)	46.7 (122.2)
<b>Employment</b>				
Unemployed (n = 711; 72.7%)	279.5 (359.2)	130.9 (273.6)	109.1 (145.6)	39.6 (103.1)
Employed (n = 267; 27.3%)	413.7 (511.7)	238.0 (483.7)	131.6 (131.0)	44.1 (127.8)
<b>Total</b>	<b>316.2 (410.7)</b>	<b>160.1 (347.0)</b>	<b>115.2 (142.0)</b>	<b>40.8 (110.4)</b>

Note: CD4+ cell count: 1 < 200 cells/ $\mu$ L; 2 = 200-350 cells/ $\mu$ L; 3 > 350 cells/ $\mu$ L; Education: Level1 = Never went to school; Level 2 = Up to grade 7/Primary; Level 3 = grade 8 - 10; Level 4 = grade 11-12; min/wk=minutes per week.

Participants engaged more in work-related PA, followed by transport-related PA and, lastly, in leisure-related PA. Participants also engaged more in moderate-intensity PA than in vigorous-intensity PA. In terms of PA domain and intensity, participants engaged more in work-related moderate-intensity PA and work-related vigorous-intensity PA than in leisure-related moderate-intensity PA and leisure-related vigorous-intensity PA. Results also show large differences in PA between men and women across all PA domains, especially in work-related PA. Men engaged in more PA than women. Table 2 shows the results of the regression analyses for age, CD4+ cell count, level of education and employment status on overall PA (Model 1), and also on work-related PA (Model 2).

Table 2

*Multiple Regression Analysis (n=858)*

Model	Predictors	Outcome	R <sup>2</sup>	β
1	Age	TMVPA	.025**	.039
	CD4 group			-.017
	Education group			.070
	Employment group			-.142*
2	Age	WTMVPA	.020*	.028
	CD4 group			-.028
	Education group			.41
	Employment group			-.136**

\* $p < .01$       \*\* $p < .001$

Note: TMVPA= Total moderate-to-vigorous physical activity; WTMVPA= Work total moderate-to-vigorous physical activity; β= standardised coefficient; R<sup>2</sup>= Coefficient of determination;

Model 1 explained 2.5% of the variance ( $R^2 = 0.025$ ) on overall PA (TMVPA) and tested significant at a 0.01 alpha level ( $p \leq 0.001$ ). Employment was a significant predictor of overall PA when controlling for age, CD4+ count and education level. Education group was not a significant predictor ( $p = 0.057$ ) of overall PA.

Model 2 explained 2% of the variance ( $R^2 = 0.02$ ) on work-related PA and tested significant at a 0.01 alpha level ( $p = 0.001$ ). Employment status was a significant predictor of work-related PA ( $p < 0.001$ ) when controlling for age, CD4 group and level of education.

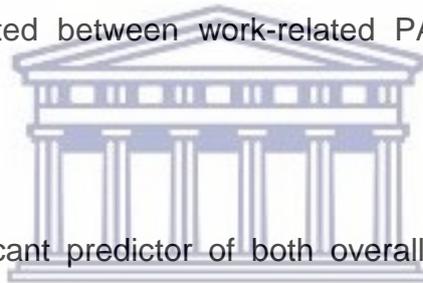
The negative standardised coefficient for employment is only because of the coding that was used for employment i.e (1= employed and 2 = unemployed) but basically as participants moved from unemployed to employed PA increased.



Leisure-related PA (Models 3 and 4): Model 3 ( $R^2 = 0.006$ ;  $p = 0.250$ ) and transport-related PA: Model 4 ( $R^2 = 0.010$ ;  $p = 0.69$ ) were not significant.

## 6.7 Discussion

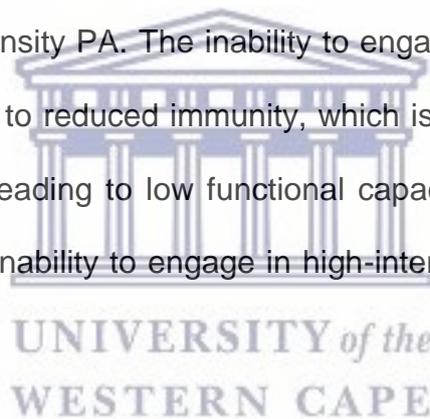
PLWHA engaged most frequently in work-related PA, followed by transport-related PA and leisure-related PA. Steele and Mummery (2003) who reported that persons of low SES participated in minimal leisure-time PA than persons of high SES support this. The present study consisted of PLWHA of low SES (i.e., 72.7% of the participants were unemployed). However, in terms of education, most of the participants (74.3%) attended school up to grade 8. The reason for engaging in less leisure-related PA may be due to persons of low SES more likely having physically demanding employment (Delaney, 2016). Florindo et al. (2006) found that a significant correlation existed between work-related PA and energy expenditure among PLWHA.



Employment was a significant predictor of both overall PA and work-related PA. Furthermore, from the descriptive analysis, those with at least two years of a high school education, and those who are employed are more likely to engage in PA. Physical inactivity is a health risk behaviour that must be reduced. Sousa (2012) stated that PA levels might be influenced by access to active workspaces in order to engage in PA in the work environment. Occupational PA was found to be more prevalent among low SES groups (Beenackers et al., 2012). However, among PLWHA in Rwanda, Murenzi (2011) found 69% of the participants to be inactive, despite being employed. However, these participants were at a more advanced stage of disease progression that could have accounted for their high levels of inactivity. In the present study, the cohort is relatively healthy with 60% of the participants with CD4+ counts greater than 200.

Transport-related PA was higher than leisure-related PA in the present study. Those who participated in more work-related PA may also engage more in transport-related PA (Macintyre & Mutrie, 2004). Persons of low SES are more likely to engage in walking when commuting, as a cost-saving alternative (Ellaway, Macintyre, & McKay, 2003; Ogilvie, Mitchell, Mutrie, Petticrew, & Platt, 2008).

Participants engaged more in moderate- than vigorous-intensity PA. Participants met the WHO (2012) guidelines for at least 150 minutes of moderate-intensity PA, but not 75 minutes of vigorous-intensity PA. The inability to engage in vigorous-intensity PA among PLWHA may relate to reduced immunity, which is as a result of low a CD4+ cell count. Consequently, leading to low functional capacity (Veljkovic et al., 2010) and fatigue and, thus, the inability to engage in high-intensity PA (Maduagwu et al., 2015).



PLWHA are more prone to adverse clinical conditions (e.g., opportunistic infections, anaemia, vitamin deficiencies, neurological problems, rheumatological problems, kidney problems, etc.) that limit or restrict their PA, especially at a vigorous-intensity (Basavaraj, Navya, & Rashmi, 2010; Anand & Puri, 2015). Multiple studies, report less vigorous-intensity PA in PLWHA (Ramírez-Marrero, Smith, Meléndez-Brau, & Santana-Bagur, 2004; Smit et al., 2006; Salyer, Lyon, Settle, Elswick, & Rackley, 2006). This is also related to the immunosuppressing effects of vigorous-intensity exercise, and is often contra-indicated medically (Pedersen & Hoffman-Goetz, 2000).

## 6.8 Strengths and Limitations

There is a scarcity of research focusing on PA in PLWHA, especially of low SES in sub-Saharan Africa. The relatively large sample size of PLWHA of low SES produced good evidence of the specific PA domains and correlates that should be targeted in PA interventions in this community. A limitation was the lack of objective measures of PA, such as accelerometry, to corroborate the data from the GPAQ. The GPAQ is a participant recall questionnaire and this type of instrument can be highly unreliable. Even though persons of low SES are likely to be employed in active occupations (Talaie et al., 2013), this study did not specify the type of employment of the participants.



## 6.9 Conclusion

PLWHA of low SES engaged in work-related PA more frequently than in transport-related or leisure-related PA. PLWHA also engaged more in moderate-intensity PA than low or vigorous-intensity PA. PA interventions for PLWHA should consider employment status, PA domains and intensity. Specifically, it is recommended that interventions target unemployed PLWHA and encourage low to moderate PA. Further research is needed to (1) understand the range and relative importance of factors that account for low SES involvement in PA and (2) understand how to engage unemployed and under educated PLWHA, especially women.

## Conflict of Interest

The authors declare no potential conflict of interest.

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## Chapter Seven: Physical Activity Among HIV Positive Women of Low Socioeconomic Status: Benefits and Barriers

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[Note: The format of this chapter is presented in its published format]

### Abstract

Physical activity (PA) is beneficial for people living with HIV. The purpose of this study was to investigate the benefits and barriers of PA for HIV-positive women of low socioeconomic status (SES). A concurrent mixed methods study design was used, wherein focus group discussions were conducted with 21 participants to explore the participants' barriers to engaging in PA and exercise preferences; and determine improvements that could be added to the content and delivery of a planned, contextualised PA intervention programme for HIV-positive women of low SES. The exercise benefits/barriers (EBBS) questionnaire was also used to assess participants' perceived benefits and barriers to exercise. The results of the study showed that the participants' barriers to PA were associated with HIV-related symptoms and medications, depression, aging, finances, time-constraints, personal living environments, a lack of knowledge about the value of PA, and a lack of motivation to engage in PA. Participants had higher perceived benefits [M (SD) = 3.16(0.74)] than barriers [M (SD) = 2.68(0.96)] to exercise. In terms of barriers, the participants agreed most on the item: 'there are too few places for me to exercise,' and disagreed most on the item: 'I am too embarrassed to exercise'. In terms of benefits, the participants agreed most on the item: 'exercise improves the way my body looks,' and disagreed most on the items: 'exercise allows me to carry out normal activities without becoming tired' and 'exercise improves the quality of my work'. Exercise preferences included aerobic exercises, calisthenics and chair exercises. Participants preferred group classes, with monitoring and tracking of exercise. In conclusion, the intervention should consider the barriers to PA that relate specifically to HIV-induced symptoms and medications. Also, the study highlights the importance of including participants' preferred exercises with monitoring and tracking of exercise.

Key words: Barriers, Benefits, HIV/AIDS, Physical activity

## 7.1 Introduction

Physical activity (PA) and exercise has substantial health benefits for people living with HIV (PLWH) (Bonato et al., 2012; Garcia et al., 2013; Farias et al., 2016). Despite the abundant evidence proving the effectiveness of PA for managing PLWH, a recent meta-analysis has shown that most PLWH seldomly engage in PA (Vancampfort et al., 2016). Socioeconomic status (SES) is one determinant which can impact PA engagement. Physical inactivity has been cited as one of the behavioural risk factors by which socioeconomic differences affect health disparities (Lee & Kim, 2016). Persons of low SES are less likely to engage in health-enhancing PA (Lee & Kim, 2016), more especially PLWH (Brennan, Brownson, & Hovmand, 2012). In South Africa, the black majority are of low SES and are disproportionately burdened by the HIV pandemic (Wabiri & Taffa, 2013).

Underserved populations are reported to be unlikely to participate in community-based PA interventions (Dornelasi, Stepnowski, Fischer, & Thompson, 2007) and this may be more so for PLWH of low SES, due to the stigma and socioeconomic problems associated with the disease (Kinsler, Wong, Sayler, Davis, & Cunningham, 2007; Hogg, Puskas, Parashar, & Montaner, 2016). The use of low-cost PA is particularly relevant in this population to assist in the management of the disease (Bull, Dombrowski, McCleary, & Johnston, 2014), because of the limited access and adherence to medication (Azia, Mukumbang, & Van Wyk, 2016). PA interventions aim to educate the participants about the health benefits of PA (Gothe & Kendall, 2016).

The social cognitive theory (SCT) (Bandura, 1986), has been widely applied as a theoretical framework to inform the design and implementation of PA programmes in older adults (McAuley, Szabo, Gothe, & Olson, 2011). The SCT emphasises the significance of identifying determining factors for behaviour change, such as the benefits, barriers and preferences to PA participation (Gothe & Kendall, 2016). The psychological, sociocultural, and environmental factors need to be carefully considered in order to successfully contextualise PA interventions (Bopp et al., 2006). Furthermore, 'shared decision-making' (i.e., community involvement or partnerships lead to better programme design, participant adherence, implementation and improved sustainability (Durlak & Dupre, 2008). As such, intervention programmes that incorporate the participants' opinions can be effective, and are more likely to succeed (Deliens, Deforche, De Bourdeaudhuij, & Clarys, 2015).



In view of the aforementioned, this study employed a concurrent mixed methods research design to (a) assess the participants' perceived benefits and barriers to exercise (b) explore the participants' barriers to engaging in PA (c) explore participant exercise preferences and (d) determine improvements that could be added to the content and delivery of a planned, contextualised pilot PA intervention programme for HIV-positive women living in low income communities in the Western Cape Province in South Africa (SA).

## 7.2 Methods

### 7.2.1 Setting and Sample

This was a preliminary study conducted to inform the design of an intervention to promote PA among PLWHA of low SES. The study was conducted at a community centre caring for HIV positive women living with HIV and AIDS in a low-income community in the Western Cape Province in SA.

### 7.2.2 Screening and Eligibility Requirements

Participants were eligible to participate in the study if they were HIV-positive, and between 18 and 65 years. In addition, to be eligible, participants needed to be unemployed and not have attained a post high school education. This is in line with the glossary of indicators of SES (Galobardes, Shaw, Lawlor, Lynch & Smith, 2006). As such, this study used level of education and employment status as indicators of SES.

### 7.2.3 Procedure

The demographic information of the participants was obtained using a demographic questionnaire. Participants' medical records were used to confirm HIV status and CD4+ cell count. These were then self-reported in the demographic questionnaire. The participants were also asked to complete the exercise benefits/barriers scale

(EBBS) (Sechrist, Walker & Pender, 1987). Focus group discussions were conducted a week after administering the demographic questionnaire and the EBBS.

## 7.3 Instruments

### 7.3.1 Question Guide

The focus group procedure (Krueger, 1998) recommends that researchers use a semi-structured question guide (Table 1). To conform to this recommendation, a question guide was developed by the research team with the aim of identifying exercise preferences, barriers to engaging in PA and any improvements that could be added to a planned PA promotion programme for PLWH of low SES. The question guide was carefully developed using appropriate literature (Nies, Troutman-Jordan, Branche, Moore-Harrison & Hohensee, 2013; CDC, 2015; Tuso, 2015) by the lead researcher. When completed, the question guide was then checked and edited by the supervisory team (CL) and (LLL). The guide contained preliminary questions and the main questions that focused on the purpose of the study, i.e., identifying the exercise preferences of the participants, the barriers to PA, and improvements that could be added to the programme. Strategic questions were used to guide the focus group discussions in the right direction, especially when the participants deviated from the main purpose of the discussions.

Table 1. Focus group question guide

Type of question	Question
Opening	1. Can you please tell us your name and where you are from?
Introduction	2. During the physical activity and wellness workshop, we spoke about physical activity. Do you engage in any daily physical activity?
Key	1. What exercises/activities would you prefer to be included in the physical activity programme that we plan to introduce for you? 2. What are your barriers to physical activity? 3. How can we plan in order to overcome the barriers?
Ending	4. Do you have any comments, recommendations, and/or additions to make regarding the PA programme?

Two focus group discussions were conducted with 21 HIV-positive female participants of low SES. One group consisted of 11 participants, and the other 10 participants. The focus group discussions took place at the community centre, where all participants were enrolled. A moderator (lead researcher) and two assistant moderators (a Sport Science Masters student and a third year Sport Science student), who were fluent in the isiXhosa language, i.e., the vernacular of the participants, facilitated each focus group session. During the focus group discussions, the assistant moderators recorded the participants' responses in booklets. The focus group discussions lasted 2 hours.

### 7.3.2 The Exercise Benefits/Barriers Scale (EBBS)

The EBBS comprises two main scales, i.e., the perceived benefits to exercise scale and the perceived barriers to exercise scale. The perceived benefits scale comprises 29-items subdivided into the following sub-scales, i.e., (a) life enhancement (8-items), (b) physical performance (8-items), (c) psychological outlook (6-items), (d) social interaction (4-items), and (e) preventative health (3-items). The perceived barriers scale comprises 14-items subdivided into the following sub-scales, i.e., (a)

exercise milieu (6-items), (b) time expenditure (3-items), and (c) family discouragement (2-items). Cronbach-alpha co-efficient scores of 0.93 and 0.83 were reported for a sample of HIV positive women for the benefits and barriers scales, respectively (Rehm & Konkle-Parker, 2016). Cronbach-alpha coefficient scores for the benefits and barriers scales for the present study were 0.82 and 0.81, respectively. All questions in the EBBS questionnaire were scored on a 4-point Likert scale, where 1 = 'strongly disagree'; 2 = 'disagree'; 3 = 'agree'; and 4 = 'strongly agree'.

#### **7.4 Ethics Statement**

At the outset of the study, the lead researcher explained the purpose of the study to the participants and provided them with study information sheets. Then, the participants signed informed consent after being informed that they could withdraw from the study at any stage with impunity. Permission to conduct the study was granted by the Senate Research Ethics Committee of the University of the Western Cape (registration number: 14/10/33) and by the management of the community centre.

#### **7.5 Data Analysis**

Means and standard deviations were calculated for the individual items of the EBBS using SPSS, version 24. Data acquired from the audio recordings of the focus group discussions were transcribed verbatim into written text in Microsoft Word, using Windows Media Player. An inductive content analysis process was employed to

analyse the data (Elo & Kyngäs, 2008). Data were coded and interpreted independently by three researchers (SZM; CL; and LLL) in order to ensure the reliability of data coding and data interpretation. Where there was doubt or disagreement amongst researchers, follow-up discussions were held until consensus was reached.

For content analysis, quotes from the data were assessed for repeated cases. These were, then, systematically branded across the data set, and grouped together by means of an open coding system (Silverman, 2004). Following this first step, themes emanating from the data were then grouped together into subcategories and, thereafter, into main categories.

## 7.6 Results



### 7.6.1 Sample Characteristics

The mean age of the participants was  $M = 37.57$ ;  $SD = 8.64$  years. The mean height for the participants was  $M = 1.61$ ;  $SD = 0.06$  m, mean weight was  $M = 84.52$ ;  $SD = 22.48$  kg, and mean BMI was  $M = 32.21$ ;  $SD = 7.89$   $\text{kg}\cdot\text{m}^{-2}$ . All participants were unemployed and did not have a post high school education. As such, all the participants were considered to be of low SES. In this study, 4.8% of the participants attended school up to grade 7; 33% up to grade 10; and 61.9% up to grade 12. The mean CD4+ cell count was  $M = 469.68$ ;  $SD = 157.48$  cells/ $\mu\text{L}$  ( $N = 19$ ), and two participants had no CD4+ cell count data, but were HIV seropositive.

## 7.6.2 Results from the EBBS

Table 2 shows the mean and standard deviation for each item of the barriers to PA sub-scale. In general, participants identified with all the barriers. The participants identified strongly with some items, which represented definite barriers for the participants (e.g., *'there are too few places for me to exercise'*; *'exercise takes too much time from my family responsibilities'* and *'I am fatigued by exercise'*. Participants disagreed most on the item: *'I am too embarrassed to exercise,'* and agreed most on the items *'there are too few places for me to exercise'*, followed by *'exercise takes too much time from my family responsibilities'* and *'exercise is hard work for me'*.

Table 2. The exercise barriers sub-scale depicted as mean and standard deviation (n = 21).

Perceived Barriers Items	M (±SD)
<b>Exercise Milieu Sub-scale</b>	
9: Places for me to exercise are too far away	2.52 (0.87)
12: I am too embarrassed to exercise	2.19 (0.75)
14: It costs too much money to exercise	2.29 (0.90)
16: Exercise facilities do not have convenient schedules for me	2.43 (0.81)
28: I think people in exercise clothes look funny	2.33 (0.86)
42: There are too few places for me to exercise	3.90 (0.30)
<b>Time Expenditure Sub-scale</b>	
4: Exercising takes too much of my time	2.48 (0.98)
24: Exercise takes too much time from family relationships	2.38 (0.81)
37: Exercise takes too much time from my family responsibilities	3.24 (1.00)
<b>Physical Exertion Sub-scale</b>	
6: Exercise tires me	2.90 (0.94)
19: I am fatigued by exercise	3.05 (0.74)
40: Exercise is hard work for me	3.19 (0.75)
<b>Family Discouragement Sub-scale</b>	
21: My spouse (or significant other) does not encourage exercising	2.38 (0.87)
33: My family members do not encourage me to exercise	2.24 (1.09)
<b>All Barriers items of all sub-scales</b>	<b>2.68 (0.96)</b>

Adapted from the Exercise Benefits/Barriers Scale (EBBS) (Sechrist et al., 1987).

Table 3 shows the mean and standard deviation for each item of the benefits sub-scale. Participants either agreed or strongly agreed with most of the benefits of exercise. Participants agreed the most with the item: ‘*exercise improves the way my body looks*’. However, for some benefits, the participants were neutral (e.g., ‘*exercise allows me to carry out normal activities without becoming tired*’; ‘*exercise improves the quality of my work*’; and ‘*exercise is good entertainment for me*’) or tended to ‘agree’ (e.g., ‘*my disposition is improved by exercise*’).

Table 3. The exercise benefits sub-scale depicted as mean and standard deviation (n = 21).

<b>Perceived Benefits Items</b>	<b>M (±SD)</b>
<b>Life Enhancement Sub-scale</b>	
25: My disposition is improved by exercise	2.90 (0.63)
26: Exercising helps me sleep better at night	3.33 (0.58)
29: Exercise helps me decrease fatigue	3.33 (0.66)
32: Exercising improves my self-concept	3.43 (0.60)
34: Exercising increases my mental alertness	3.00 (0.78)
35: Exercise allows me to carry out normal activities without becoming tired	2.48 (0.60)
36: Exercise improves the quality of my work	2.48 (0.51)
41: Exercise improves overall body functioning for me	3.05 (0.74)
<b>Physical performance Sub-scale</b>	
7: Exercise increases my muscle strength	3.05 (0.74)
15: Exercising increases my level of physical fitness	3.24 (0.83)
17: My muscle tone is improved with exercise.	3.10 (0.70)
18: Exercising improves functioning of my cardiovascular system	3.10 (0.63)
22: Exercise increases my stamina	3.10 (0.89)
23: Exercise improves my flexibility	3.24 (0.63)
31: My physical endurance is improved by exercising	3.00 (0.71)
43: Exercise improves the way my body looks.	3.86 (0.36)
<b>Psychological Outlook Sub-scale</b>	
1: I enjoy exercise	3.57 (0.51)
2: Exercise decreases feelings of stress and tension for me	3.52 (0.60)
3: Exercise improves my mental health	3.57 (0.51)
8: Exercise gives me a sense of personal accomplishment	3.05 (0.74)
10: Exercising makes me feel relaxed	3.29 (0.78)
20: I have improved feelings of well-being from exercise	3.19 (0.68)
<b>Social Interaction Sub-scale</b>	
11: Exercising lets me have contact with friends and persons I enjoy	3.19 (0.75)

30: Exercising is a good way for me to meet new people	3.10 (0.70)
38: Exercise is good entertainment for me	2.52 (0.81)
39: Exercising increases my acceptance by others	3.10 (0.63)
<b>Preventative Health Sub-scale</b>	
5: I will prevent heart attacks by exercising	3.29 (0.78)
13: Exercising will keep me from having high blood pressure	3.29 (0.85)
27: I will live longer if I exercise	3.38 (0.74)
<b>All Benefit items of all sub-scales</b>	<b>3.16 (0.74)</b>

Adapted from the Exercise Benefits/Barriers Scale (EBBS) (Sechrist et al., 1987).

### 7.6.3 Results from the Focus Group Discussions

From the focus group discussions, the responses showed that most participants had no knowledge of what exercises to do to improve their health, e.g., most only thought of jogging, as a form of exercise  $n = 18$  (85.71%). Also, most participants thought that engaging in PA meant engaging in competitive sport  $n = 16$  (76.19%). Participants also had minimal knowledge about the value of PA for enhancing health  $n = 15$  (71.43%). Qualitative analysis of the participants' responses resulted in the development of themes for each question, as shown in Table 4.

Table 4. Responses from the focus group discussions and formulation of themes.

Questions and Themes	Examples of participant statements
<b>What are the barriers to PA?</b>	
<ul style="list-style-type: none"> <li>HIV-related symptoms and medications</li> </ul>	<ul style="list-style-type: none"> <li>"At times I feel weak after taking my medication, I obviously can't exercise or do anything after that, I have to sleep"</li> <li>"It depends on my health, sometimes I feel pain on my joints, it becomes hard even to walk, physiotherapy has not helped the situation, I gave up physiotherapy".</li> </ul>
<ul style="list-style-type: none"> <li>Depression</li> </ul>	<ul style="list-style-type: none"> <li>"I am just too stressed and depressed about my life, I don't think I can exercise with this mental situation"</li> </ul>
<ul style="list-style-type: none"> <li>Aging</li> </ul>	<ul style="list-style-type: none"> <li>"I am too old to be running and jumping around like a kid, my body no longer allows me to do that"</li> </ul>
<ul style="list-style-type: none"> <li>Financial-constraints</li> </ul>	<ul style="list-style-type: none"> <li>It's too expensive to become a gym member, there are other pertinent issues that I must deal with first before joining a gym, I can't even afford the sportswear"</li> </ul>
<ul style="list-style-type: none"> <li>Time-constraints</li> </ul>	<ul style="list-style-type: none"> <li>"I simply do not have the time, I come to the community centre every day in the morning, leave late, then at home I have to focus on the domestic chores"</li> </ul>
<ul style="list-style-type: none"> <li>Unconducive living</li> </ul>	<ul style="list-style-type: none"> <li>"I can't go and exercise in the park, there are</li> </ul>

environment	gangsters there doing drugs or drinking beer, it's too dangerous"
<ul style="list-style-type: none"> <li>Lack of knowledge about PA</li> </ul>	<ul style="list-style-type: none"> <li>"Is exercising that important? I never considered exercising seriously"</li> <li>"I walk to and from the community centre every day, isn't that enough exercise?"</li> <li>"I do not know which exercises to do, I do not have the information about exercising"</li> <li>"I thought exercising was for fat individuals, I have already lost weight due to the disease, so I thought exercising might worsen the situation".</li> </ul>
<ul style="list-style-type: none"> <li>Lack of motivation</li> </ul>	<ul style="list-style-type: none"> <li>"I just feel lazy, maybe if I exercise with someone or in a group"</li> </ul>
<p><b>What are the preferred exercises?</b></p> <ul style="list-style-type: none"> <li>Aerobic exercises</li> </ul>	<ul style="list-style-type: none"> <li>"I prefer aerobics so that I can manage my weight, I also enjoy it because it's like dancing"</li> <li>"Walking"</li> <li>"Brisk walking up and down the stairs"</li> <li>"Hip exercises, to lessen fat accumulation around the hip and abdominal area"</li> <li>"Low intensity jogging"</li> <li>"Marching on the spot"</li> <li>"I prefer exercises that tone the body such as sit ups, squats and star jumps."</li> </ul>
<ul style="list-style-type: none"> <li>Calisthenics</li> </ul>	<ul style="list-style-type: none"> <li>"We come here and sit and start sewing for the rest of the day, my back muscles become tense, I want exercises that I can do whilst I am sitting, or without having to go far away from my work station"</li> </ul>
<ul style="list-style-type: none"> <li>Chair exercises</li> </ul>	<ul style="list-style-type: none"> <li>"After the exercise and physical activity classes, we should at least have 30 minutes of group exercises, we are so keen to start exercising, I even brought my tracksuit"</li> </ul>
<p><b>What else do you think we should include in the exercise programme?</b></p> <ul style="list-style-type: none"> <li>Group activities</li> </ul>	<ul style="list-style-type: none"> <li>"Let's exercise as a group here at the community centre and then we can exercise alone at home"</li> </ul>
<ul style="list-style-type: none"> <li>Monitoring and tracking of exercise</li> </ul>	<ul style="list-style-type: none"> <li>"I think we must record our exercise activities somewhere so that we keep track of the exercises we do"</li> </ul>

## 7.7 Discussion

Gothe and Kendall (2016) investigated the barriers, motivations and preferences for PA among female older adults. Participants pointed out that they preferred group aerobics with a dance concept. Similarly, participants in the present study suggested that they preferred aerobics with a dance concept. These findings are in line with the outcomes of previous research that reported dance to be a common preference for women (Robinson et al., 2003; Grieser et al., 2006).

The participants also asked for a 30 minute group exercise session at the end of each contact session. Group exercises have an advantage of possessing a social support component, which promotes PA participation (Mendes de Leon, Glass & Berkman, 2003). High levels of social support, at baseline, predict change in PA (Young & Stewart, 2006). Among women, high levels of exercise self-efficacy, related to social support, have been reported (Litt, Kleppinger & Judge, 2002). The implication is that when developing PA programmes for women of low SES, it is imperative to include exercise activities that exploit social interaction (Gothe & Kendall, 2016). Social support to promote PA among women can enhance the effectiveness of such an intervention (Gothe & Kendall, 2016).

Participants in the present study also expressed an interest in the inclusion of aerobics for weight control purposes. The highest perceived benefit of exercise is that it improves physical appearance (Lovell, Ansari & Parker, 2010). As such, researchers should include exercises that aid in weight loss, especially for women of low SES who are likely to be overweight (Schmeiser, 2009).

The study by Knackfuss et al. (2015) about exercise adherence among PLWH, reported a direct association between exercise intensity and participant withdrawal. The results showed that adherence increased if participants chose their own types of activities and the exercise intensity. This finding is supported by the hedonic theory, which states that people are motivated to seek pleasure and avoid pain (Higgins, 1997).

Preferred exercises generate feelings of enjoyment and incite greater and continued participation, compared to only offering information about the health benefits of PA (Knackfuss et al., 2015). Feelings of pleasure and well-being are the strongest motives for adherence to a PA programme (Ekkekakis, Parfitt & Petruzzello, 2011). As such, practising simple, low-cost, enjoyable physical activities inspires long-term adherence to PA in PLWH and should be encouraged (Van Sluijs & Kriemler, 2016). Preferably, the intensity of PA should be determined by the participants and should instil a sense of ownership for their physical behaviour (Elsangedy, Alves, Krinski & Da Silva, 2010).

A variety of barriers to PA were mentioned by the participants. One barrier particularly common amongst persons of low SES is living in an uncondusive environment, lack of safety and high crime (Roos, Myezwa & van Aswegen, 2015). Lack of safety and a high prevalence of crime are reported to be significant barriers to PA participation among PLWH of low-income in South Africa (Roos et al., 2015). In South Africa, persons in low SES neighbourhoods are usually robbed when walking to the bus terminus, taxi rank or train station (Africa Check, 2013). Thus, it is

important to consider neighbourhood safety, when designing and implementing programmes for persons in low SES neighbourhoods.

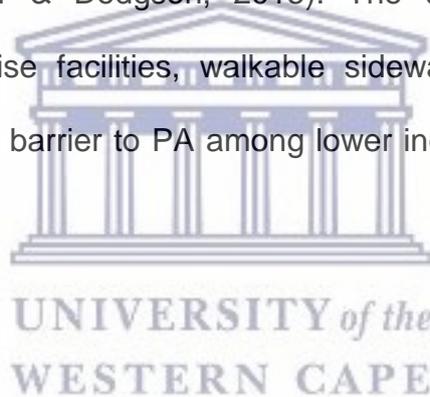
Another barrier to engaging in PA was HIV-related symptoms, such as pain and discomfort. Physical pain was reported to be a usual deterrent to engaging in PA among adults (Belza et al., 2004; Crombie et al., 2004). In South Africa, those in pain are likely to be HIV positive, of low-income and older (Wadley, Mitchell & Kamerman, 2016). Consequently, PA interventions need to be combined with pain management therapy in order to minimise pain as a barrier. Also, understanding specific activities which are pleasurable and pitched at the right level of intensity is equally important for success and sustainability (Knackfuss et al., 2015).

Another barrier was financial-constraints related to the inability to pay for gym membership. Scarcity of financial resources was a barrier to PA amongst other populations at-risk (van Adrichem et al., 2016). Implementing home- and community-based PA programmes that emphasise activities of daily living (ADLs), such as domestic chores, gardening, and fun activities with family and/or pets, may help overcome the barriers associated with gym membership fees and/or transport costs.

Based on the EBBS, the participants had higher perceived benefits than barriers to exercise. The participants were neutral or tended to agree on many of the barriers [M (SD) = 2.68(0.96)], whereas they either 'agreed' or 'strongly agreed' on most of the benefits [M (SD) = 3.16(0.74)]. For the barriers, the participants agreed the most on

the item: *'there are too few places for me to exercise'* and disagreed the most on the item: *'I am too embarrassed to exercise'*. For the benefits, participants agreed the most on the item: *'exercise improves the way my body looks'* and disagreed the most on the items: *'exercise allows me to carry out normal activities without becoming tired'* and *'exercise improves the quality of my work'*.

The barrier that participants most agreed on was that *'there are too few places for me to exercise'*. This is not surprising given that the scarcity of exercise facilities has been reported to be a barrier to PA among women from low-income communities (Joseph, Ainsworth, Keller & Dodgson, 2015). The unbalanced distribution of resources, such as exercise facilities, walkable sidewalks, and streetlights was previously reported to be a barrier to PA among lower income women (Mama et al. 2015).

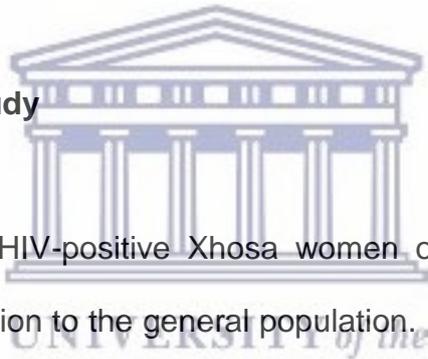


In order to improve the content and delivery of the PA programme, participants expressed the need to monitor their exercise frequency using exercise diaries and pedometers. It has been reported that pedometers enhance PA adherence in different populations (Chan, Ryan & Tudor-Locke, 2004; Bravata et al., 2007). The use of an exercise monitoring device, such as a pedometer, is related to substantial increases in PA participation, and significant decreases in body mass index and blood pressure (Brava et al., 2007). Thus, in planning a contextualised, population-specific intervention, including tracking devices, such as pedometers, as well as exercise diaries is beneficial.

## 7.8 Strengths of the Study

An important consideration for researchers to make when designing population-specific PA interventions for African women of low SES are the specific barriers they face that impede engaging in regular PA. Identification of these barriers can aid in the development of comprehensive and contextualised programmes to promote PA and help address PA-related health inequalities among persons of low SES. The findings of the current study are important for understanding and developing PA promotion interventions that may be effective in urban communities of low SES and where HIV prevalence is high.

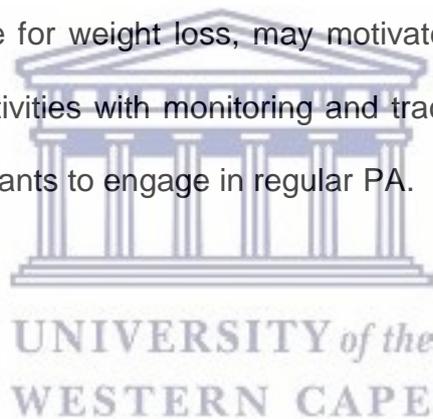
## 7.9 Limitations of the Study



The study only assessed HIV-positive Xhosa women of low SES, therefore, the results have limited application to the general population. In addition, the participants in this study were mainly from one high-density peri-urban township in the Western Cape, SA, and as such, the findings reported in this study may not be generalised to all racial or ethnic communities in South Africa. Finally, PLWH in South Africa are still viewed as a health threat, and face unique challenges of stigma and discrimination that may not be typical of people with other chronic non-communicable conditions, such as diabetes and obesity, and who may not have the same barriers to PA. The number of participants used in this study is small and, therefore, the generalisability of the current findings is limited. A point to note is that the study was conducted to inform the development of a contextualised PA intervention for PLWH of low SES.

## 7.10 Conclusion

This study found that PLWH of low SES, experience substantial barriers to PA, such as HIV-related symptoms and medications, depression, aging, financial limitations, time-constraints, unconducive living environments, a lack of knowledge about PA, limited resources to exercise and apathy to engage in PA. Teaching participants about the use of exercise for managing HIV and identifying ways of overcoming the barriers to exercise may increase engagement in PA. Because persons of low SES have few places to exercise, teaching home-based exercises can present a viable alternative. Also, the inclusion of exercise activities that aid in improving physical appearance, such as those for weight loss, may motivate many women to take up PA. Using group-based activities with monitoring and tracking of exercise may also further motivate the participants to engage in regular PA.



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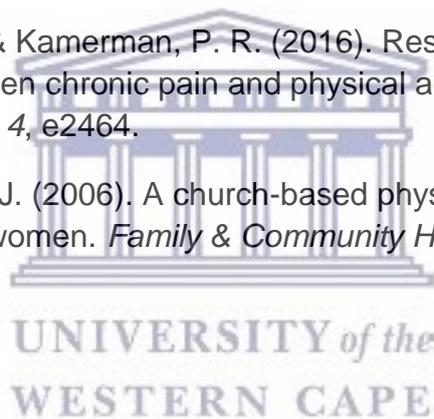
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## **Chapter Eight: Development of a Context-Sensitive Physical Activity Intervention for People Living with HIV and AIDS of Low Socioeconomic Status Using the Behaviour Change Wheel.**

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[Note: The format of this chapter is presented in line with the journal guidelines]

### **Abstract**

Regular physical activity (PA) has been recommended for the management of HIV and AIDS. The purpose of this study was to develop a contextualised intervention for promoting PA among persons living with HIV and AIDS (PLWHA) of low socioeconomic status (SES). The Behaviour Change Wheel (BCW) for designing behaviour change interventions was used. This method was further supplemented by evidence from the literature, systematic literature review (SLR), a concurrent mixed methods study and two cross-sectional studies. The SLR aided in determining the theoretical frameworks to inform the intervention, the specific PA behaviours to be targeted by the intervention, the intervention functions, the intervention policy category and the mode of delivery of the intervention. The concurrent mixed methods study was used to identify key factors that needed to change in order for participants to engage in regular PA. The first cross-sectional study was used to determine the gender to be targeted by the study. The second cross-sectional study was used to determine the domain and intensity of PA to target in the intervention. A face-to-face context-sensitive PA intervention employing 14 behavioural change techniques was designed. The PA intervention would be more likely to succeed by (a) using the Transtheoretical model of behaviour change and the Social Cognitive theory as the underpinning theoretical frameworks (b) targeting convenient PAs, such as walking, doing simple home-based exercises, engaging in activities of daily living or doing simple exercises at the community centre (c) using education, reward, training in PA, modelling exercise activities and enablement to increase the opportunity to engage in PA as intervention functions (d) using service provision as policy priorities, and (e ) using a direct face-to-face mode of delivery. The PA intervention emphasises behavioural techniques for increasing PA participation, such as goal-setting, self-monitoring, strategies for overcoming PA barriers, social support and rewards. The intervention employs strategies that highlight low-cost local PA resources and opportunities to help HIV infected women of low SES to participate in

PA. The BCW provides a useful and comprehensive framework for intervention design.

Key words: Intervention, Behaviour change wheel, Physical activity



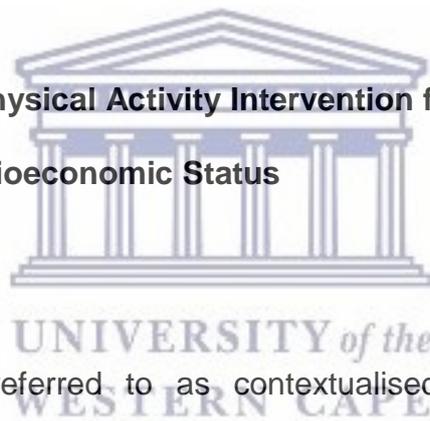
## 8.1 Background

Amongst the general population, physical activity (PA) has been found to have both psychological and physical health benefits (Eijkemans, Mommers, Jos, Thijs, & Prins, 2012; Holtermann et al., 2013). Regular PA has also been prescribed as an alternative disease management strategy for HIV and AIDS (Lundgren et al., 2008; Jagers & Hand, 2016). A systematic review of literature showed that PA and exercise are safe and effective methods of enhancing cardiorespiratory fitness, metabolic function and quality of life among people living with HIV and AIDS (PLWHA) (Vancampfort et al., 2016). Similarly, progressive resistance exercise aids in improving body composition and muscular strength among PLWHA (Somarriba, Neri, Schaefer & Miller, 2010). Long-term exercise training lowers the likelihood of disability caused by sarcopenia among PLWHA (da Silva Paes et al., 2015).

In spite of the evidence of the health benefits of PA, most PLWHA in Africa do not engage in adequate amounts of PA (Murenzi, 2011). A factor that has been found to influence the low PA levels amongst PLWHA in Africa and in Western societies is socioeconomic status (SES) (Chopra & Ford, 2005; Myburgh & De Bruto, 2008). Likewise, in Africa, HIV and AIDS are diseases that predominantly affect persons of low SES (Ogunmola, Oladosu, & Olamoyegun, 2014; Kasirye, 2016). Therefore, in Africa, PLWHA are more likely to be of low SES, and are more likely to be inactive (Brennan, Brownson, & Hovmand, 2012). Consequently, health practitioners need to develop PA interventions that are applicable and match the African context.

One way of developing informed and successful interventions is the use of established methods for intervention design. As such, health practitioners should utilise a methodical approach in the intervention design process (Greaves et al., 2011). This entails using a systematised approach in the design of the intervention, such as an established design framework that will assist the health practitioner to contextualise and select the appropriate intervention ingredients that have the potential of bringing about the desired behaviour change. One such framework is the Behaviour Change Wheel (BCW) that provides a comprehensive, systematic and transparent approach to intervention design based on established behaviour change theory (Barker, Atkins, & de Lusignan, 2016).

## **8.2 The Contextualized Physical Activity Intervention for People Living with HIV and AIDS of Low Socioeconomic Status**



The PA intervention is referred to as contextualised, because it employs a combination of strategies and information tailored for HIV positive women of low SES and considers the participants' preferred content (exercise activities, barriers to PA, monitoring and tracking of PA). The intervention was informed by the Social cognitive theory (SCT) and the Transtheoretical model (TTM).

The intervention was delivered in the indigenous isiXhosa language, the vernacular of the participants. Fruit packs and food packs were used for incentivising the participants at each training session to promote adherence. The intervention employed strategies that highlighted low-cost, local PA resources and opportunities to help HIV infected women of low SES to engage in PA. The intervention

emphasised increasing walking, doing simple home-based exercise activities, such as sit-ups and lunges, as well as engaging in activities of daily living (ADLs), such as gardening and washing clothes manually.

The intervention started by determining each participant's stage of readiness to engage in PA. In addition, specific and measurable short-term goals were set with each participant. Participants were also shown how to use the pedometer and the PA diary. Participants then attended PA classes for two hours each week over a period of six weeks, where they were taught the following topics in the first hour, namely: (a) the role of PA as a non-pharmacological, low-cost strategy for the management of HIV, (b) the health benefits of PA for PLWHA, (c) safety considerations when exercising, (d) how to identify or develop simple home-based exercises, such as chair exercises, (e) strategies for increasing physical exercise self-efficacy and social support, and (g) how to identify the barriers to PA and strategies for overcoming them. In the second hour, participants were taught and performed home-based exercise activities for 30 minutes and, then, a 30-minute group aerobics exercise session was done. Participants received a PA manual with all the material taught during the classes. All exercise activities were in line with the American College of Sport Medicine (ACSM) guidelines for individuals infected with HIV (ACSM, 2013).

Goals were set on the number of steps and the number of home-based exercises to do per day that were tailored to the participants' needs and abilities. Individualised feedback followed on a weekly basis and goals were reviewed and changed

accordingly. Feedback to participants corresponded to their current motivational readiness for PA. In the last week of the intervention, the participant with the highest number of steps recorded on the pedometer received an achievement award.

Participants were also educated on the barriers to PA and how to overcome them. Participants identified their perceived barriers to PA and then discussions followed on how to overcome them. Strategies to overcome barriers and increase PA included providing information on where and when to exercise. Participants were also taught how to manage their time for PA, e.g., if a participant mentioned that they did not have adequate time for PA, they were taught to integrate PA into their activities of daily living, such as brisk walking to the shop.

### **8.3 Models and Frameworks Informing the Study**

#### **8.3.1 Behaviour Change Wheel**

Having noted the need for a comprehensive framework when designing an intervention, Michie et al., 2011 reviewed current frameworks and evaluated their effectiveness based upon their comprehensiveness, coherence and association with an overarching behavioural model. Subsequently, a new framework was developed based on an amalgamation of 19 existing frameworks (Michie et al., 2011). The BCW links policy to behaviour through various intervention functions. The purpose of the wheel is to aid intervention developers in identifying pertinent potential ingredients needed for behaviour change and, thereby, assist designers in analysing target behaviours and characterising interventions and their active components

(Michie et al., 2011). The BCW provides clear procedures for linking theory to established behavioural change techniques (BCTs). The ability of the BCW to link theory with BCTs, gives the BCW an advantage over existing frameworks. Other benefits of the BCW are that the model (a) affords one the tools to develop an intervention, even if one does not have a broad knowledge of behaviour change theories, (b) provides a wide choice of intervention features, and (c) offers a division between intervention function and achievement method (policy) (Michie, Atkins, & West, 2014).

At the centre of the wheel, are the various sources of behaviour that are necessary for behaviour change to occur (Figure 1). The BCW utilises a theoretically based behaviour system referred to as the Capability, Opportunity, Motivation–Behaviour (COM-B) model. The model proposes that a change in behaviour will involve a change in at least one of the following components i.e., the capability of a person to carry out that behaviour; or the opportunity for the behaviour to occur; or the motivation to perform the behaviour at that moment in time (Michie et al., 2011).

Each component of the COM-B model comprises two elements (Michie et al., 2011). Capability is composed of physical and psychological abilities, both required to carry out the behaviour. The physical and social environment affords Opportunity, including contextual factors such as time, resources, physical barriers, and social and cultural expectations. Motivation involves use of reflective processing for planning and evaluating a behaviour, and automatic processes triggered by emotion, impulse and reflex reactions (Michie et al., 2014).

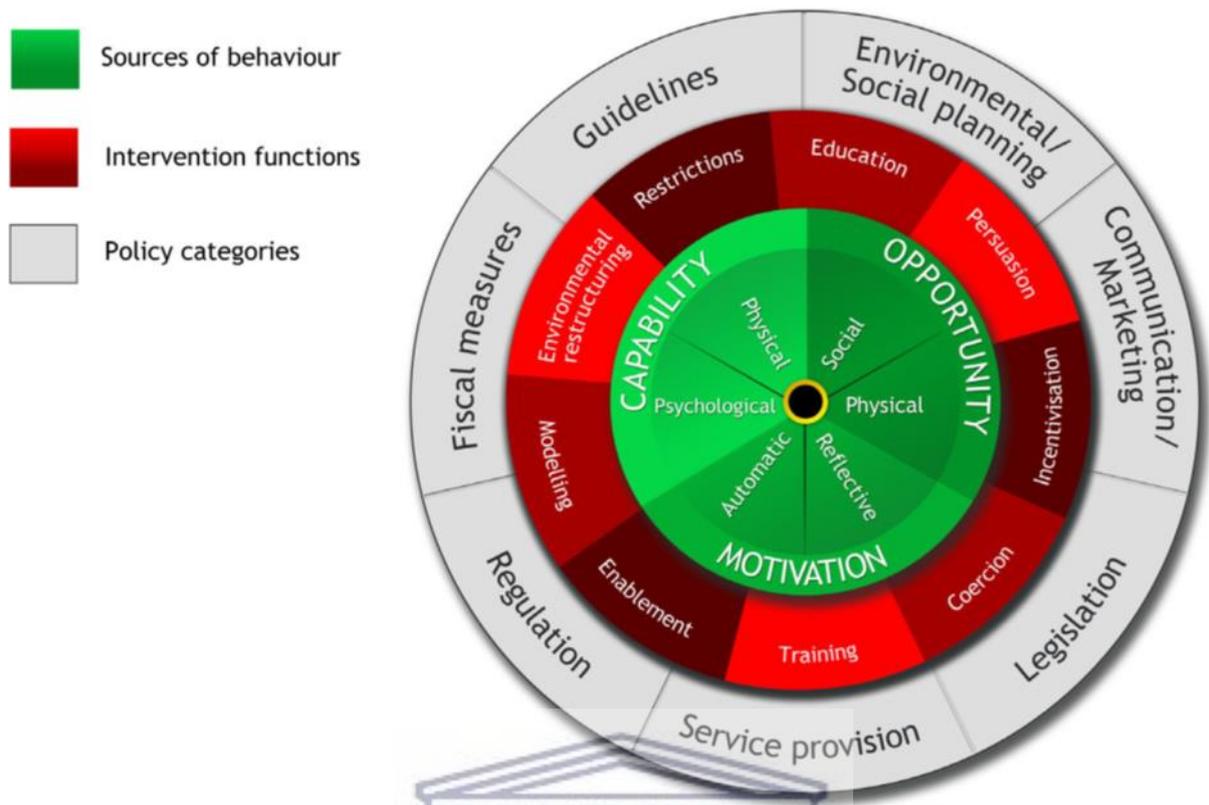
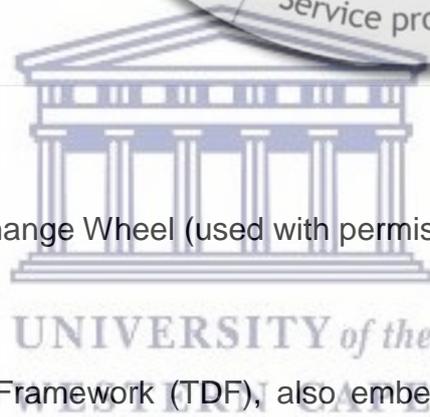


Figure 1. The Behaviour Change Wheel (used with permission from authors) (Michie et al., 2014)



The Theoretical Domains Framework (TDF), also embedded in the BCW, can be used to further understand behaviour. The TDF is made up of 14 domains emanating from theoretical constructs identified from 33 behaviour change theories, and was developed by authorities in behaviour change (Michie et al., 2005; Cane, O'Connor, & Michie, 2012). The TDF assists intervention designers in choosing and using appropriate theory (Atkins et al., 2017). The framework is related to the COM-B components, and assists in understanding the target behaviour (Michie et al., 2014). The framework includes the following 14 domains, namely, knowledge, skills, memory, attention and decision processes, behavioural regulation, social/professional role and identity, beliefs about capabilities, optimism, beliefs

about consequences, intentions, goals, reinforcement, emotion, environmental context and resources, and social influences. The COM-B system and TDF when combined offer a complete theoretical model for understanding behaviour change (Salmon, 2016).

The BCW proposes that in order to change behavioural components, an intervention must perform certain functions (Michie et al., 2014). The middle layer of the wheel in the BCW represents the intervention functions that are listed in Table 1. The outer layer of the wheel indicates different policies that can be used to apply to interventions. The definitions applied to intervention functions and policies are shown in Table 1.



Table 1

*Definitions of Intervention Functions and Policies*

<b>Intervention functions</b>	<b>Definition</b>
Education	Increasing knowledge or understanding
Persuasion	Using communication to induce positive or negative feelings or stimulate action
Incentivisation	Creating expectation of reward
Coercion	Creating expectation of punishment or cost
Training	Imparting skills
Restriction	Using rules to increase the target behaviour by reducing opportunity to engage in competing behaviours
Environmental restructuring	Changing the physical or social context
Modelling	Providing an example for people to aspire to or imitate
Enablement	Increasing means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)
<b>Policies</b>	
Communication/marketing	Using print, electronic, telephonic or broadcast media
Guidelines	Creating documents that recommend or mandate practice. Includes

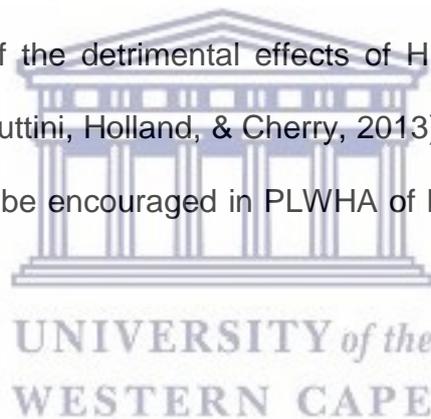
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	changes to service provision
Fiscal	Using the tax system to reduce or increase the financial cost
Regulation	Establishing rules or principles of behaviour or practice
Legislation	Making or changing laws
Environmental/social planning	Designing/controlling the physical or social environment
Service provision	Delivering a service

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Adopted from Michie et al. (2014) with permission from authors.

In a systematic review for identifying effective theories and BCTs for informing PA interventions for low SES populations, (Mabweazara, Leach, & Ley, 2016) suggest that South African researchers, specifically, should aim at developing contextualised PA interventions for the management of HIV and AIDS. Pharmacological therapies that may alleviate some of the detrimental effects of HIV are linked to exorbitant financial costs (Fillipas, Cicuttini, Holland, & Cherry, 2013). Therefore, the practise of simple low-cost PA should be encouraged in PLWHA of low SES (Knackfuss, Maia, & Soares, 2015).



## 8.4 Methods

### 8.4.1 Aim, Design and Setting

The purpose of this study was to develop a contextualised intervention for promoting PA among PLWHA of low SES. In addition to the BCW and the TDF (Michie et al., 2011), this study was based on a number of studies that were conducted to aid in the intervention design process. These included a systematic review (Mabweazara et al., 2016), a concurrent mixed methods study (Mabweazara, Leach & Ley, 2017), and two cross-sectional studies (Mabweazara et al., 2018(a), unpublished; Mabweazara

et al., 2018(b), unpublished). However, identifying the intervention functions, policy categories and mode of delivery may require the use of judgement in order to make the most appropriate decisions in the context of a planned intervention (Michie et al., 2014). As such, the APEASE criteria (see table 2) outlined in the BCW guide were used to make strategic judgements regarding intervention content and mode of delivery by the research team (SZM, LLL, CL). Table 2 shows the APEASE criteria for designing and evaluating interventions.

#### 8.4.2 Materials and Processes

The preliminary studies conducted to aid in the intervention design process were as follows:

1. A systematic review was conducted to inform the design of PA interventions for low-income persons by identifying successful intervention techniques and theoretical frameworks (Mabweazara et al., 2016). The review included randomized controlled trials with interventions aiming to promote PA and/or adherence to PA for the management of chronic disease. The systematic review specifically focused on chronic disease, because HIV infection is now considered a chronic disease (Deeks, Lewin, & Havlir, 2013). Eleven papers were included in the review. The systematic literature review was used to identify successful intervention techniques and theoretical frameworks to inform the PA intervention. The systematic review was also used to determine specific PA behaviours targeted by the interventions, the intervention functions, the intervention policy

category and the mode of delivery. Table 3 shows the outcome of extracting these intervention aspects from the 11 studies included in the systematic review.

2. A cross-sectional study with 978 HIV positive participants of low SES was conducted to determine if age, body weight, height, gender, waist-to-hip ratio (WHR), educational attainment, employment status, CD4+ cell count, and body mass index (BMI) could predict overall PA among PLWHA of low SES (Mabweazara et al., 2018(a), unpublished). Results of this study were used to determine the gender to be targeted by the PA intervention.
3. A cross-sectional study with 978 HIV positive participants of low SES was conducted to examine the PA profile of PLWHA based on PA domains and PA intensity. The study also sought to determine whether employment status and level of education could predict PA among PLWHA of low SES (Mabweazara et al., 2018(b), unpublished). The results of this study were used to determine the domain and intensity of PA to target in the intervention.
4. A concurrent mixed method study was conducted with 21 HIV positive female participants of low SES using the exercise benefits/barriers scale (EBBS) (Sechrist, Walker & Pender, 1987) and two focus group discussions to explore the participants' barriers to engaging in PA and the delivery of a planned PA intervention (Mabweazara et al., 2017). The results of this study were used to identify what needed to change in the participants behaviours in order to engage them in PA and to specify the target behaviour.

Additionally, in order to identify the target behaviours, previous literature was used to draw up a list of possible PA behaviours to be targeted by the intervention (Atienza, 2001; Pate et al., 2005; Matthews et al., 2007; Opdenacker, Boen, Coorevits, & Delecluse, 2008; Beedie, Mann, & Jimenez, 2014).

## 8.5 Use of the Behaviour Change Wheel

The BCW employs eight systematic steps to design an intervention (Michie et al., 2014). The first three steps assist intervention designers to identify a specific behaviour they wish to change. Steps one to eight of the BCW are outlined below:

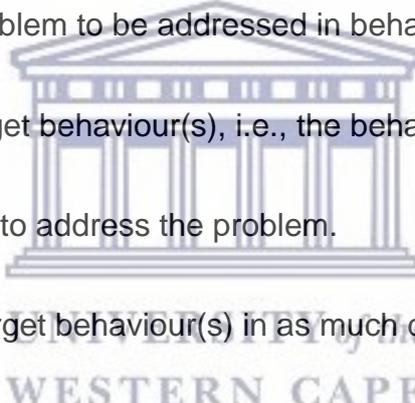
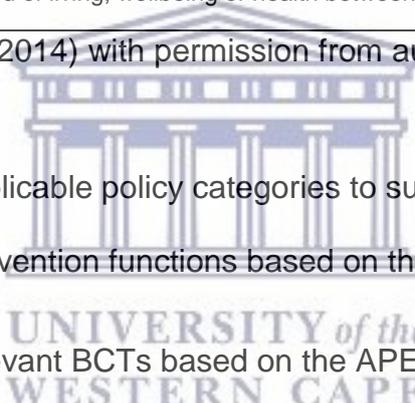
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- Step 1: Define the problem to be addressed in behavioural terms.
- Step 2: Select the target behaviour(s), i.e., the behaviours most likely to bring about change to address the problem.
- Step 3: Specify the target behaviour(s) in as much detail as possible.
- Step 4: Identify what component needs to change using the COM-B model.
- Step 5: Select the relevant intervention functions from the following list:
- education; persuasion; incentivisation; coercion; training; restriction; environmental restructuring; modelling and enablement (based on an assessment of the APEASE criteria: affordability, practicability, effectiveness, acceptability, side effects and safety, and equity) (Table 2).

Table 2

*The APEASE Criteria for Designing and Evaluating Interventions.*

Criterion	Description
Affordability	The ability of the intervention to meet the expense of the intervention. An intervention is affordable if the budget of the intervention allows it to be delivered to, or accessed by, all those for whom it is intended.
Practicability	The viability of the intervention. A practicable intervention is one that can be delivered as designed through the means intended to the target population.
Effectiveness and cost-effectiveness	The effect size of the intervention in relation to the desired objectives in a real world context. Cost-effectiveness refers to the ratio of effect to cost.
Acceptability	The extent to which relevant stakeholders (public, professional and political) judge an intervention appropriate.
Side-effects/Safety	An intervention may be effective and practicable but have unwanted or unintended consequences. This needs to be taken into consideration when planning the intervention.
Equity	The extent to which an intervention may reduce or increase the disparities in standard of living, wellbeing or health between different sectors of society.

Adapted from Michie et al. (2014) with permission from authors.

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- Step 6: Select the applicable policy categories to sustain the delivery of the identified intervention functions based on the APEASE criteria.
- Step 7: Select the relevant BCTs based on the APEASE criteria.
- Step 8: Select the mode(s) of intervention delivery based on the APEASE criteria, and confirm the intervention content.

The BCW was used to implement the evidence from the preliminary studies (Mabweazara et al., 2016; 2017; Mabweazara et al., 2018(a, b), unpublished) into the intervention design process. To design the intervention, the eight steps of the intervention design process using the BCW recommended by Michie et al. (2014) were followed.

## **8.6 Results**

The results of the study are presented in line with the three stages and the eight steps of the BCW intervention design process, which are recommended by Michie et al. (2014).

## **8.7 The Theoretical Underpinning of the Intervention**

The results from the systematic literature review (Mabweazara et al., 2016) showed that the Transtheoretical model (TTM) of behaviour change and the Social Cognitive theory (SCT) were the common theoretical frameworks used as the basis for most of the successful interventions for individuals of low-SES. Consequently, the planned intervention was informed by the SCT and the TTM as the theoretical underpinnings.

## **8.8 Stage 1: Understand the Behaviour**

### **8.8.1 Step 1: Defining the Problem in Behavioural Terms**

The target population was HIV positive adult women of low SES. The intervention would target women because a preliminary cross-sectional study to inform the intervention design found that PA is significantly higher in men than in women (Mabweazara et al., 2018(a), unpublished). As such, women were at a higher risk of physical inactivity. The behavioural problem was a lack of regular PA among these individuals. Table 3 shows the questions that were asked and the answers developed in order to define the problem in behavioural terms as recommended by Michie et al. (2014).

Table 3

*Defining the Problem in Behavioural Terms.*

What behaviour?	Increasing physical activity among PLWHA of low SES
Where does the behaviour occur?	At the community centre; at home.
Who is involved in performing the behaviour?	HIV positive women of low SES at a community centre.

Adapted from Michie et al. (2014) with permission from authors

8.8.2 Step 2: Selecting the Target Behaviour



Target behaviours were rated on (a) impact on behaviour change and, (b) likelihood of changing behaviour. The rating of each target behaviour was determined by examining if the target behaviour matched the low-cost target behaviours identified in the systematic review (Mabweazara et al., 2016). Studies included in the systematic review only targeted non-costly PA behaviours, such as promoting walking, engaging in PA through activities of daily living (Albright et al., 2005; Dutton, Martin, Welsch & Brantley, 2007; Pekmezi, Barbera, Bodenlos, Jones & Brantley, 2009), or alternative exercises, such as chair exercises (Keyserling et al., 2008). Any potential target behaviours that had a measurement score rated as “unpromising” were not included in the intervention. The results of a mixed method study (Mabweazara et al., 2017)

showed that PLWHA preferred aerobics, walking, calisthenics, chair exercises, group exercises and light jogging.

Based on the literature (Atienza, 2001; Pate et al., 2005; Matthews et al., 2007; Opdenacker et al., 2008; Beedie et al., 2014) and the systematic review (Mabweazara et al., 2016), the following feasible and low-cost PA behaviours were identified, namely:

1. Walking, e.g., to and from the church, the store etc. (Matthews et al., 2007).
2. Simple home-based exercises, e.g., chair exercises, stepping or stair-climbing, lifting weighted objects, etc. (Atienza, 2001).
3. Activities of daily living, e.g., domestic cleaning, sweeping, vacuuming, hanging-up washing, etc. (Opdenacker et al., 2008).
4. Exercising at the community centre, e.g., organised group exercise classes, either free callisthenic exercises or rhythmical exercises, such as aerobics to music, etc. (Beedie et al., 2014).
5. Exercising during leisure time, e.g., actively participating in age- and health-appropriate activities, such as gardening, knitting, sewing, bowls, darts, table tennis, etc. (Pate et al., 2005).

Table 4 shows how each target behaviour was scored for inclusion using the BCW guide. Leisure-related PA, such as gardening, was also targeted as a target behaviour, because the preliminary research found that PLWHA of low SES engaged less in leisure-related PA (Mabweazara et al., 2018(b), unpublished). We

hoped that the intervention would promote leisure-related PA amongst PLWHA. Walking was also targeted because the same study found that PLWHA of low SES were likely to engage in transport-related PA. All selected PA behaviours were of low to moderate intensity, because the study revealed that PLWHA of low SES were more likely to engage in moderate-intensity PA than vigorous-intensity PA (Mabweazara et al., 2018(b), unpublished).

Table 4

*Selecting the Target Behaviours*

Potential target behaviours relevant to improving PA engagement among PLWHA of low SES	Impact of behaviour change	Likelihood of changing behaviour	Spill over score	Measurement score
Walking, e.g., to and from church, the store, etc.	<i>Very promising</i>	<i>Very promising</i>	<i>Very promising</i>	Very promising
Simple home-based exercises.	<i>Very promising</i>	<i>Very promising</i>	<i>Very promising</i>	Very promising
Activities of daily living.	<i>Very promising</i>	<i>Very promising</i>	<i>Very promising</i>	Very promising
Exercising at the community centre	<i>Very promising</i>	<i>Very promising</i>	<i>Very promising</i>	Very promising
Exercising during leisure (e.g. actively participating in organised sport)	<i>Unpromising but worth considering</i>	<i>Unpromising</i>	<i>Unpromising</i>	Unpromising

**Target behaviours: Walking; Simple home-based exercises; Activities of daily living; exercising at the community centre**

Adapted from Michie et al. (2014) with permission from authors. Spill over score = score assigned to the target behaviour based on its potential to impacting on behaviour change and its likelihood of changing behaviour; Measurement score = Final score assigned to the target behaviour; Very promising = highly likely to change behaviour; Promising = likely to change behaviour; Unpromising, but worth considering = may not change behaviour within the given context but can be considered.

### 8.8.3 Step 3: Specifying the Target Behaviour

Michie et al. (2014) recommend that when specifying the target behaviour, one has to consider the following questions: Who, What, When, Where, How often and with Whom. Table 5 shows the list of the answers generated from answering these questions.

Table 5

#### *Specifying the Target Behaviour*

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**Purpose: To describe the target behaviour according to who needs to do the behaviour, what needs to be done, when it needs to be done, where it needs to be done, how often and with whom**

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<b>Target behaviours</b>	Walking to-and-from places; Doing simple home-based exercises and engaging in physical activity through activities of daily living; Doing simple exercises at the community centre.
<b>Who</b> needs to perform the behaviour?	PLWHA of low SES
<b>What</b> do they need to do differently to achieve the desired behaviour?	Walk at a moderate-to-vigorous intensity instead of using motorised transport; do home-based exercises; Do simple home-based exercises and activities of daily living at a moderate-to-vigorous intensity; Do simple exercises at the community centre at a moderate-to-vigorous intensity; seek out opportunities for being more active around the home, such as performing domestic chores, e.g., gardening, etc.
<b>When</b> do they need to do it?	When going to-and-from places; during free time at home; during free time at the community centre.
<b>Where</b> do they need to do it?	When going to-and-from places; at home; at the community centre.
<b>How</b> often do they need to do it?	Whenever going to-and-from places; at least once every other weekday for at least 30 minutes or bouts of 10 minutes accumulatively.
<b>With whom</b> do they need to do it?	Alone/in a group; alone/ with family and friends; with the exercise leader and other participants attending the community centre.

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The intervention would then (What) promote PA among (Who) women of low SES living with HIV and AIDS (Where) at a community centre, and encourage participation (With whom) alone, in a group, or with an exercise leader. Ideally, (How often) group activities will be performed once a week and the participants would be encouraged to engage in PA every day for at least 30 minutes. In addition, the inclusion of exercises, such as walking, chair exercises, aerobics, calisthenics, aerobic exercises and leisure-related PA in the intervention, where based on the findings from two preliminary studies (Mabweazara et al., 2017; Mabweazara et al., 2018(b), unpublished].

#### 8.8.4 Step 4: Identifying What Needs to Change

Table 6 shows the outcome of matching participant's statements obtained through focus group discussions in a preliminary study (Mabweazara et al., 2017) with the COM-B components in order to identify what needed to change. The findings revealed that physical capability, psychological capability, physical opportunity, social opportunity, and reflective and automatic motivation needed to change for the target behaviour to occur.

Table 6

*Matching of Participant Statements in the Focus Group Discussions (Mabweazara et al., 2017) with the COM-B Components to Identify What Needed to Change*

<b>Purpose: To identify what needed to change for PLWHA of low SES to engage in PA, Using the COM-B model</b>			
<b>COM-B components</b>	<b>What needed to happen for the target behaviour to occur?</b>	<b>Is there a need for change?</b>	<b>Example of participant statement in focus group discussions to support inclusion</b>
<b>Physical capability</b>	Developing the physical skills to perform the exercises, such as teaching participants how to correctly do sit-ups.	Yes, change was needed, as most PLWHA of low SES do not possess these skills.	<i>"I do not know which exercises to do, ..."</i>
<b>Psychological capability</b>	Developing knowledge of exercises, the correct techniques used and the appropriate intensity.	Yes, change was needed in terms of knowledge of cost-effective home-based exercises, exercise technique and intensity.	<i>"..., I do not have the information about exercising"</i>
<b>Physical opportunity</b>	Accessing time, resources and locations to exercise and understanding when an opportunity to engage in PA presents itself.	Yes, participants needed to know the opportune time to exercise, the resources available and when and where to exercise.	<i>"I simply do not have the time, I come to the community centre every day in the morning, leave late, then at home I have to focus on the domestic chores"</i>
<b>Social opportunity</b>	Increasing social support from family and friends for engaging in PA	Yes, change was needed so that PLWHA of low SES can make use of social support to engage in PA	<i>"Let's exercise as a group here at the community centre and, then, we can exercise alone at home"</i>
<b>Reflective motivation</b>	Instilling beliefs that engaging in PA will help manage HIV/AIDS by teaching the participants about the importance of PA in managing HIV and HAART-related complications.	Yes, change was needed as most PLWHA of low SES do not know the benefits of PA for managing HIV/AIDS.	<i>"I thought exercising was for fat individuals, I have already lost weight, due to the disease, so I thought exercising might worsen the situation"</i>
<b>Automatic motivation</b>	Establishing routines and habits for engaging in PA. Automatic motivation would also be derived from weight control, being more energetic, performing activities of daily living (ADLs) a lot easier, and enhanced quality of	Yes, change was needed to establish routines and habits. Change was also needed for compliance and sustainability of the programme.	<i>"I think we must record our exercise activities somewhere so that we keep track of the exercises we do"</i>

life (QoL)

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<b>Behavioural analysis of the relevant COM-B components</b>	Physical capability, psychological capability, physical opportunity, social opportunity, and reflective and automatic motivation needed to change for the target behaviour to occur.
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## 8.9 Stage 2: Identification of Intervention Options

### 8.9.1 Step 1: Intervention Functions

Table 7 shows the outcome of the intervention function selection process based on the APEASE criteria and the studies selected in the literature review (Mabweazara et al., 2016). Intervention functions which best met the APEASE criteria (see Table 2) were included in the intervention. The following intervention functions, namely, persuasion, coercion and restriction were excluded, because they did not satisfy the APEASE criteria, while environmental restructuring was not compatible with the intervention theoretical frameworks (see Table 8) identified in the literature review (Mabweazara et al., 2016). The selected intervention functions, based on the BCW guide and the systematic literature review, were education, incentivisation, training, modelling and enablement.

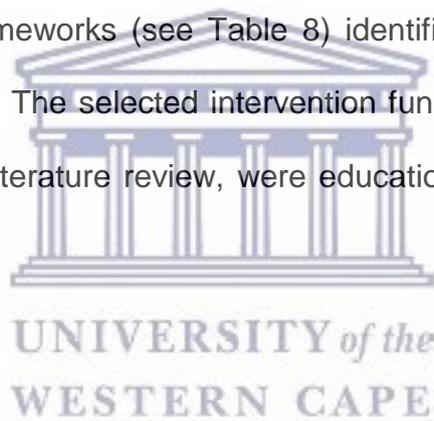


Table 7

*Linking the Result of the Behavioural Assessment with the Intervention Functions*

<b>Candidate intervention functions</b>	<b>Does the intervention function meet the APEASE criteria in the context of engaging PLWHA of low SES in PA?</b>	<b>Application of intervention function based on the studies identified in the systematic literature review (Mabweazara et al., 2016)</b>
<b>Education</b>	Yes, since it was practicable, as there was time available to teach PLWHA about the benefits of PA; about simple and cheap home-based exercises; about the barriers to PA and how to deal with them; as well as about the social support and self-efficacy for PA.	(Dutton et al., 2007; Pekmezi et al., 2009; Keyserling et al., 2008; Hovell, Mulvill, Buono, Liles & Schade, 2008; Marcus et al., 2013)
<b>Persuasion</b>	Yes, since it was likely to add value to the intervention. However, none of the researchers were trained to apply persuasive messages to motivate participants into adopting PA.	None of the studies
<b>Incentivisation</b>	Yes, since the use of incentives can motivate participants to adhere to the intervention. Food and fruit packs could be used for incentivising.	(Webel, Moore, Hanson & Salata, 2013)
<b>Coercion</b>	No, since it does not stimulate the desired autonomous behaviour and can have legislative implications.	None of the studies
<b>Training</b>	Yes, since it was practicable, as there was time to impart exercising skills to participants. Training could be used to teach participants simple home-based exercises or simple exercises to do at the community centre.	(Pekmezi et al., 2009)
<b>Restriction</b>	No, since it was not practicable, as there was not enough opportunities to apply this intervention function. Resources available did not permit the employment of this function in the intervention.	None of the studies
<b>Environmental restructuring</b>	No, the theoretical frameworks informing the intervention (SCT and TTM) did not allow use of this intervention function (it applies to the Socioecological Model).	(Marcus et al., 2013)
<b>Modelling</b>	Yes, it was practicable to demonstrate how to do the simple home-based exercises and exercises at the community centre.	(Lowther, Mutrie & Scott, 2002; Pekmezi et al., 2009)

**Enablement**

Yes, it was practicable in order to increase the means for PA participation and reduce the barriers.

(Lowther et al., 2002; Emmons et al., 2005; Whitehead, Bodenlos, Cowles, Jones & Brantley, 2007; Pekmezi et al., 2009 (b); Marcus et al., 2013; Webel et al., 2013; Quinn et al., 2016; Webb, Foster & Poulter, 2016; Connell, McMahon, Redfern, Watkins & Eng, 2015)

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**SELECTED INTERVENTION FUNCTIONS:** Education; incentivisation; training; modelling; enablement

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Adapted from Michie et al. (2014) with permission from authors. APEASE= affordability, practicability, effectiveness and cost effectiveness, acceptability, side effects and safety, and equity.



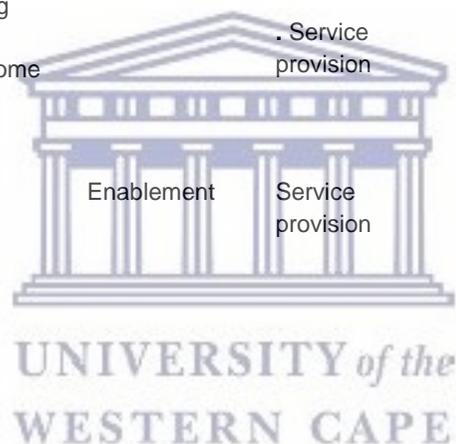
Participants would have to be trained to be able to perform the home-based exercise activities. Modelling could be used in demonstrating to the participants how to perform the exercise activities. Enablement could also be applied to reduce the barriers to PA by teaching the participants the strategies of overcoming the barriers in order to increase their capability for engaging in regular PA. In addition, incentives could be used to motivate the participants to meet their PA goals. Table 8 shows the intervention characteristics, as identified in studies included in the literature review by Mabweazara et al. (2016).



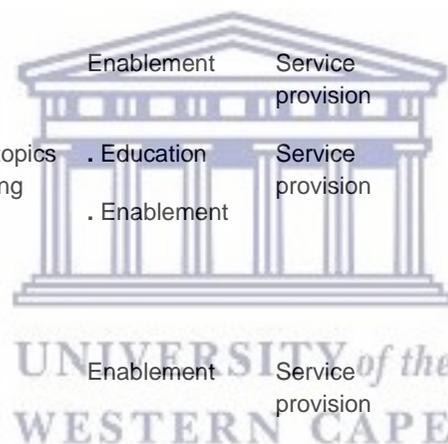
Table 8

*Breakdown of Specific Intervention Characteristics, as Identified in Studies Included in the Literature review by Mabweazara et al. (2016)*

Study	Specific physical activity behaviours targeted by intervention	Educational component and its focus	Intervention function/s	Policy category	Mode of delivery	Tailoring	Exercise tracking and monitoring
Albright et al. (2005)	Teaching participants to accumulate 30 minutes of moderate-intensity PA e.g. walking 5 days a week.	Used eight 1-hour weekly behavioural skill-building classes to inform and motivate women to become more physically active.	Education	. Guidelines . Service provision	. Mailing . Phone	Curriculum for the education component was designed to be culturally sensitive for the Latina population.	. Pedometers . PA self-monitoring logs
Dutton et al. (2007)	Taking the stairs; promoting walking; gardening; dancing	Not specified or N/A	Enablement	Service provision	. Mailing . Phone	Development of individualised goals; Intervention materials were tailored for each participant; recommendations were tailored to the individual's current activity levels, activity preferences and capabilities.	N/A
Emmons et al. (2005)	Not specified or N/A	Taught participants on the social meanings of PA; social support	Enablement	Service provision	. Mailing . Phone	Intervention takes into account elements of the social context in which participants live.	N/A
Hovell et al. (2008)	Not specified or N/A	Included exercise education; proper foot wear; hydration; proper posture; proper attire;	. Education . Training	Service provision	Face-to-face	Exercise education was culturally appropriate for low-literacy Latinas.	Heart rate monitors



		importance of warm-up/cool down; exercise safety; injury prevention; treatment of minor injuries; heart-healthy diet and exercise health benefits.				Intervention took into consideration participants' personal concerns.	
Keyserling et al. (2008)	Chair exercises	Taught problem solving skills; social support; lifestyle behaviour change strategies	. Training . Education . Enablement	Service provision	. Mailing . Phone . Face-to-face	Development of an individualised action plan.	Pedometer
Lowther et al. (2002)	Not specified or N/A	Not specified or N/A	Enablement	Service provision	Face-to-face	Not specified or N/A	Not specified or N/A
Marcus et al. (2013)	Not specified or N/A	Tip sheets on selected topics e.g. stretching; measuring heart rate	. Education . Enablement	Service provision	Mailing	Individually tailored feedback reports. The intervention addressed PA barriers identified by Latinas in focus group discussions.	. Pedometers . PA logs
Pekmezi et al. (2009)	Not specified or N/A	Not specified or N/A	Enablement	Service provision	Mailing	PA manuals were matched to participant's current level of motivational readiness and participants were given individually tailored feedback.	. Pedometers . PA logs
Pekmezi et al. (2009b)	Walking	Not specified or N/A	Enablement	Service provision	. Mailing . Phone	Personalised letters sent to participants; Messages tailored to the participant's motivational readiness.	N/A



Webel et al. (2013)	Was dependent on the outcome of participant's small self-designed experiments to improve health	Taught systems thinking; self-monitoring and goal setting; lifestyle routines; systems improvement strategies and social support; PA and self-experiments; patterns of exercise, types of fitness and testing small experiments; sleep; mental wellness behaviours; personal time; relapse prevention	. Education . Enablement	Service provision	Face-to-face	Included challenges specifically faced by PLWH. Individual participants determined and evaluated their own behaviour change. The intervention was culturally adapted.	Diaries of daily activities
Whitehead et al. (2007)	Not specified or N/A	Not specified or N/A	Enablement	Service provision	Mailing	Used individually tailored letters	N/A



### 8.9.2 Step 2: Policy Categories

The next step was to identify the relevant policies that would support the delivery of the identified intervention functions. The following policy categories, namely, communication/marketing, guidelines, regulation, legislation and fiscal measures did not meet the APEASE criteria and were subsequently excluded. The same policy categories were not identified in the systematic review (Mabweazara et al., 2016). Service provision was the only policy category that was selected through the APEASE criteria and using the outcomes of the studies included in the systematic review (Mabweazara et al., 2016). Table 9 shows the outcomes of selecting the policy category using the APEASE criteria.



Table 9

*Selecting the Policy Categories to Support the Intervention Delivery*

<b>Intervention function</b>	<b>COM-B component</b>	<b>Potentially useful policy categories</b>	<b>Does the policy category meet the APEASE criteria?</b>
<i>Education</i>	Psychological capability; reflective motivation	Communication/marketing	Too expensive, since persons of low income are more likely to be of low literacy levels, as well as being unemployed, so they may not be able to read or access relevant information, including communication technologies.
		Guidelines	No, PA guidelines for PLWHA already exist.
		Regulation	Possibly in the long term, but not at the present time, because rules or principles of practice can only be established over time.
		Legislation	Not practicable in this context, as the intervention does not aim to make or change laws.
<i>Incentivisation</i>	Reflective motivation; automatic motivation	Service provision	Yes, and very practicable, because the intervention designers aim to deliver a service to PLWHA of low SES.
		Communication/marketing	Too expensive, since the participants are of low income or unemployed and of low literacy levels and not able to read or afford information communication technologies.
		Guidelines	No, PA guidelines for PLWHA already exist.
		Fiscal measures	Not relevant in this context, this policy uses the tax system to reduce or increase the financial cost in order to change behaviour.
		Regulation	Possible in the long term, but not present moment, because this policy seeks to establish rules or principles of behaviour.
		Legislation	Not practicable in this context, since the intervention does not seek to make or change laws.
<i>Training</i>	Physical	Service provision	Yes, very practicable, because the intervention designers aims to deliver a service to PLWHA of low SES.
		Guidelines	No, PA guidelines for PLWHA already exist.

	capability; psychological	Fiscal measures	Not relevant in this context, since this policy uses the tax system to reduce or increase the financial cost in order to change behaviour.
	capability; automatic motivation;	Regulation	Possible in the long term, but not at the present time, because rules or principles of practice can only be established over time.
	physical opportunity	Legislation	Not practicable in this context, since the intervention does not seek to make or change laws
		Service provision	Yes, very practicable, because the intervention designers aim to deliver a service to PLWHA of low SES.
<i>Modelling</i>	Psychological capability;	Communication/marketing	Too expensive, since the participants are of low income or unemployed and of low literacy levels so they may not be able to read or afford information communication technologies
	reflective motivation;	Service provision	Yes, very practicable, because the intervention designers aim to deliver a service to PLWHA of low SES.
	automatic motivation;		
	social opportunity		
<i>Enablement</i>	Psychological capability;	Guidelines	No, PA guidelines for PLWHA already exist
	reflective motivation;	Fiscal measures	Not relevant in this context, since this policy uses the tax system to reduce or increase the financial cost in order to change behaviour.
	automatic motivation;	Regulation	Possible in the long term, but not at the present time, because rules or principles of practice can only be established over time
	physical opportunity;	Legislation	Not practicable in this context, since the intervention does not seek to make or change laws.
	social opportunity	Service provision	Yes, very practicable, because the intervention designers aim to deliver a service to PLWHA of low SES.

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**Policy category selected: Service provision**

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## 8.10 Stage 3: Identifying Intervention Content and Implementation Options

### 8.10.1 Step1: Identification of Behaviour Change Techniques

The next step was to select the behaviour change techniques (BCTs) that were most likely to be suitable for inclusion in an intervention to engage PLWH in PA. For the definitions of the different BCTs, the reader is referred to Michie et al. (2011). Table 10 presents the selected BCTs from the BCW and those identified through the systematic literature review (Mabweazara et al., 2016).

Table 10

#### *Matching of BCTs Identified in the Systematic Literature Review to Those Identified Through the BCW*

<b>BCTs identified in the systematic review</b>	<b>BCTs identified through the BCW</b>
Provide information on the consequences of the behaviour to the individual	Information about health consequences
Provide information on the consequences of the behaviour in general	
Provide feedback on the performance	Feedback on the behaviour
Prompt review of the outcome goals	Feedback on outcomes of the behaviour Goal-setting outcome
Prompt self-monitoring of the behavioural outcomes	Self-monitoring of the behaviour
Prompt self-monitoring of the behaviour	Self-monitoring of the behaviour
Model/Demonstrate the behaviour	Demonstration of the behaviour
Provide instruction on how to perform the behaviour	Instruction on how to perform the behaviour
Plan social support/social change	Social support (unspecified) Social support (practical)
Goal-setting behaviour	Goal-setting behaviour

Prompt review of the behavioural goals

Review the behavioural goals

Action planning

Action planning

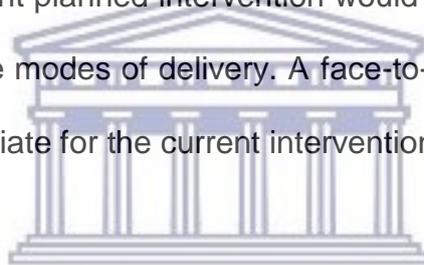
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**Selected BCTs: Information about health consequences; feedback on behaviour; feedback on outcomes of the behaviour; goal setting outcome; self-monitoring of the behaviour; demonstration of the behaviour; instruction on how to perform the behaviour; social support (unspecified); social support (practical); goal setting behaviour; review behavioural goals; action planning.**

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### 8.10.2 Step 2: Mode of Delivery

Most of the studies in the systematic literature review (Mabweazara et al., 2016) used mailing and the telephone as a method of delivery. However, the low SES of the participants in the current planned intervention would not allow for mailing or use of the telephone as feasible modes of delivery. A face-to-face mode of delivery was, thus, deemed most appropriate for the current intervention.



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Selection of the face-to-face mode of delivery was also supported by evidence from the studies in the systematic literature review (Mabweazara et al., 2016). For example, Hovell et al. (2008), Keyserling et al. (2008) and Webel et al. (2013) used the face-to-face method successfully. Table 11 presents the outcome of the APEASE criteria used to select the intervention mode of delivery.

Table 11

*Outcome of the APEASE Criteria for Selecting the Mode of Delivery*

Mode of delivery				Does the mode of delivery meet the APEASE criteria in the context of increasing PA for PLWHA of low SES?	
Face- to-face	Individual			Yes	
	Group			Yes	
Distance	Population level	Broadcast media	TV Radio	These modes of delivery are not relevant, as PLWHA of low SES are unlikely to have access to phones, computers or be exposed to other forms of media.	
		Outdoor media	Billboard Poster		
		Print media	Newspaper Leaflet		
		Digital media	Internet Mobile phone application		
		Individual level	Phone		Phone helpline Mobile phone text
					Individually accessed computer programme

Adapted from Michie et al. (2014) with permission from authors. APEASE= affordability, practicability, effectiveness and cost effectiveness, acceptability, side effects and safety, and equity.

## 8.11 Discussion

This study described the preliminary and developmental research to identify key components of a contextualised intervention for promoting PA among PLWHA of low SES. The BCW has been used previously in the development of behavioural change interventions (Webb et al., 2016; Connell et al., 2015; Gould et al., 2017). The current study specifically focused on the development of a contextualised PA intervention for PLWHA of low SES. To the best of our knowledge, no study has been conducted to develop a PA intervention for PLWHA of low SES using the BCW, especially in an African context. For example, some studies that have aimed at promoting PA amongst clinical populations have focused on cancer (Webb et al., 2016) and stroke (Connell et al., 2015).

PA may be an effective alternative therapy to address the varying health challenges faced by PLWHA, which include the common prevalence of cardiovascular disease, metabolic syndrome, and neurocognitive deficits that are mainly caused by antiretroviral therapy (Yahiaoui, McGough, & Voss, 2012). The use of cost-effective home based exercise activities and integrating PA into activities of daily living in PA interventions for PLWHA of low SES may assist in promoting PA among this population. Costly PA interventions that include high-intensity PA may not work for PLWHA (Mabweazara et al., 2016; Montoya, Wing, Knight, Moore, & Henry, 2015).

Additionally, the use of preliminary research may aid in informing the intervention development process. This may be particularly so, if the research is conducted among people who exhibit the same characteristics (e.g., chronic disease and low SES), as those to be targeted by the intervention. For example, in one of our preliminary studies we found that women living with HIV and AIDS prefer exercising as a group with monitoring and tracking of exercise (Mabweazara et al., 2017). As such, the final PA intervention included group exercises and the use of pedometers and PA diaries to track and monitor PA.

### **8.12 Strengths of the Study**

The intervention was developed by applying a rigorous systematic method that combined theory, participant preferences and practical considerations. Two theoretical frameworks, the SCT and the TTM, also informed the intervention. The strength of the BCW is that the framework was developed from theoretical constructs of numerous theories, instead of one theory (Michie et al., 2014). In addition, the breadth of the BCW offers a comprehensive way of tackling possible obstacles and understanding enablers of behaviour change (Cane et al, 2012).

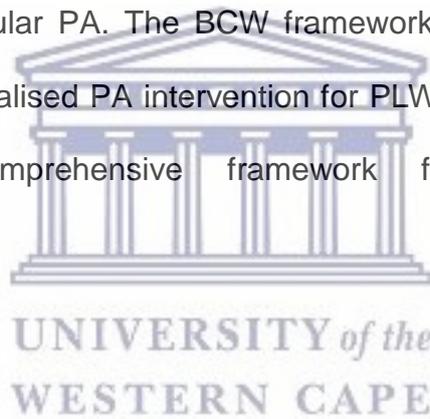
### **8.13 Limitations of the Study**

Even though the BCW is a comprehensive framework for intervention development, subjectivity is still an issue in the choice of intervention content and delivery options (Cane et al., 2012). For example, in terms of intervention functions and policy

categories, intervention choices depended on the decisions of the intervention developers (SZM; LLL; CL).

#### **8.14 Conclusion**

PA can be used to ameliorate the adverse effects of HIV infection and those of antiretroviral therapy among PLWHA. PLWHA of low SES encounter multiple factors that hinder their ability to engage in healthy levels of PA. Cost-effective and contextualised PA interventions are ideal for PLWHA of low SES, and have the potential of promoting regular PA. The BCW framework can be used to design a cost-effective and contextualised PA intervention for PLWHA of low SES. The BCW is a useful and comprehensive framework for intervention design.



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## Chapter Nine: A Six Week Contextualised Physical Activity Intervention for Women Living with HIV and AIDS of Low Socioeconomic Status: A Pilot Study

Mabweazara, S. Z., Leach, L. L., Ley, C., & Smith, M. (2018). A six week contextualised physical activity intervention for women living with HIV and AIDS of low socioeconomic status: A pilot study. *Aids Care, 30(sup2)*, 61-65. doi: 10.1080/09540121.2018.1470309. Manuscript published.

[Note: The format of this chapter is presented in its published format]

### Abstract

Research has consistently shown the benefits of regular physical activity (PA) for women living with HIV and AIDS (WLWHA). This study is a pilot, randomised controlled crossover trial, reporting the effects of a contextualised PA intervention amongst a sample of 21 HIV positive Xhosa-speaking women of low socioeconomic status (SES). The study determined total moderate-to-vigorous PA (TMVPA) as measured subjectively by the Global Physical Activity Questionnaire (GPAQ), total weekly steps (TWS) as measured by a pedometer, and self-efficacy for PA as measured by the Physical Exercise Self-efficacy scale (PESES). Multivariate analysis of covariance (MANCOVA) was used to compute the impact of the intervention on TMVPA, TWS, and self-efficacy for PA from baseline to six weeks, and baseline to 12 weeks post-intervention, controlling for pre-test differences in TMVPA. Results showed that participants exposed to the intervention had significant increases in PA as measured by TMVPA ( $p = .027$ ), TWS ( $p = .032$ ), as well as exercise self-efficacy ( $p = .000$ ) from pre-test to 6 weeks. No significant findings were reported for all three variables, when measured from baseline to 12 weeks. In conclusion, the findings of the pilot study suggest that the intervention was effective in producing significant increases in PA in a sample of PLWHA of low SES over six weeks. Careful consideration of behavioural constructs, such as self-efficacy, can help WLWHA of low SES to adopt regular PA as a complementary therapy for managing their health.

Key words: Physical activity, exercise, socioeconomic status, HIV, AIDS

## 9.1 Introduction

Amongst people living with HIV and AIDS (PLWHA), physical activity (PA) is associated with improvements in mental and physical well-being (MacArthur, Levine, & Birk, 1993; Neidig, Smith & Brashers, 2003; Fillipas, Cicuttini, Holland, & Cherry, 2013). Aerobic and strength training improve the profile of lymphocytes (O'Brien, Nixon, Glazier, & Tynan, 2004), body composition, muscle strength and quality of life (Spence, Galantino, Mossberg, & Zimmerman, 1990).

In Africa, Murenzi (2011) reported that PLWHA, particularly women (Smit et al., 2006), engage in insufficient amounts of PA, which may be related to low socioeconomic status (SES) (Economic and Social Research Council, 2014).

Given the foregoing, the purpose of this study was to evaluate the effect of a six-week pilot PA intervention amongst PLWHA of low SES.

## 9.2 Methods

### 9.2.1 Design

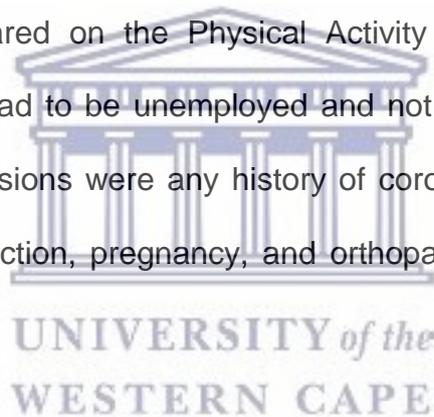
The study was a crossover trial. Participants were randomly placed in either a 6-week PA intervention or standard care. After a 2-week washout period, participants were crossed-over for another 6 weeks. At week 15, the study terminated.

### 9.2.2 Setting and Sample

The study was conducted at a community centre caring for HIV positive Black African isiXhosa-speaking women in a low-income community in the Western Cape Province, SA. Study participants belonged to an HIV support group who consented to participate in the study.

### 9.2.3 Eligibility/Inclusion Criteria

Participants were between 18 and 65 years and HIV positive, as confirmed through medical records, and cleared on the Physical Activity Readiness Questionnaire (PAR-Q). All participants had to be unemployed and not have attained any tertiary education. Additional exclusions were any history of coronary heart disease and/or diabetes, opportunistic infection, pregnancy, and orthopaedic conditions that made PA unsafe.

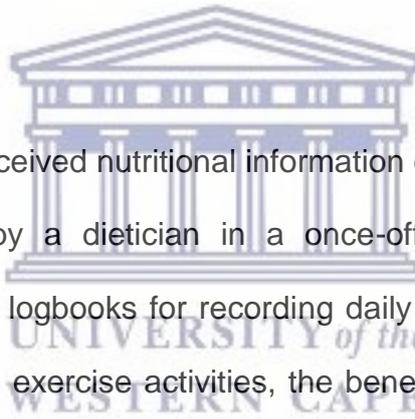


### 9.2.4 Protocol

An information session and information sheets were used to inform participants about the study, and participant written informed consent was obtained. An interviewer-administered questionnaire was used for recording participant demographic information. Height was measured with a stadiometer, and body weight using a calibrated weight scale with participants wearing minimal clothing. Blood pressure was measured, while sitting quietly for approximately 5 minutes, using a

sphygmomanometer. Omron pedometers counted the number of steps per day for seven consecutive days.

Study measurements were total moderate-to-vigorous PA (TMVPA) by the Global Physical Activity Questionnaire (GPAQ) (World health Organisation, 2006), total weekly steps (TWS) by an Omron HJ-720IT-E2 pedometer, self-efficacy for PA using the Physical Exercise Self-efficacy scale (PESES) (Schwarzer & Renner, 2008), and the stages of motivational readiness for change (SOC) (Marcus & Simkin, 1993). Two isiXhosa-speaking research assistants helped the participants to complete the questionnaires.



The standard care group received nutritional information on healthy eating (Gibney & Vorster, 2001) designed by a dietician in a once-off 2-hour session. The PA intervention group received logbooks for recording daily PA, and a PA manual with information on home-based exercise activities, the benefits and barriers to PA, and strategies for improving exercise self-efficacy. Figure 1 shows the flow of the study.

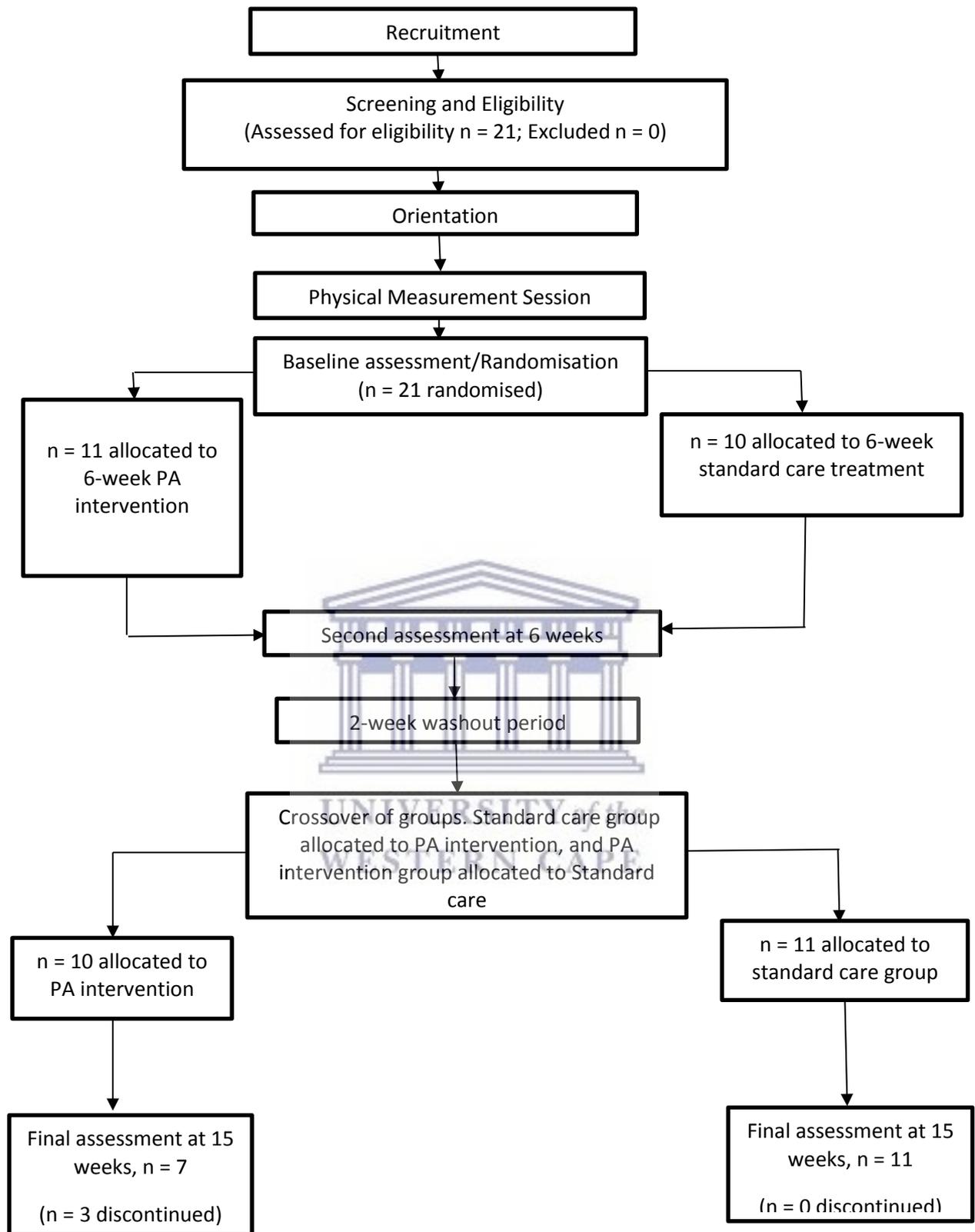


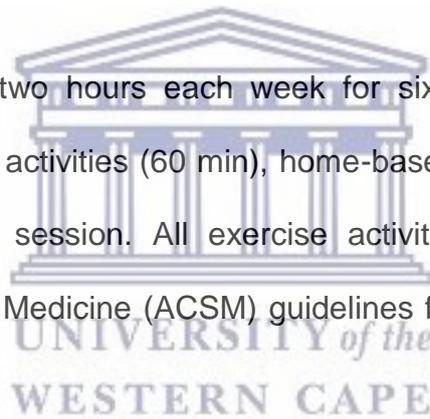
Figure 1. Flow chart of the randomised controlled cross-over trial

### **9.3 The Contextualised Physical Activity Intervention**

The PA intervention was developed in a previous study (Mabweazara, Leach & Ley, 2017) and informed by Social Cognitive theory (SCT) (Bandura, 1986) and the Transtheoretical model (TTM) (Prochaska & DiClemente, 1983).

The PA intervention was delivered in the indigenous isiXhosa language, and food packs were used to promote adherence. The intervention employed low-cost activities of daily living (ADLs) using local resources and opportunities.

The PA intervention was two hours each week for six weeks that comprised a combination of educational activities (60 min), home-based activities (30 min) and a 30-minute group aerobics session. All exercise activities were in line with the American College of Sport Medicine (ACSM) guidelines for individuals infected with HIV (ACSM, 2013).



### **9.4 Ethics Statement**

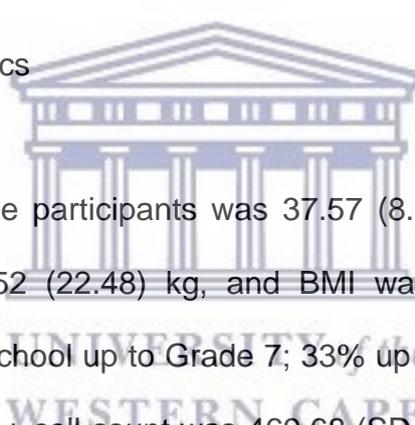
Ethics approval was obtained from the Ethics Committee of the University of the Western Cape (registration number: 14/10/33).

## 9.5 Data Analysis

Descriptive statistics were used to summarise the participants' demographic and clinical characteristics. Levene's test was computed to assess equality of means. Independent t-tests and multivariate analysis of covariance were used to assess differences between groups, and statistical significance was set at an alpha level of  $p < .05$ .

## 9.6 Results

### 9.6.1 Sample Characteristics



The mean ( $\pm$ SD) age of the participants was 37.57 (8.64) years, height was 1.61 (0.06) m, weight was 84.52 (22.48) kg, and BMI was 32.21 (7.89)  $\text{kg}\cdot\text{m}^{-2}$ . For education, 4.8% attended school up to Grade 7; 33% up to Grade 10; and 61.9% up to Grade 12. The mean CD4+ cell count was 469.68 (SD = 157.48) cells/ $\mu\text{L}$  ( $n = 19$ ). Tables 1 and 2 show TMVPA, TWS and self-efficacy at baseline, after six weeks and post-crossover.

The results for SOC showed two participants in the precontemplative stage, 11 in the contemplative stage, four in the preparatory stage and one in the action stage.

Table 1

*Total Moderate-to-Vigorous Physical Activity, Total Weekly Steps and Self-Efficacy for Physical Activity at Baseline and After Six Weeks in the Pre-Crossover Phase (n = 21)*

<b>PA Intervention group (n = 11)</b>		
<b>Variable</b>	<b>Baseline Mean (SD)</b>	<b>6 weeks Mean (SD)</b>
TMVPA (min/wk)	1198.82 (872.33)	1530.36 (1009.86)
TWS (steps/wk)	32198.64 (17148.51)	35311.91 (17767.08)
S-E for PA	10.82 (4.31)	16.18 (2.18)
<b>Standard care group (n = 10)</b>		
<b>Variable</b>	<b>Baseline Mean (SD)</b>	<b>6 weeks Mean (SD)</b>
TMVPA (min/wk)	1427.50 (987.00)	1459.70 (954.84)
TWS (steps/wk)	36572.30 (11014.70)	38153.86 (12081.60)
S-E for PA	14.00 (4.08)	14.30 (2.45)

TMVPA = total moderate-to-vigorous physical activity; TWS = total weekly steps; S-E for PA = Self-Efficacy for physical activity

Table 2

*Total Moderate-to-Vigorous Physical activity, Total Weekly Steps and Self-efficacy for Physical Activity at Baseline and After six weeks in the post-crossover phase (n=21).*

<b>PA Intervention group (n = 10)</b>		
<b>Variable</b>	<b>Baseline Mean (SD)</b>	<b>6 weeks Mean (SD)</b>
TMVPA (min/wk)	1459.70 (954.84)	1750.00 (868.29)
TWS (steps/wk)	38153.86 (12081.60)	115006.86 (176202.25)
S-E for PA	14.30 (2.45)	19.14 (0.90)
<b>Standard care group (n = 11)</b>		
<b>Variable</b>	<b>Baseline Mean (SD)</b>	<b>6 weeks Mean (SD)</b>
TMVPA (min/wk)	1530.36 (1009.86)	1527.00 (1007.00)
TWS (steps/wk)	35311.91 (17767.08)	34083.55 (18149.03)
S-E for PA	16.18 (2.18)	16.91 (2.12)

TMVPA = total moderate-to-vigorous physical activity; TWS = total weekly steps; S-E for PA = Self-Efficacy for physical activity

### 9.6.2 Baseline Assessments

Levene's tests for TMVPA ( $F = .145$ ,  $p = .708$ ), TWS ( $p = .612$ ) and self-efficacy for PA ( $p = .891$ ) were not significant and, thus, equal variances were assumed.

Baseline comparison revealed no significant findings between groups on TWS ( $t = .647, p = .527$ ) and self-efficacy ( $t = 2.167, p = .05$ ), but a significant difference on TMVPA ( $t = .116, p = .042$ ). Thus, pre-existing differences on TMVPA were controlled as a covariate. Table 3 indicates that there were significant differences between groups on all three outcome variables (TMVPA:  $F = 6.037, p = .027$ ; TWS:  $F = 5.586, p = .032$ ; self-efficacy:  $F = 21.211, p = .000$ ) from baseline to 6 weeks. No significant findings were reported for TMVPA and self-efficacy from baseline to 12 weeks.

Table 3

*Multivariate Analysis of Covariance for Physical Activity Measures*

	N	SS <sub>b</sub>	df	MS	F	p
<b>TMVPA</b>						
Baseline – 6 weeks	21	408781.158	1	408781.158	6.037	.027*
Baseline – 12 weeks	18	128205.335	1	128205.335	.929	.350
<b>Total weekly steps</b>						
Baseline – 6 weeks	21	17912427.740	1	17912427.740	5.586	.032*
<b>Self-efficacy for PA</b>						
Baseline – 6 weeks						

Baseline – 12 weeks	21	138.117	1	138.117	21.211	<.000**
	18	192.171	1	19.217	2.243	.155

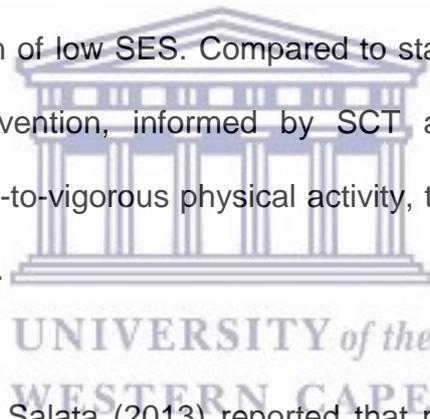
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SS<sub>b</sub>=sum of squares between; df=degree of freedom; MS= mean square; F= Anova Statistic, *p* = alpha level; TMVPA = total moderate-to-vigorous physical activity; TWS = total weekly steps; S-E for PA = Self-Efficacy for physical activity

\* *p* ≤ .05; \*\* *p* < .01

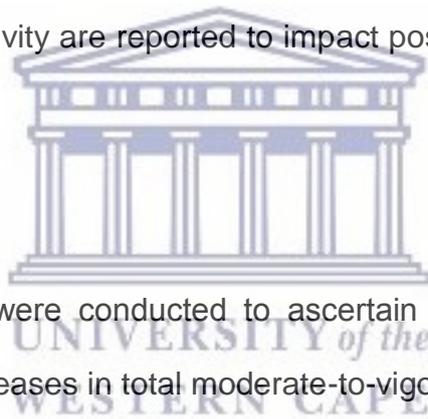
## 9.7 Discussion

The purpose of this study was to evaluate the effects of a six week contextualised intervention aimed at increasing physical activity and self-efficacy for physical activity among HIV positive women of low SES. Compared to standard care, participants in the physical activity intervention, informed by SCT and TTM, had significant increases in total moderate-to-vigorous physical activity, total weekly steps and self-efficacy for physical activity.



Webel, Moore, Hanson, & Salata (2013) reported that participants increased their physical activity by 300 MET-minutes per week compared to the standard care group. Similar to this study, Webel and colleagues included PA self-monitoring, goal-setting, inclusion of physical activity into activities of daily living, social support and strategies for overcoming barriers to engaging in physical activity, such as the effective use of personal time.

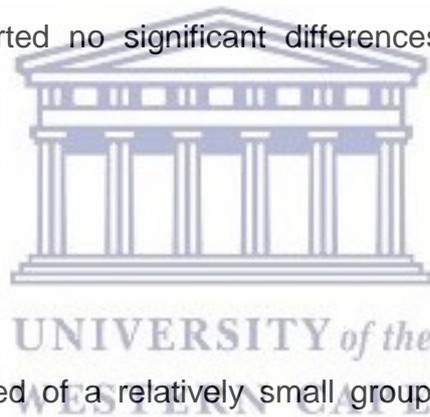
Both studies were also theory-based interventions. Theory-based behaviour change interventions are found to be effective (Sparling et al., 2000). Theories assist the researcher to identify the most effective behaviour change techniques (Glanz et al., 2011) and form the base for the development of evidence-based interventions (Sparling et al., 2000). The intervention used in this study applied SCT and TTM. Both theories emphasise the enhancement of self-efficacy (DiClemente & Prochaska, 1983; Stacey, James, Chapman, Courneya, & Lubans, 2015). The significant increase in self-efficacy for physical activity could be attributed to the exercises that were chosen and deemed to be enjoyable (Lewis et al., 2016). Including strategies on goal-setting and educating the participants on the benefits and barriers of physical activity are reported to impact positively on health behaviour change (Bandura, 2004).



Focus group discussions were conducted to ascertain the participants' preferred exercise activities. The increases in total moderate-to-vigorous physical activity could be attributed to the fact that the intervention included the preferred exercises of the participants. Enjoyment of physical activity has been found to be an important determinant of physical activity initiation (Lewis et al., 2016). Moreover, increased perceived enjoyment of physical activity may result in increased self-efficacy, which may lead to a greater prospect of increasing physical activity behaviour (Lewis et al., 2016).

Good health is a major motivator for engaging in regular physical activity (Tuso, 2015). Educating participants on the health benefits of physical activity, such as walking to church rather than taking a taxi, most likely acted as a positive trigger that reminded them to walk more often (Tuso, 2015). The increase in total weekly steps can be attributed to the fact that participants were conscientised on the health benefits of engaging in regular and appropriate physical activity. Also, educating participants on where to find safe environments to walk very likely assisted them to be more physically active (Tuso, 2015). Persons of low SES are more likely to travel on foot than others (Titheridge, Christie, Mackett, Hernandez, & Ye. 2014). However, Jagers et al. (2016) conducted a 9-month home-based physical activity intervention among PLWHA and reported no significant differences in the number of steps walked per day.

### **9.8 Study Limitations**



The study sample consisted of a relatively small group. It was a pilot study and statistical power was not calculated at the outset. Furthermore, the intervention period was for six weeks only. The study does not report on the effect of the intervention on mental or physical health of the participants. Further examination of the intervention is still needed before widespread implementation of the intervention.

### **9.9 Conclusion**

The contextualised physical activity intervention resulted in significant increases in total moderate-to-vigorous physical activity, total weekly steps and self-efficacy for physical activity in women living with HIV and AIDS of low SES. Including constructs, such as self-efficacy, participant exercise preferences and social support, can help PLWHA of low SES to adopt regular physical activity, and can serve as adjunct therapy for the management of HIV and AIDS.



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# Chapter 10: Summary, Conclusion and Recommendations

## 10.1 Introduction

The purpose of this chapter is to summarise the main findings of the previous chapters and their recommendations for future research. The main aim of this thesis was to develop and evaluate the efficacy of a contextualized intervention that promotes PA among PLWHA. The thesis objectives were:

1. To review the specific intervention techniques in an updated taxonomy of behaviour change techniques (Michie, Ashford, Sniehotta, Dombrowski, Bishop, & French, 2011) that were found to be successful in changing PA behaviour.
2. To review the relevant behaviour change theories used to develop the intervention content.
3. To review the available literature on PA, social support and SES for PLWHA with a view to informing the design of an effective PA intervention for PLWHA of low SES.
4. To determine if age, body weight, height, gender, waist-to-hip ratio (WHR), educational attainment, employment status, CD4+ cell count and body mass index (BMI) can predict overall PA among PLWHA.
5. To examine the PA profile of PLWHA based on PA domains and PA intensity.
6. To determine whether employment status and level of education can predict PA among PLWHA of low SES.
7. To assess the perceived benefits and barriers to exercise amongst women living with HIV and AIDS (WLWHA) of low SES.

8. To explore the participants' barriers and exercise preferences to engaging in PA amongst WLWHA of low SES.
9. To develop and evaluate a contextualised intervention for promoting PA among PLWHA of low SES.

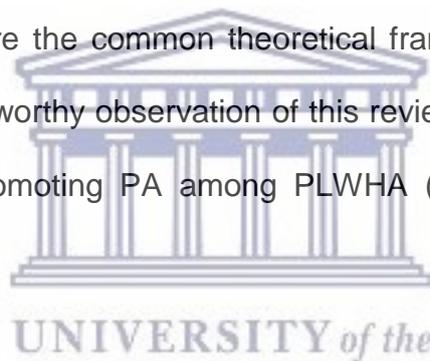
## **10.2 Main Findings**

### 10.2.1 Study One (Chapter 3): Physical Activity Interventions for the Management of Chronic Disease in Low-Income Populations: A Systematic Review

This study (Mabweazara, Leach & Ley, 2016) was conducted to (a) assess the specific intervention techniques in an updated taxonomy of behaviour change techniques (Michie et al., 2011a), and (b) assess the relevant behaviour change theories used to develop the intervention content. Initially, the aim was to conduct a systematic literature review that would focus on PA promotion studies among PLWHA of low SES, but due to a lack of studies with interventions mainly intended for PLWHA of low SES, the study was broadened to include studies that focused on the management of chronic conditions among persons of low SES.

Eleven studies met the inclusion criteria. Amongst other behavioural change techniques (BCTs) reported in chapter 3, 'provide feedback on performance', 'goal setting (behaviour)', and 'plan social support/social change' were the most frequently used behavioural change techniques. Other BCTs that were identified as successful interventions were prompting self-monitoring of behavioural outcomes, providing

information about where and when to perform the behaviour, using follow-up prompts, barrier identification/problem solving, prompt review of behavioural goals, prompt self-monitoring of behaviour, action planning, providing rewards contingent on successful behaviour, providing instruction on how to perform the behaviour, relapse prevention/coping planning, motivational interviewing, prompt reviewing of outcome goals, providing information on the consequences of behaviour to the individual, setting graded tasks, environmental structuring, model/demonstrate behaviour, providing information on the consequences of behaviour in general, facilitating social comparison, teaching use of prompts/cues and time management. Among the existing theories, the Transtheoretical model (TTM) and the Social cognitive theory (SCT) were the common theoretical frameworks to underpin most study interventions. A noteworthy observation of this review was that only one of the 11 studies focused on promoting PA among PLWHA (Webel, Moore, Hanson & Salata, 2013).



It was recommended that policy makers and PA practitioners should engage in effective and context-sensitive behavioural change techniques, as well as advocate for theoretically grounded interventions to increase PA behaviour in populations of low SES. 'Providing feedback on performance', 'goal-setting' (behaviour), and 'planning social support/social change' were the most frequent BCTs employed in the interventions and considered appropriate in promoting PA for individuals of low SES. TTM and SCT are recommended as effective theoretical frameworks for informing interventions that promote PA among persons of low SES. The review also

revealed that there is a scarcity of randomized controlled trials (RCTs) that promote PA among low-income persons, especially in the African continent.

#### 10.2.1.1 Contributions of the Study Towards Intervention Development

BCTs identified through this review, as well as the behaviour change wheel (BCW) reported in chapter eight were implemented in the final intervention. Theoretical frameworks also identified through this review were used to inform the intervention.

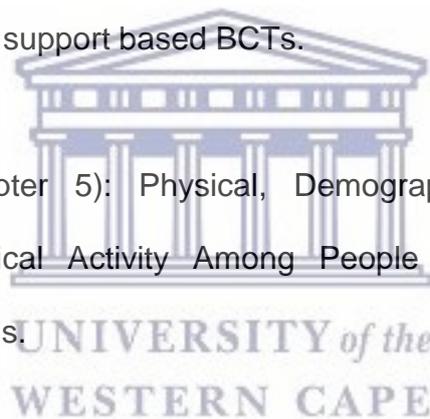
#### 10.2.2 Study Two (Chapter 4): Physical Activity, Social Support and Socioeconomic status Amongst People Living with HIV and AIDS: A review

This purpose of this study was to review the available literature on PA, social support and SES of PLWHA. The findings of the study revealed that PA in different forms can be used to manage HIV/AIDS, particularly the adverse effects of HAART. The findings also revealed the evidence of social support as a crucial variable in promoting PA amongst persons of low SES. The study also showed that affordable PA interventions, such as home-based or walking interventions that are not financially burdensome need to be designed. The study also showed that interventions should utilise group activities, such as group aerobic exercise activities to enhance social support.

#### 10.2.2.1 Contributions of the Study Towards Intervention Development

The PA intervention emphasised low-cost activities including increasing walking, doing simple home-based exercise activities, such as sit-ups and lunges, as well as engaging in activities of daily living (ADLs), such as gardening and washing clothes manually. Participants then attended PA classes for two hours each week over a period of six weeks, where they were taught the following topics in the first hour, namely: the role of PA as a non-pharmacological, low-cost strategy for the management of HIV, the health benefits of PA for PLWHA and strategies for increasing physical exercise self-efficacy and social support. Participants were also taught and performed home-based exercise activities for 30 minutes and, then, a 30-minute group aerobics exercise session was done. Strategies to promote PA in the intervention included social support based BCTs.

10.2.3 Study Three (Chapter 5): Physical, Demographic, and Socioeconomic Predictors of Physical Activity Among People Living with HIV of Low Socioeconomic status.



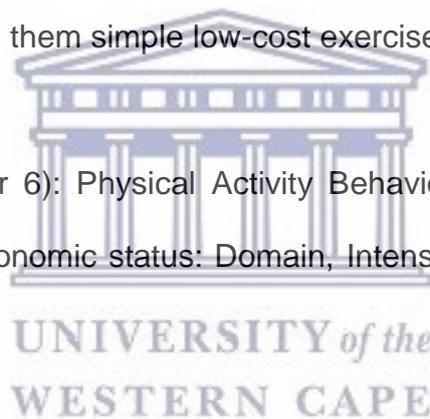
The primary aim of this cross-sectional study was to determine if age, body weight, height, gender, waist-to-hip ratio (WHR), educational attainment, employment status, CD4+ cell count, and body mass index (BMI) could predict overall PA among PLWHA. It was found that education, employment status and gender significantly predicted total moderate-to-vigorous PA (TMVPA) among PLWHA of low SES. Gender had the greatest effect on TMVPA compared to education and employment.

### 10.2.3.1 Contributions of the Study Towards Intervention Development

The intervention included educating the participants about the health benefits of PA, the strategies for overcoming the barriers to PA participation, and the strategies of social support and self-efficacy to enhance PA participation. A PA promotion pamphlet with the relevant information and home-based exercise activities was prepared as part of the intervention material.

Most importantly, the intervention targeted unemployed PLWHA of low SES. Thus, the PA intervention educated PLWHA on the benefits of PA for the management of HIV and AIDS and teaching them simple low-cost exercises they could do at home.

### 10.2.4 Study Four (Chapter 6): Physical Activity Behaviours of People Living with HIV of Low Socioeconomic status: Domain, Intensity, and Sociodemographic Correlates



The purpose of this study was to (a) examine the PA profile of PLWHA based on PA domains and PA intensity (b) determine whether employment status and level of education could predict PA among PLWHA of low SES.

The findings of the study showed that PLWHA engaged most frequently in work-related PA, followed by transport-related PA and, lastly, in leisure-related PA. Participants engaged more frequently in overall PA at a moderate- than vigorous-intensity of PA. Employment was also a significant predictor of work-related PA. The

results showed that being unemployed was related with lower levels of work-related PA. This study helped to pinpoint the specific PA domains and correlates to be targeted for PLWHA of low SES.

Transport-related PA can be a vital basis of daily PA and an important focal point for PLWHA of low SES to meet the recommended levels of PA for public health benefits. Researchers should also take cognisance of the restrictions in PA engagement in PLWHA which might be brought about by low CD4+ cell counts that impact negatively on health status.

#### 10.2.4.1 Contributions of the Study Towards Intervention Development

The PA intervention included strategies of dealing with barriers to PA in low-income settings. The PA intervention promoted walking as transport-related PA. Personalised PA goals were set for each participant, because of the variations in ability, especially due to fluctuations in CD4+ cell counts.

#### 10.2.5 Study Five (Chapter 7): Physical Activity Among HIV Positive Women of Low Socioeconomic Status: Benefits and Barriers

The aim of this study (Mabweazara, Leach & Ley, 2017) was to (a) assess the participants' perceived benefits and barriers to exercise (b) explore the participants' barriers to engaging in PA (c) explore participant exercise preferences and (d) determine improvements that could be added to the content and delivery of a

planned, ~~pilot~~ contextualised pilot PA intervention programme for HIV positive women living in low income communities in the Western Cape Province in South Africa (SA). The results of the study showed that the participants' barriers to PA were associated with HIV-related symptoms, HIV medications, aging, finances, time-constraints, home environment, a lack of knowledge about the value of PA, and a lack of motivation to engage in PA. In terms of exercise benefits, participants agreed the most with the item: '*exercise improves the way my body looks*'. However, for some benefits, the participants were neutral (e.g., '*exercise allows me to carry out normal activities without becoming tired*'; '*exercise improves the quality of my work*'; and '*exercise is good entertainment for me*') or tended to 'agree' (e.g., '*my disposition is improved by exercise*').

Participants had higher perceived benefits than barriers to exercise. Exercise preferences included aerobics, aerobic exercises, calisthenics and chair exercises. Participants preferred group classes, with monitoring and tracking of exercise.

#### 10.2.5.1 Contributions of the Study Towards Intervention Development

Preferred exercises were included in the intervention. The intervention also included educating the participants on the strategies of overcoming the barriers to PA in a low-income neighbourhood. Participants were also taught about the benefits of PA. At the request of the participants, exercise diaries and pedometers were used to monitor PA.

### 10.2.6 Study Six (Chapter 8): Development of a Context-Sensitive Physical Activity Intervention for People Living with HIV/AIDS of Low Socioeconomic status Using the Behaviour Change Wheel.

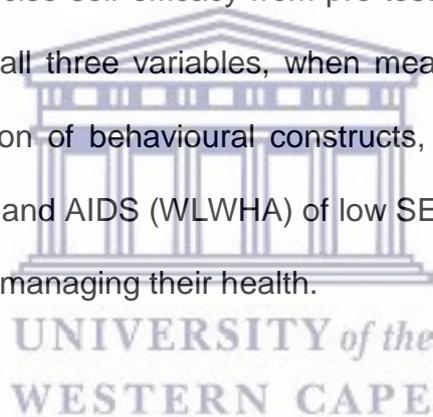
The purpose of this study was to develop a contextualised intervention for promoting PA among PLWHA of low SES. The method of intervention design used in this study was based on the eight-step guide of the Behaviour Change Wheel (BCW) for designing and evaluating behaviour change interventions. The results showed that the intervention for PLWHA of low SES would be more likely to succeed by (a) using the Transtheoretical model of behaviour change and the Social cognitive theory as the underpinning theoretical frameworks (b) targeting convenient physical activities, such as walking, doing simple home-based exercises or engaging in activities of daily living or doing simple exercises at the community centre (c) using education, reward, training in PA, modelling exercise activities and enablement to increase the opportunity to engage in PA as intervention functions (d) using service provision as policy priorities, and (e ) using a direct face-to-face mode of delivery.

#### 10.2.6.1 Contributions of the Study Towards Intervention Development

The BCW allowed for the development of a PA promotion programme that was theoretically informed, using a comprehensive framework for intervention design.

### 10.2.7 Study Seven (Chapter 9): A Six Week Contextualised Physical Activity Intervention for Women Living with HIV and AIDS of Low Socioeconomic Status: A Pilot Study.

This study was a pilot, randomised controlled crossover trial, reporting the effects of a contextualised PA intervention amongst a sample of 21 HIV positive isiXhosa-speaking women of low socioeconomic status (SES). The results showed that participants exposed to the intervention had significant increases in PA as measured by TMVPA, as well as exercise self-efficacy from pre-test to 6 weeks. No significant findings were reported for all three variables, when measured from baseline to 12 weeks. Careful consideration of behavioural constructs, such as self-efficacy, can help women living with HIV and AIDS (WLWHA) of low SES to adopt regular PA as a complementary therapy for managing their health.



### 10.3 Contributions of the Thesis to Knowledge

To the best of the researcher's knowledge, this is the first PA promotion programme to be developed using the BCW for PLWHA of low SES. The findings in this thesis do not advocate using PA as an alternative therapy to HAART. However, the findings in the literature show that PA can be a corrective therapy for the adverse effect of HAART. As such, PA can be restorative therapy for improving the quality of life of PLWHA. HAART is mandatory and cannot be replaced by PA. The studies

conducted in this thesis contribute to knowledge in various ways and mainly in that the thesis identifies the following:

- a) Successful BCTS for use in PA interventions targeting persons of low SES.
- b) Relevant theoretical frameworks that inform PA interventions targeting persons of low SES.
- c) Considerations to be made when planning for a PA intervention in terms of the SES and social support.
- d) Sociodemographic predictors of PA among PLWHA of low SES.
- e) Specific PA domains and PA intensities for PLWHA of low SES.
- f) Barriers and benefits of PA among PLWHA of low SES, coupled with their preferred intervention content.
- g) The BCW can be a useful model for designing PA interventions for PLWHA of low SES.
- h) A carefully designed PA intervention using the BCW and taking into consideration the most promising BCTS, sociodemographic predictors, preferred intervention content, and benefits and barriers to PA has the potential for promoting PA amongst PLWHA of low SES.

#### **10.4 Strengths of the Study**

The Strengths of the individual studies are discussed in their respective chapters. The general strength of the study is discussed in this section. The use of a systematic literature review to identify BCTS employed in the intervention is evidence-based. Furthermore, the identification of participants' preferences,

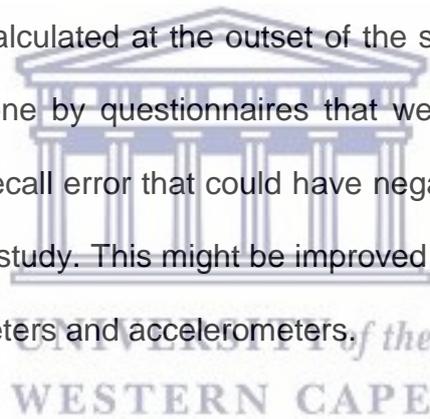
perceived benefits and barriers to PA were key to determining the effectiveness of the intervention. The cross-sectional studies conducted in this thesis allowed for an understanding of PA behaviour among PLWHA and how PA relates with sociodemographic variables. Use of the BCW (Michie et al., 2011b) as a theoretical framework to inform the intervention design process affords a comprehensive understanding of PA behaviour and, consequently, the understanding of mechanisms of behaviour change. Moreover, the use of homogeneous terminology for the BCTs in the BCT taxonomy (Michie et al., 2013) makes it easy to compare the current intervention with other interventions and aids in facilitating reproducibility of the intervention design process.

To the best of the researcher's knowledge, there are no known published studies aimed at developing interventions for promoting PA among PLWHA of low SES in the African context. An advantage of the intervention developed in this thesis is that it has been designed within the context of PLWHA of low SES, especially in South Africa, where the HIV epidemic continues to be rampant among individuals of low SES.

## **10.5 Limitations of the Study**

Findings reported in this thesis must be understood with caution and within the context in which the research was conducted. For example, the focus group study reported in Chapter 7 only assessed HIV positive isiXhosa women of low SES, therefore these findings can only be generalised to this specific population.

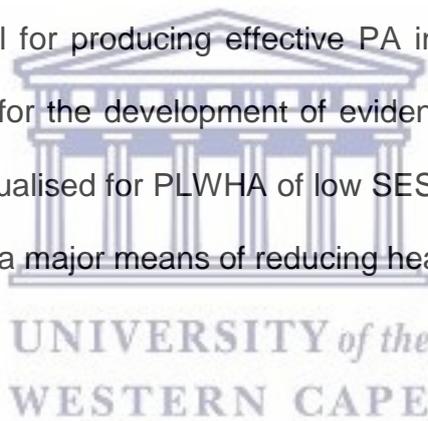
With regard to the efficacy study reported in Chapter 9, the study sample consisted of a relatively small group of HIV-infected women of low SES. Recruitment of participants is challenging in this field (Loutfy et al., 2014), especially in Africa, where stigmatisation and discrimination against PLWHA still persists. Even so, as in this study, other studies that have conducted RCTs for engaging HIV-positive participants into PA have used relatively small samples (Henry & Moore, 2016; Jagers et al., 2016). The study did not examine sources of self-efficacy, which led to a failure in identifying and recommending further strategies for enhancing self-efficacy. This was a pilot study testing the efficacy of an intervention and, therefore, statistical power was not calculated at the outset of the study. Additionally, some of the data collection was done by questionnaires that were self-reported and could have included participant recall error that could have negatively impacted the overall quality of the results of the study. This might be improved by making use of objective measures, such as pedometers and accelerometers.



## **10.6 Conclusion**

PA is a cost-effective alternative therapy that can be used for managing HIV/AIDS and the adverse effects of HAART. It is important for researchers to identify BCTs and theoretical frameworks that have the potential of promoting PA amongst persons of low SES. In particular, SCT and TTM can be effective theoretical frameworks for informing PA interventions for PLWHA of low SES. Correlates of PA such as SES,

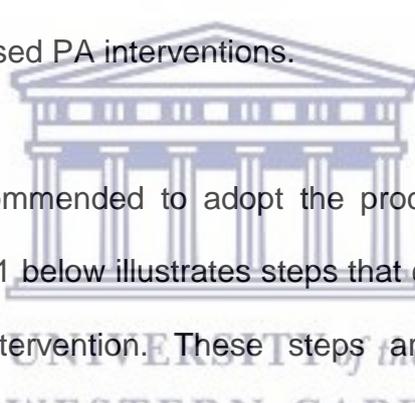
social support, self-efficacy, gender, education and employment have the potential of impacting on PA behaviour and must be considered when designing and contextualising PA interventions for PLWHA of low SES. Designing contextualised PA domain and intensity specific interventions can be a useful strategy for enhancing the effectiveness of PA interventions for PLWHA of low SES. Researchers should also take into cognisance the perceived barriers and benefits of PA, when developing PA interventions for PLWHA of low SES. Moreover, taking into account the preferred exercise activities for inclusion in PA interventions for PLWHA of low SES may enhance enjoyability and aid in promoting PA. Most importantly, this thesis has shown that the use of a comprehensive intervention design framework, such as the BCW, has the potential for producing effective PA interventions for PLWHA of low SES. There is a need for the development of evidence-based PA interventions that are specifically contextualised for PLWHA of low SES. PA interventions for low-income populations can be a major means of reducing health disparities.



## **10.7 Recommendations**

In conducting formative research to inform intervention design, researchers are encouraged to do a systematic review of successful PA interventions for PLWHA of low SES. Such reviews might aid in identifying effective intervention techniques, which are specific to PLWHA of low SES. Including a meta-analysis will further aid in identifying specific patterns among different studies. Researchers should also use larger populations to show strong relationships between PA and sociodemographic variables. Researchers are also encouraged to make use of interviews and focus

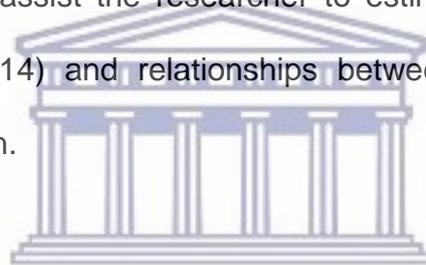
group discussions in order to gain in-depth knowledge on the preferred intervention content and delivery with larger samples of PLWHA of low SES. This can aid in obtaining detailed information about perceptions and opinions of the target population. Interviews may be useful with stigmatised populations, such as PLWHA, especially when participants may feel uncomfortable about discussing sensitive topics. Researchers are also encouraged to consult professionals in behavioural change intervention design when developing PA interventions for PLWHA of low SES. Authorities may shed light on better methods, steps and frameworks to use based on the nature of the study. The use of multi-ethnic groups may undo the effects of the influences of culture on PA behaviour and thus, give a truer picture of the effect of more broad-based PA interventions.



Researchers are also recommended to adopt the process used in this study for intervention design. Figure 1 below illustrates steps that can be adopted towards the development of a PA intervention. These steps are recommended because systematic reviews have the advantages of synthesising multiple studies at the same time and enable higher and efficient access to evidence (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996; Green, 2005) that will inform the researcher about effective intervention content. Furthermore, the systematic review will assist the researcher to get the best possible evidence for answering some of their research questions (Gopalakrishnan & Ganeshkumar, 2013) and thus inform subsequent steps to follow.

A narrative review will then assist the researcher to understand and summarise different primary studies into an all-inclusive interpretation (Kirkevold, 1997). This is particularly so for comprehensive issues (Collins & Fauser, 2005) such as understanding multi-faceted issues pertaining to economic status, social support and PA.

After having conducted literature reviews, to understand the PA behaviour of the target population, it is best to conduct cross-sectional studies as they allow you to understand a cross-section of the target population (Sedgwick, 2014). Cross-sectional studies will also assist the researcher to estimate the prevalence of PA behaviour (Sedgwick, 2014) and relationships between PA and PA correlates among the target population.



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Before, developing the intervention, one can then conduct focus group discussions with participants who possess the same characteristics as the targeted population in the planned intervention. This method is favoured by researchers who seek to improve their intervention plans or program improvement (Leung, 2009). The focus group is useful for needs assessment and project evaluation (Leung, 2009). Thereafter, taking the key findings of all the previous research into consideration, one can then use a comprehensive framework to develop the intervention.

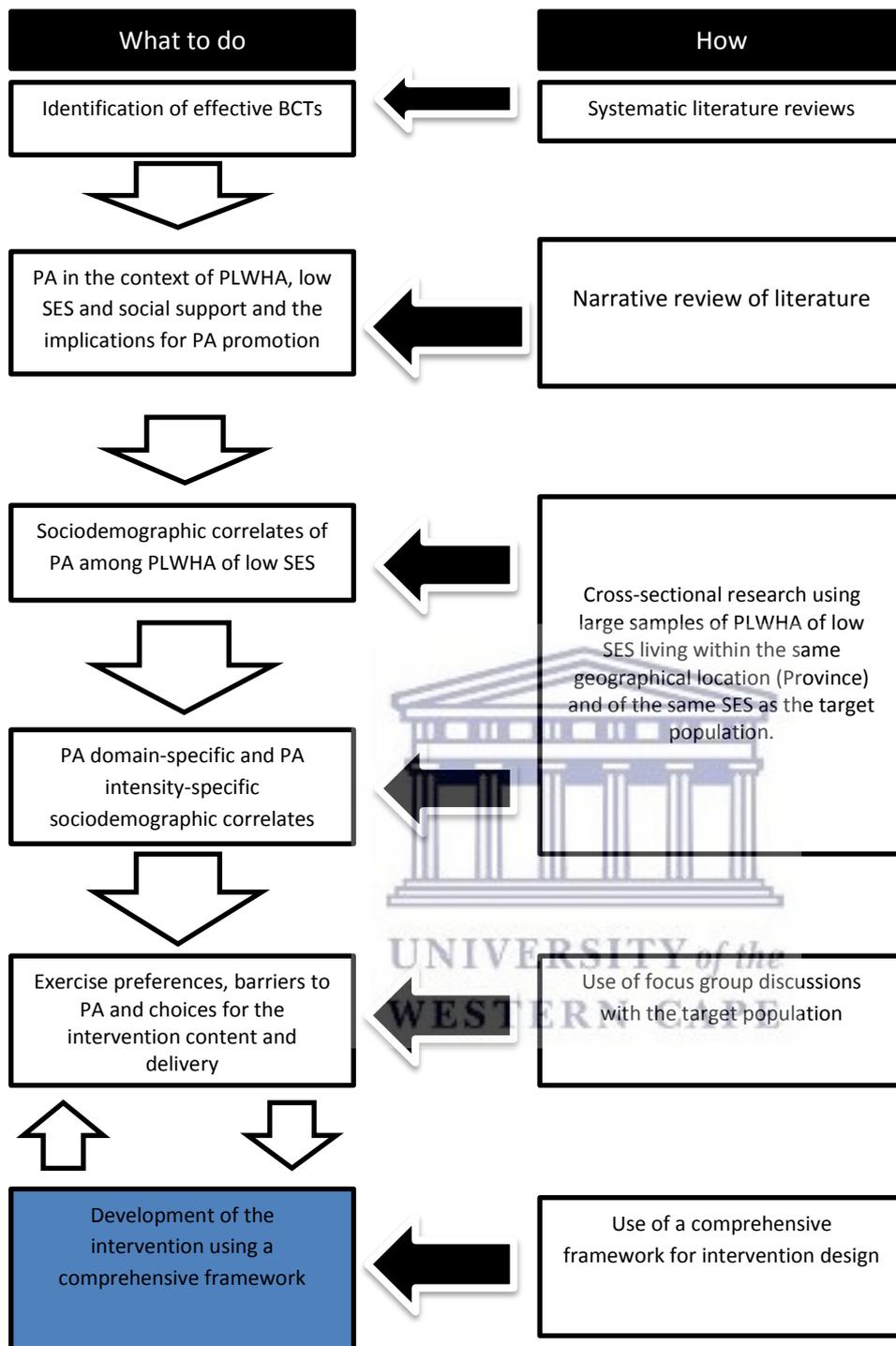


Figure 1. Suggested steps for intervention development

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## APPENDIX A: Information sheet



### UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

*Tel: +27 21-959-2350, Fax: 27 21-959-3688*

E-mail: 3200313@myuwc.ac.za

#### INFORMATION SHEET

**Project Title:** Physical activity behaviours of persons with HIV and AIDS in low-income populations: the design of a context sensitive randomised control trial.

#### **What is this study about?**

This is a research project being conducted by Smart Zivanai Mabweazara at the University of the Western Cape. We are inviting you to participate in this research project, because you are a person living with HIV in a low-income community. The purpose of this research project is to pilot a physical activity program that has been designed for people living with HIV/AIDS of low socioeconomic status.

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

You will be asked to fill in four self-report forms which measure (a) Global physical activity Questionnaire (b) perceived self-efficacy (c) perceived benefits and barriers of physical activity, and (d) social support from family and friends. You will fill in these forms, three times in Nyanga a private area, in the presence of the researcher who will assist if any misunderstanding arises. It will take you approximately forty minutes to complete the forms. Examples of questions you will answer are: (1) Do you play sport? For habitual physical activity; (2) I can manage to carry out my exercise intentions even when I have worries and problems. For self-efficacy; (3) Exercise decreases feelings of stress and tension for me- For the benefits and barriers of exercise; and (4) I get a lot of assistance from my friend when I am exercising- For social support. You may also be asked to participate in a physical intervention study that will last for 15 weeks. In this intervention study you may receive educational material on how to increase your physical activity, social support and self-efficacy levels or receive nothing at all.

#### **Would my participation in this study be kept confidential?**

We will keep your personal information confidential. To help protect your confidentiality, the researcher will ensure that only he and his supervisors have access to your personal information. All the data forms containing your personal information will be kept securely, in password-protected computer files. If we write a report or article about this research project, your identity will be protected to the maximum extent possible.

In accordance with legal requirements and/or professional standards, we will disclose to the appropriate individuals and/or authorities information that comes to our attention concerning child abuse or neglect or potential harm to you or others.

### **What are the risks of this research?**

As with any exercise activity the possibility exists that certain abnormal changes can occur during the tests. Every effort will be made to minimize these risks as well as potential injury by evaluating preliminary information carefully and constant monitoring during testing. Trained first aid personnel will be available at all times during testing who can deal with unusual situations should any situation arise. Emergency procedures of UWC will be followed should something happen, and you will be referred to the appropriate medical professional.

### **What are the benefits of this research?**

This research is not designed to help you personally, but the results may help the investigator learn more about the physical activity behaviours of low-income persons living with HIV . We hope that, in the future, other people might benefit from this study through utilizing recommendations that will be generated for the design of physical activity interventions meant for low-income persons living with HIV and improved understanding of the exercise behaviours of this population.

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

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

### **Is any assistance available if I am negatively affected by participating in this study?**

Counselling will be provided for any participants who are negatively affected by this study.

### **What if I have questions?**

This research is being conducted by Smart Zivanai Mabweazara at the University of the Western Cape. If you have any questions about the research study itself, please contact Smart Zivanai Mabweazara at: 19 Daffodil Crescent, Belhar, 7490 or email: [smabweazara@gmail.com](mailto:smabweazara@gmail.com).

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

**Departmental Chairperson: Prof A Travill**  
**University of the Western Cape**  
**Private Bag X17, Belville 7535**  
**Telephone: (021)959-3934**  
**Fax: (021)959-3688**  
**Email: [atravill@uwc.ac.za](mailto:atravill@uwc.ac.za)**

**Dean of the Faculty of Community and Health Sciences: Prof J Frantz**  
**University of the Western Cape**  
**Private Bag X17, Bellville 7535**  
**Telephone: (021)959-2746**  
**Fax: (021)959-2755**  
**Email: [jfrantz@uwc.ac.za](mailto:jfrantz@uwc.ac.za)**

This research has been approved by the University of the Western Cape's Senate Research Committee and Ethics Committee.



## APPENDIX B: Consent form



# UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa  
Tel: +27 21-959 2350, Fax: 27 21-959 3688  
E-mail: [3200313@myuwc.ac.za](mailto:3200313@myuwc.ac.za)

### CONSENT FORM

**Title of Research Project:** Physical activity behaviours of persons with HIV and AIDS in low-income populations: the design of a context sensitive randomised control trial.

The study has been described to me in language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way.

Participant's name.....  
Participant's signature.....  
Witness.....  
Date.....

Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact the study coordinator:

**Study Supervisor: Dr L. Leach**  
University of the Western Cape  
Private Bag X17, Belville 7535  
Telephone: (021)959-2653  
Fax: (021)959-3688  
Email: [lleach@uwc.ac.za](mailto:lleach@uwc.ac.za)

**Departmental Chairperson: Prof A Travill**  
University of the Western Cape  
Private Bag X17, Belville 7535  
Telephone: (021)959-3934

## APPENDIX C: Global Physical Activity Questionnaire

Physical Activity		
<p>Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do not consider yourself to be a physically active person.</p> <p>Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment. <i>[Insert other examples if needed]</i>. In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart</p>		
Questions	Response	Code
Activity at work		
1	<p>Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like <i>[carrying or lifting heavy loads, digging or construction work]</i> for at least 10 minutes continuously?  <i>[INSERT EXAMPLES] (USE SHOWCARD)</i></p> <p>Yes 1            No 2 <i>If No, go to P 4</i></p>	P1
2	<p>In a typical week, on how many days do you do vigorous- intensity activities as part of your work?</p> <p>Number of days <input type="text"/></p>	P2
3	<p>How much time do you spend doing vigorous-intensity activities at work on a typical day?</p> <p>Hours : minutes <input type="text"/> : <input type="text"/>            hrs mins</p>	P3 (a-b)
4	<p>Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking <i>[or carrying light loads]</i> for at least 10 minutes continuously?</p> <p>Yes 1            No 2 <i>If No, go to P 7</i></p>	P4
5	<p>In a typical week, on how many days do you do moderate- intensity activities as part of your work?</p> <p>Number of days <input type="text"/></p>	P5
6	<p>How much time do you spend doing moderate-intensity activities at work on a typical day?</p> <p>Hours : minutes <input type="text"/> : <input type="text"/>            hrs mins</p>	P6 (a-b)
Travel to and from places		
<p>The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship. <i>[insert other examples if needed]</i></p>		
7	<p>Do you walk or use a bicycle (<i>pedal cycle</i>) for at least 10 minutes continuously to get to and from places?</p> <p>Yes 1            No 2 <i>If No, go to P 10</i></p>	P7

8	In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	Number of days <input type="text"/>	P8
9	How much time do you spend walking or bicycling for travel on a typical day?	Hours : minutes <input type="text"/> : <input type="text"/> hrs mins	P9 (a-b)
<b>Recreational activities</b>			
The next questions exclude the work and transport activities that you have already mentioned. Now I would like to ask you about sports, fitness and recreational activities (leisure), [insert relevant terms].			
10	Do you do any vigorous-intensity sports, fitness or recreational ( <i>leisure</i> ) activities that cause large increases in breathing or heart rate like [running or football,] for at least 10 minutes continuously? [INSERT EXAMPLES] (USE SHOWCARD)	Yes 1  No 2 If No, go to P 13	P10
11	In a typical week, on how many days do you do vigorous- intensity sports, fitness or recreational ( <i>leisure</i> ) activities?	Number of days <input type="text"/>	P11
12	How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Hours : minutes <input type="text"/> : <input type="text"/> hrs mins	P12 (a-b)
<b>Physical Activity (recreational activities) contd.</b>			
<b>Questions</b>		<b>Response</b>	<b>Code</b>
13	Do you do any moderate-intensity sports, fitness or recreational ( <i>leisure</i> ) activities that causes a small increase in breathing or heart rate such as brisk walking, (cycling, swimming, volleyball)for at least 10 minutes continuously? [INSERT EXAMPLES] (USE SHOWCARD)	Yes 1  No 2 If No, go to P16	P13
14	In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational ( <i>leisure</i> ) activities?	Number of days <input type="text"/>	P14
15	How much time do you spend doing moderate-intensity sports, fitness or recreational ( <i>leisure</i> ) activities on a typical day?	Hours : minutes <input type="text"/> : <input type="text"/> hrs mins	P15 (a-b)
<b>Sedentary behaviour</b>			

The following question is about sitting or reclining at work, at home, getting to and from places, or with friends including time spent [sitting at a desk, sitting with friends, travelling in car, bus, train, reading, playing cards or watching television], but do not include time spent sleeping. *[INSERT EXAMPLES] (USE SHOWCARD)*

16	How much time do you usually spend sitting or reclining on a typical day?	<p style="text-align: center;">Hours : minutes      <input type="text"/> : <input type="text"/></p> <p style="text-align: center;">                                 hrs                                    min s</p>	P16 (a-b)
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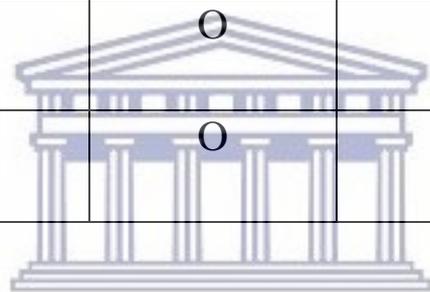


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## APPENDIX D: Physical Exercise Self-Efficacy Scale

For each statement below, please fill in the bubble below the appropriate response. Please make sure that you answer EVERY ITEM and that you mark ONLY ONE bubble per statement. This is a measure of your personal belief, thus there are no right or wrong answers.

	Very uncertain	rather uncertain	rather certain	Very certain
I can manage to carry out my exercise intentions even when I have worries and problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can manage to carry out my exercise intentions even if I feel depressed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can manage to carry out my exercise intentions even when I feel tense.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can manage to carry out my exercise intentions even when I'm tired.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can manage to carry out my exercise intentions even when I am busy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



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## APPENDIX E: Personal information form

**Participant's Code:**

**Title of study:** Physical activity behaviours of persons with HIV and AIDS in low-income populations: the design of a context sensitive randomised control trial.

**Name :**

.....

**Surname:**

.....

**Date of Birth:**

.....

**Gender:** *(Please tick where appropriate)*

Male       Female

**Ethnicity:** *(Please tick where appropriate)*

Xhosa       Zulu       Coloured     

Other (Specify).....

**Physical address:**

.....  
.....  
.....

**Postal address:**

.....  
.....  
.....

**Home telephone number:**

.....

**Work telephone number:**

.....

**Cell phone number:**

.....

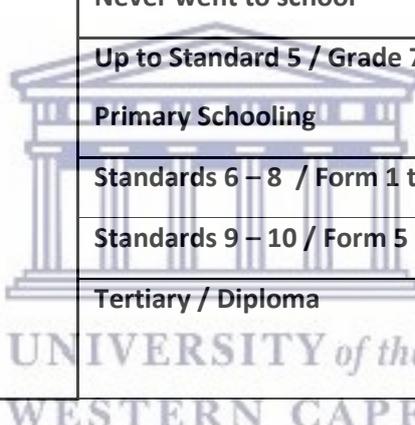
## APPENDIX F: General, demographic and socioeconomic information questionnaire

### GENERAL AND DEMOGRAPHIC INFORMATION (ADAPTED FROM THE METABOLIC COMPLICATIONS OF HIGHLY ACTIVE ANTIRETROVIRAL THERAPY (MCHAART) QUESTIONNAIRE

We would like to ask you more personal questions. Everything you say will be strictly confidential.

**Instructions**

Please tick where appropriate, for example if you never went to school, tick in the box next to 1.

In order to maintain your confidentiality of your data, please write your identification code in the space provided as Participant Code.		<b>Participant Code</b>
<b>1A</b> What is the highest level of education that you have achieved?		
	Never went to school	1
	Up to Standard 5 / Grade 7	
	Primary Schooling	2
	Standards 6 – 8 / Form 1 to 4	3
	Standards 9 – 10 / Form 5 to 6	4
	Tertiary / Diploma	5
		
<b>1B</b> Are you ...	Employed / Self-employed	1
	Unemployed	2
	A full-time homemaker	3
	A pensioner	4
	On a disability grant	5
<b>1C</b> What type of housing do you live in?	Built formal unit: privately owned	1
	Council / core house	2
	Informal shack / shelter	3

**GENERAL AND DEMOGRAPHIC INFORMATION (ADAPTED FROM THE METABOLIC COMPLICATIONS OF HIGHLY ACTIVE ANTIRETROVIRAL THERAPY (MCHAART) QUESTIONNAIRE**

We would like to ask you more personal questions. Everything you say will be strictly confidential.

**Instructions**

Please tick where appropriate, for example if you never went to school, tick in the box next to 1.

	Hostel	4	
	Other: .....	5	
<b>1D How many rooms does your house have? (don't include bathroom &amp; kitchen, if separate)</b>			
<b>1E How many people are living with you in your house?</b>			
	Does your household have	YES	NO
<b>1F</b>	Electricity?	1	2
<b>1G</b>	A radio?	1	2
<b>1H</b>	A television	1	2
<b>1I</b>	A telephone	1	2
<b>1J</b>	A refrigerator?	1	2
<b>1K</b>	A personal computer (PC)?	1	2
<b>1L</b>	A washing machine?	1	2

**Marital status**

**1M** Single .... Married .... (Please tick appropriate)

**1N** Number of children living in the household (*if any*): .....

**Medication**

**1O** Previous medical conditions (*if any*): .....

**1P** Are you on Antiretroviral Therapy? **Yes**..... **No**..... (Please tick appropriate)

**1Q** Are you receiving any pharmacological (other than antiretroviral therapy) and/or psychological care: **Yes**..... **No**.....

If yes, briefly explain the care pharmacological (other than HAART) and/or psychological care being received .....

**1R** What is your present CD4 count?

.....

**Weight** .....

**Height** .....

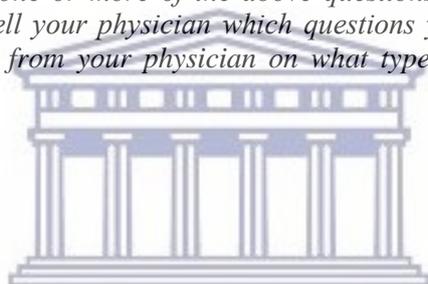


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## APPENDIX G: Physical Activity Readiness Questionnaire (PAR-Q)

	Questions	Yes	No
1	Has your doctor ever said that you have a heart condition and that you should only perform physical activity recommended by a doctor?		
2	Do you feel pain in your chest when you perform physical activity?		
3	In the past month, have you had chest pain when you were not performing any physical activity?		
4	Do you lose your balance because of dizziness or do you ever lose consciousness?		
5	Do you have a bone or joint problem that could be made worse by a change in your physical activity?		
6	Is your doctor currently prescribing any medication for your blood pressure or for a heart condition?		
7	Do you know of <u>any</u> other reason why you should not engage in physical activity?		

*If you have answered "Yes" to one or more of the above questions, consult your physician before engaging in physical activity. Tell your physician which questions you answered "Yes" to. After a medical evaluation, seek advice from your physician on what type of activity is suitable for your current condition.*



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**APPENDIX H: Stages of readiness to change questionnaire**  
(Tick the appropriate box)

**STAGE**

1. **PRECONTEMPLATIVE:** At the present time, I AM NOT INTERESTED in making a change in my health-related behaviour

2. **CONTEMPLATIVE:** At the present time, I AM THINKING ABOUT making a change in my health-related behaviour

3. **PREPARATORY:** At the present time, I AM DOING SOME PHYSICAL ACTIVITY, but not meeting the recommended criteria for health-related benefits, i.e.,

HEALTH-RELATED CRITERIA FOR PHYSICAL ACTIVITY		
<b>Intensity</b>	Moderate-to-intense physical activity	Vigorous physical activity
<b>Duration</b>	30 min per session	≥ 20 min per session
<b>Frequency</b>	≥ 4 days per week	3-5 days per week

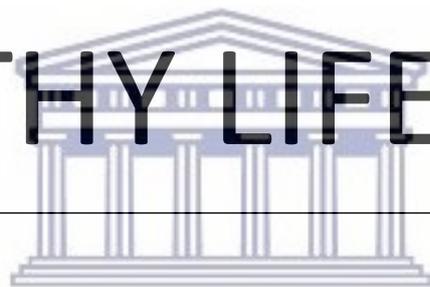
2. **ACTIVE:** At the present time, I AM DOING REGULAR PHYSICAL ACTIVITY, and meet the above-referenced (preparation) criteria on a consistent basis, but I HAVE NOT MAINTAINED the behaviour for 6 months.

3. **MAINTENANCE:** At the present time, I AM DOING REGULAR PHYSICAL ACTIVITY FOR 6 MONTHS OR MORE, AND MEETING the recommended criteria for health-related benefits.

4. **RELAPSE:** At the present, I have not MAINTAINED REGULAR PHYSICAL ACTIVITY FOR 6 MONTHS.



# HEALTHY EATING AND HEALTHY LIFESTYLE

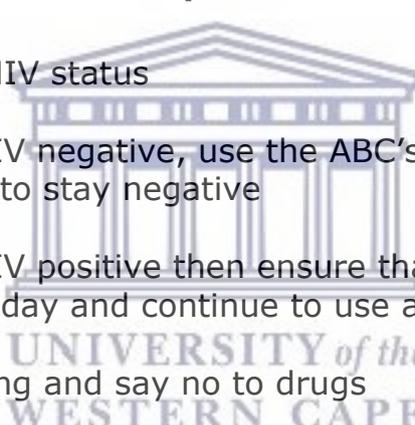


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## Introduction

People living with HIV should aim to eat a balanced and healthy diet, one without too much fat, sugar or salt. For some people, eating well is a pleasure, and learning how to cook and prepare food in a healthy manner can be fun. If you are underweight – perhaps because HIV was already making you ill by the time you were diagnosed – or overweight, or if you have any particular dietary problems or side-effects that make it hard to eat well, then you might benefit from talking to a healthcare professional about your diet. This pamphlet will teach you about keeping healthy and the type of foods that make up a healthy diet.

## Keep HEALTHY!

- 
- The logo of the University of the Western Cape is a faint watermark in the background. It features a classical building with a pediment and columns, with the text 'UNIVERSITY of the WESTERN CAPE' below it.
- Know your HIV status
  - If you are HIV negative, use the ABC's (Abstain, Be faithful, Condomise) to stay negative
  - If you are HIV positive then ensure that you are taking your ARV's every day and continue to use a condom
  - Avoid smoking and say no to drugs
  - Avoid alcohol – alcohol is processed in your liver as a toxin/poison. This process leads to the ARV's passing through your system as if you had not taken them at all
  - All foods should be cooked thoroughly e.g. chicken should NOT be pink at all. If food is not properly cooked then this can lead to food poisoning and severe diarrhoea and vomiting
  - Make sure that you wash your hands with warm water and soap every time after you use the toilet, cough, or sneeze as well as before and after preparing food
  - Go to the clinic/doctor when you are sick. Take the medication that is prescribed to you for the full duration. Depending on what type of illness you are being treated for,

the medication can often help to stop spreading the disease  
e.g. chicken pox or TB

- If you have sudden unexplained weight loss or have been coughing for 2 weeks or more, feel tired all the time and have been around someone who has TB then you **MUST** get tested for TB at your clinic
- Being overweight or underweight can cause significant problems to your health. Keep a healthy body weight for your height by eating well and keeping active

Developed by Theresa O’Gorman Registered Dietician (DT0041963) – Etafeni (July 2016)

## WHY IS IT IMPORTANT TO EAT HEALTHY FOODS?

Good nutrition is important in developing your mind, body and immune system from birth. As an adult we are faced with many food options in our day to day routines. It can sometimes be overwhelming to know what food choices are better for us. Let’s look at the different types of foods and what choices we should be making and why...

### 1. Enjoy a **VARIETY** of foods

Fat, protein, starch and many different vitamins and minerals all come from different types of foods. Eating many different types of foods can ensure that you are getting all the nutrition that your body needs to keep healthy. It is also important to eat 4-5 small meals throughout the day and not just 1 or 2 big meals.

### 2. **Be active!**

It keeps your heart, lungs and muscles strong and working at their best. Actively doing housekeeping chores, playing with children or grandchildren, getting off the taxi at an earlier taxi stop, going for a walk where it is safe, taking the stairs instead of the elevator are all ideas on how to keep active in our daily lives.



### 3. **Make starchy foods part of most meals**

Starchy foods include bread, maizemeal, pasta, samp, potatoes and rice. These foods are needed by your body



for energy. It is important to make sure that you are eating the right amount of starchy foods at each meal. 2 slices of bread, a cup of rice or a starchy portion that is the size of your fist is enough for each meal.

#### 4. Eat plenty of vegetables and fruit every day

Vegetables and fruit are where we get most of our vitamins, minerals and fibre from. These foods are especially important for our immune systems and should be eaten every day. For example, in winter our citrus fruits are in season. These include oranges and naartjies. These foods have a lot of vitamin C to help prevent and fight infections, especially during the "flu season". Vitamin A is another important vitamin found mainly in orange coloured veg and fruit e.g. orange flesh sweet potato, butternut, carrots, and apricots.

Each of the different colours of fruit and vegetables shows a different type of nutrient that can be used by the body (See the vegetable and fruit sheet attached)



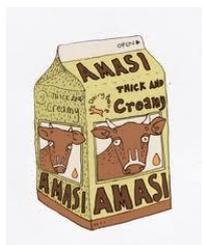
Do you have space for a home garden??????

#### 5. Eat dry beans, split preferred exercise activities, lentils and soya regularly

These foods are very high in proteins which build muscles. They also have a lot of fibre in them that help to keep your stomach healthy and immune system strong

#### 6. Have milk, maas or yoghurt every day

These foods are dairy products. They are high in proteins, vitamins and minerals especially calcium. Calcium is needed for building strong bones and prevents against osteoarthritis (swollen painful joints) later in life. Be careful of coffee creamers – they are not dairy and they contain mainly fats which are not healthy for you



#### 7. Fish, chicken, lean meats or eggs and be eaten

daily

These foods are very high in protein and B vitamins which are important for health and energy levels.



Foods like fish also have good fats in them which help to protect against heart disease

**8. Drink lots of clean safe water**

Your body needs about 6-8 glasses of water a day. Other drinks such as tea and coffee can be high in caffeine which makes you pass urine frequently, therefore you lose that fluid quickly. Fruit juices are an alternative but they must be mixed half-and-half with water as they contain a lot of fruit sugar.

**9. Use fats sparingly. Choose vegetable oils rather than hard fats.**

Hard fats such as lard are very high in cholesterol which can lead to heart disease. Remove the skin from chicken before cooking as this is also very high in fat.

**10. Use sugar and food and drinks containing sugar sparingly**

Your daily intake of sugar should not exceed 4 teaspoons (tsp) of sugar per day. This means that you should not be adding more than 1 tsp of sugar to each cup of tea or coffee. Read the labels of your foods: 5g of sugar = 1tsp. Extra sugar that we eat turns is stored as fat in the body.



**11. Use salt and foods high in salt sparingly**

High salt intake can lead to heart disease. Heart disease is the second highest cause of death in South Africa. Foods high in salt are: stock cubes, soup packets, MSG flavourings, salted snacks e.g. peanuts, chips and biltong. If you add any of these foods to your cooking then try not to add salt as well. If you add salt to the food while cooking then remember to only add it once, so don't add more when you are eating the food.



## APPENDIX J: Physical activity diary



**MY PHYSICAL ACTIVITY DIARY**  
**INCWADI YAMI YOKUZILOLONGA**



## APPENDIX K: Physical activity manual



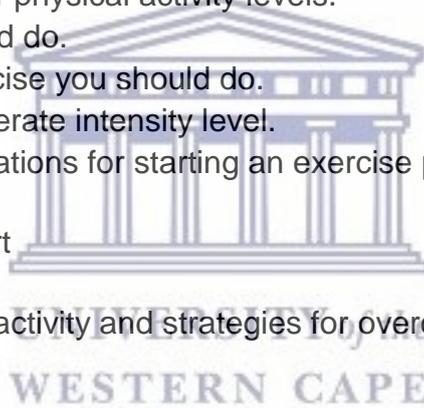
# PHYSICAL ACTIVITY MANUAL

## OVERVIEW OF THE CONTEXT SENSITIVE INTERVENTION TO PROMOTE PHYSICAL ACTIVITY PARTICIPATION PROGRAMME AMONG PEOPLE WITH HIV OF LOW SOCIOECONOMIC STATUS

The CONTEXT SENSITIVE INTERVENTION TO PROMOTE PHYSICAL ACTIVITY PARTICIPATION is a 6-week programme that seeks to increase your engagement in physical activity. The programme focuses on increasing your physical activity to more than 150 minutes a week with a combination of resistance and aerobic exercises.

First, you will attend a workshop where you will learn how to do the exercises and strategies to engage in physical activity. The schedule of the workshop will be as follows:

- Understanding physical activity.
- Health benefits of physical activity to persons living with HIV/AIDS.
- How to improve your physical activity levels.
- Exercises you should do.
- The amount of exercise you should do.
- Exercising at a moderate intensity level.
- Behavioral considerations for starting an exercise program.
  - Self-efficacy
  - Social support
  - Goal setting
- Barriers to physical activity and strategies for overcoming them.



At the end of 6 weeks, the goal is to maintain the 150 minutes a week. As a "seasoned" participant, you should continue your strength and walking exercises. The interventionist will continue to give you support and supply you with any informational resources you may require. This booklet will assist you to get active and offer examples of home-based. During the workshop you will be taught how to do the exercises on your own at home.

## **Introduction**

### **Welcome to the CONTEXT SENSITIVE INTERVENTION TO PROMOTE PHYSICAL ACTIVITY PARTICIPATION AMONG PEOPLE WITH HIV OF LOW SOCIOECONOMIC STATUS.**

I want to welcome you to the physical activity programme, which is intended to help you all become healthier and more physically active people. The programme is informed by research in physical activity and behaviour change. It will empower you with the information that you need in order to learn about incorporating exercise into your lifestyle and becoming more physically active. It will help you develop an active lifestyle and teach you to maintain your new activity levels. Your presence here is an important first step to leading a healthier lifestyle by becoming more physically active.

We are going to cover several topics that strongly influence your habits and your activity levels. In general, the program seeks to prepare you with the tools, practice, encouragement, and information you need in order to build your confidence about being more active for the rest of your life.

I would also like to hint on the importance of the dynamics of this group and group participation. We all come from unique backgrounds and have many different experiences to share. That means we each bring something special to the group, which we can use to increase physical activity in our daily lives. How our group interacts will influence the success of this programme. Positive group participation is a key component, as we help each other become and stay active.

Together, we will share our successes and our challenges. We will learn problem-solving skills to address our concerns and meet our goals. As a group, we will make this fun and successful for everyone. Let the process of becoming more active begin.

## **BASICS OF THE PHYSICAL ACTIVITY PROGRAMME**

I will start by describing the basics of the program. Our main goal is to build up to 150 minutes of exercise every week. That may sound huge right now, but if you think about it, when you get to that goal, it is less than 30 minutes a day. Please bear in mind that you won't be doing the same exercise over and over again.

### **Walking**

Walking will be your main source of aerobic exercise. We want you to walk regularly, by yourself, with a partner, or in a group. We strongly encourage you to set up a small walking group. It's easier to stay motivated when you're accountable to someone else, and I hope you'll enjoy the social aspects of these walks too. When you exercise, make sure it is "dedicated" exercise. Over time you will learn to dedicate time specifically for exercise, and I will teach you how to do this. During the

first 6 weeks of the programme, we will work up to a goal of 150 minutes of total exercise each week. That is, the time spent in doing strength exercises plus walking time will build up until you reach 150 minutes of exercise each week. You will have a physical activity diary that you will use to record the time you spent walking and doing strength exercises.

### **Home-Based Strength Training**

The second important part of the program is strength training. The program will also teach you to do simple strength training which you can do on your own at home. We will work towards a goal of you engaging in strength training at least once a week.

Today we will include behaviour coaching sessions. The behaviour coaching sessions are designed to help you develop the knowledge and skills to make long-lasting changes in your physical activity levels to improve your health and wellness. We'll talk about things like recognising and overcoming barriers to physical activity, strengthening your self-efficacy, and building a strong support network.

### **Physical activity diary**

Each one of you will keep a physical activity diary of your exercises – i.e., the time you spend doing the exercises, including walking. These diaries will help you track your progress and meet your individual physical activity goals. We will also discuss your goals and activities, so we strongly recommend that each one of you keep a diary. Copies of physical activity diaries will be included in today's session materials. The easiest way to use the diary is to enter your times immediately after each exercise session at home and when you have walked. These tracking sheets, are a very easy way for you to help keep track of and celebrate your progress.

### **WHAT IS PHYSICAL ACTIVITY?**

Physical activity is defined as any movement of the body that uses energy. Physical activity is one of the most basic human functions. It is an important foundation of health throughout life. There are many different forms, kinds and levels of intensity of physical activity. These include fundamental movement skills, active play, leisure activities, such as walking, dancing, hiking and biking, sports and structured exercise. Physical activity can take place in a range of domains and settings, such as in “green” or “blue” spaces (water landscapes), at school, in the workplace, during transport from place to place, at home or as part of the activities of daily living, such as gardening or household chores. Different forms of physical activity may be more or less relevant to certain social groups or genders and at different stages of life.

## **COMMON PHYSICAL ACTIVITIES**

- Walking the dog or taking the stairs.
- Active Recreation such as swimming or hiking.
- Active transportation such as cycling or walking.
- Active Play such as playing in the park.

## **HEALTH BENEFITS OF PHYSICAL ACTIVITY**

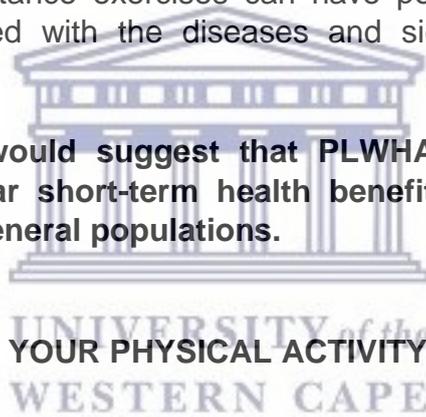
Being physically active improves physical and mental well-being. Physical activity helps reduce chronic diseases and other risk factors such as high blood pressure, and is important in the management of a range of health conditions, including managing HIV and AIDS. Physical activity increases mobility, independence and quality of life in older adults and provides protection from injuries due to falls. It enhances healthy growth and development in children. Overall, physical activity is fun and provides opportunities for creative expression.

## **HEALTH BENEFITS OF PHYSICAL ACTIVITY FOR PEOPLE LIVING WITH HIV/AIDS**

Since the discovery of antiretroviral therapy we have begun to observe people living with HIV/AIDS well into their adult lives for multiple decades. Because of the toxic side effects of antiretroviral therapy (ART) medications and the long-term consequences of viral infection, people living with HIV/AIDS have begun to show increased rates of metabolic abnormalities, including lipodystrophy, increased circulating blood lipids, and increased fat accumulation in the abdominal region. It has been shown that the primary cause of death among people living with HIV/AIDS are chronic diseases generally associated with aging such as cardiovascular disease and kidney failure, among others. Potential contributors of this increased risk of chronic disease, most of which are metabolic in nature are environmental factors predisposing people living with HIV and AIDS to high visceral fat mass and obesity, since HIV and AIDS is mainly found amongst persons of lower socioeconomic classes in Africa. Other factors include poor diet, inactive/ sedentary lifestyle, chronic stress, and negative lifestyle choices. Other factors include the low cost of energy-dense food with large amounts of sugars and fats. As a result, many patients are beginning ART treatment with a higher body mass index and fat mass. Fortunately, physical activity and exercise are both safe and effective in improving cardiorespiratory fitness, metabolic profile, and quality of life among people living with HIV and AIDS and thus counteracting the effects of high visceral fat mass and obesity. The following health benefits of physical activity for people living with HIV/AIDS have been reported.

- Studies have consistently shown physiological improvements across clinical measurements of health such as body mass index (BMI), waist circumference, blood lipids, muscular strength, and cardiorespiratory fitness among others.
- Findings have also indicated significant decreases in total abdominal adipose tissue, total cholesterol, and circulating triglycerides.
- Similar results have been reported by other researchers who have found significant increases in cardiorespiratory fitness, oxygen pulse, and maximum tidal volume.
- In addition, aerobic exercise has demonstrated decreases in BMI, waist-to-hip ratio, and body fat among people with HIV/AIDS.
- Exercise has also caused reductions in depressive symptoms and/ or significant improvements in quality of life.
- Physical activity also significantly reduces anxiety and depression in people with HIV/AIDS.
- There is potentially an added benefit to maintaining a stable CD4+ cell count when engaging in routine moderate-intensity while taking ART.
- For those with conditions such as HIV, cancer, and type 2 diabetes, aerobic combined with resistance exercises can have positive effects in alleviating symptoms associated with the diseases and side effects of the medical interventions.

**In summary, evidence would suggest that PLWHA, regardless of disease status, can obtain similar short-term health benefits from routine physical activity reported within general populations.**



## **HOW CAN YOU IMPROVE YOUR PHYSICAL ACTIVITY LEVELS?**

### **AT HOME**

- Choose activities that you enjoy and can do regularly.
- Fit exercises into a daily routine such taking a brisk walk to the shop, train station or bus stop.
- Push the baby in a stroller.
- Involve your family-enjoy an afternoon walk with your kids.
- Clean the house.
- Walk or cycle more, and drive or use public transport less.
- Do stretches or exercise while watching television.
- Mow the lawn with a push mower.
- Plant and care for a vegetable garden.
- Play with the kids or dance to favourite music.
- Exercise to a workout video.

## AT WORK

- Get off the bus or train one stop early and walk to work.
- Replace a coffee or cigarette smoking break with a brisk 10-minute walk. Ask a friend to go with you.
- Join your work's soccer or netball team.

## AT PLAY/FREE TIME

- Walk, jog or cycle.
- Play basketball, netball or soccer.
- Try different activities until you find the ones that feel right for you.
- Reduce the time you spend watching television or sitting and engage in activities that make you move.
- Do at least 10 minutes of exercise at a time.
- Join a team-take part in sports and recreation activities in groups and make new friends.

## WHAT EXERCISES SHOULD I DO?

Aerobic and resistance exercise provide important health benefits for individuals with HIV/AIDS.

### Aerobic exercise



Aerobic exercise

Aerobic exercise uses oxygen to burn fat in your body. This is why people who are trying to lose weight often do a lot of aerobic exercise. It is also called cardiovascular exercise, because it raises your heart rate and makes your heart stronger. Besides burning fat, it can increase your endurance so that you do not get tired as quickly when you are active. Aerobic exercises can also lower cholesterol, triglycerides, and blood sugars.

Aerobic activity is often described in terms of its intensity, or how much effort it takes to do something. During moderate intensity activity, your breathing and heart rate become a bit higher and you will likely be a bit sweaty at the end. Another way to think of moderate intensity activity is any activity during which you can talk but not sing. During vigorous intensity activity, a person cannot say more than a few words without pausing for a breath, since vigorous effort causes your heart rate and breathing to increase substantially.

Examples of moderate aerobic activity include:

- Brisk walking (greater than four kilometres per hour, but not race walking)
- General gardening (e.g., weeding, raking leaves)
- Biking (less than ten miles per hour)
- Water aerobics

### **Resistance training**



Resistance training (Wall push-ups)

Muscle-strengthening activities, also called weight-bearing exercise or resistance training, involve moving or resisting the movement of weight with your muscles. For most people, it is normal to have mildly sore or tired muscles after weight or resistance training. This occurs because these activities actually cause very small muscle tears that take two or three days to heal. When the muscles heal, they heal stronger. Therefore it is important for you to wait two to three days after having exercised a part of the body before strengthening it again. This is usually the amount of time it takes for any soreness to go away.

For health benefits, adults must do muscle-strengthening activities at least two days a week at moderate to high levels of intensity. These activities should work all the major muscle groups, including the arms, legs, chest, back, and abdomen.

There are several types of muscle-strengthening activities:

- Exercises that use body weight as resistance (push-ups, sit-ups, deep-knee bends)
- Working with resistance bands
- Lifting weights

Muscle-strengthening exercise can be especially helpful for women living with HIV because it can help prevent both muscle and bone loss. If you have had muscle loss, weight-bearing exercise is probably good for you. However, if you have osteoporosis (bone disease), weight-bearing exercise could be dangerous. It is important to ask your health care provider if weight-bearing exercise is good for you.

### **HOW DO I KNOW THAT I AM DOING ENOUGH EXERCISE?**

Exercise recommendations have been drafted for individuals with HIV/AIDS. These are as follows:

#### **Frequency**

##### **Aerobic exercise**

- Exercise 3 to 5 days per week.

##### **Resistance exercise**

- Exercise 2 to 3 days per week.

#### **Intensity**

##### **Aerobic exercise**

- 40% - 60% of your maximum rate of oxygen consumption

##### **Resistance exercise**

- 8-10 repetitions at approximately 60% of the most weight you can lift once for an exercise.

#### **Duration**

##### **Aerobic exercise**

- Begin with 10 minutes and progress to 30-60 minutes per day.

##### **Resistance exercise**

- Approximately 30 minutes to complete 2-3 sets of 10-12 exercises that target major muscle groups.

### **HOW DO I KNOW THAT I AM EXERCISING AT A MODERATE INTENSITY LEVEL?**

You should do moderate-intensity exercise. Moderate-intensity exercise will make you breathe harder and your heart beat faster. You should be able to talk, but not sing. Examples of moderate activity include walking quickly and riding a bike.

## **WHAT DO I NEED TO CONSIDER WHEN STARTING MY EXERCISE PROGRAM?**

### **EXERCISE SELF-EFFICACY**

Exercise self-efficacy is your belief about your capabilities to be successful in exercise-related activities. The following strategies will help you to increase your exercise self-efficacy.

- Use your positive past experience in exercise to motivate you to successfully engage in, and complete exercise. Remember, “if you have done it once, you can do it again”.
- Develop realistic short-term goals and post them where you can look at them, both in the morning and at night. Your goals should be “SMART”, (i.e.) goals should be specific, measurable, attainable, realistic, and time oriented.
- Begin with exercises that currently match your current level of fitness and slowly progress to more complex and highly intense exercises as your fitness level increases.
- Use an exercise diary to capture each workout so that one day you may look back and see the progress that you have made since the start of the exercise programme.
- If you have a family member or friend who exercises regularly use them as a model to motivate you. Remember, “if he can do it, I can do it too”.
- When you are feeling low or demotivated, mentally re-create successful past experiences. For example, imagine a successful set of a particular exercise or an effective workout. Imagine how healthy you will be, how you will look and feel once you become fit.
- Use affirmation statements such as “I can do this!” and “I’ve done it before and I can do it again” to help you stay focused as you exercise.
- If you feel highly anxious about exercising, use positive self-talk to reduce anxiety.

### **SOCIAL SUPPORT**

Social support refers to the people or personal networks that you will use regularly to help you exercise. Some strategies that can help you to access social support and strengthen your social support network include:

- Having serious discussions with significant individuals (such as your spouse or boss) to make them aware of the importance of exercise in your life and to express the importance of social support.
- Join an exercise group such as a group for walking to work or enlist a friend as an exercise partner. This can provide you with the social support you need to adhere to exercise.
- Use community programs or sport leagues to find support (e.g.) joining a walking club or a local social soccer club.
- Let your family and friends know your thoughts and feelings. Be clear with them about how and when they should provide support. They need to hear from you that you really want to achieve your goals, you're committed to success, and you want them behind you.
- Choose good partners. And more than one! One person may not be able to provide all the support you need, so reach out to more than one person. You could choose someone who is making the same changes you are and support each other. Or maybe choose someone who is healthy and whom you look up to for their active lifestyle. Most important, choose someone who is a good listener, who can support you and encourage you when you're down.
- Ask for the specific help you need and develop a plan together. Never expect others to know how to provide the support you need. Not being specific about your needs is one of the most common roadblocks to obtaining helpful social support.

You should be able to answer the following question;

### **What kind of support do you need?**

#### **Someone to listen to you**

It's important to be able to share your thoughts and feelings with others. It's also important to have someone who can be open and honest with you. Find one or two people with whom you can share both positive and negative aspects of your life. Find someone who is willing to listen rather than always trying to give you advice. Who will listen to you and avoid being judgmental when you're struggling or get off track?

#### **Someone to participate with you**

It's often easier and more enjoyable to make lifestyle changes when others participate with you. Will it help if a family member or friend makes some changes with you? Try to find others with similar interests and needs as you (e.g., an exercise or lunch partner who is committed to making healthy changes).

#### **Someone to encourage you**



It's easier to make changes when others are encouraging and supporting you. Having someone to encourage you can be helpful when you slip up or don't reach your goals as quickly as you would like. Who can provide the encouragement you need when you get discouraged? It's important to feel that others are proud of your successes. Who will be excited about your success?

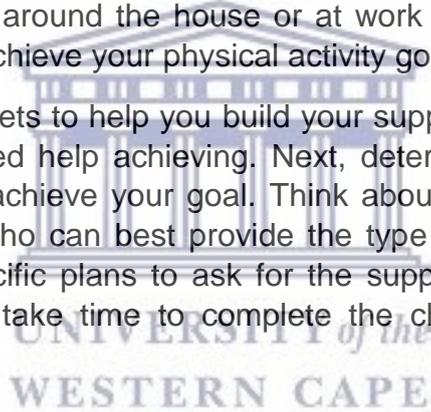
**Someone to provide knowledge**

To achieve your goals, you may need to build some relationships with people who have knowledge and experience in the areas in which you're trying to make changes. Who can help provide the knowledge and skills you need for success? Talking with someone who has already been successful with weight management or lifestyle change can often be helpful. So can turning to your session coaches, who are always happy to help.

**Someone to assist you**

Successful change may require you to reorganize the ways you spend your time. You may also find that you need others to help you get things done. What help do you need to free up time to exercise, attend a group meeting, or cook a healthy meal? Who can help you around the house or at work so you can make time for things you need to do to achieve your physical activity goals?

Use the following worksheets to help you build your support team. Start by thinking about what goals you need help achieving. Next, determine the specific types of support you will need to achieve your goal. Think about specific family members, friends, and co-workers who can best provide the type of support you need. The final step is to make specific plans to ask for the support you need. If you don't finish the chart in class, take time to complete the chart at home. It will be a valuable tool for you.



What do I need help with?	What type of support do I want?	Who can help me?	How can they help?	How will I ask for help?
		Name:  Phone:		

		Name:		
		Phone:		

## WHAT ARE THE POSSIBLE BARRIERS TO PHYSICAL ACTIVITY AND HOW DO I OVERCOME THEM?

A **Barrier** is something that keeps you from participating in regular physical activity or following through on an exercise plan. Barriers may include things such as the environment (such as very cold weather), feelings and thoughts, or daily interruptions such as the telephone, a TV show, a crime infested community park, an unexpected guest, or even a change in our health. But barriers are not always negative occurrences or things we need to eliminate from our daily lives. For instance, some people have caregiving responsibilities that challenge their ability to engage in regular physical activity. Barriers may often trigger a lapse in physical activity, making it difficult to be successful.

There are two different types of barriers: external barriers and internal barriers. External barriers result from things in your environment or from your relationships with other people. Some examples are things such as a busy schedule or other activities, caregiving obligations or visiting relatives, or bad weather. Internal barriers emerge from inside you. Feelings of failure, feelings of resistance, dislike of exercise, and lack of motivation are common internal barriers people confront.

### Skills and strategies to use when you encounter a barrier

- Practice self-awareness to help you identify the cause of that barrier.
- Monitor your emotions and when/where/why you have them.
- Talk back to negative thoughts.
- Replace negative thoughts with positive thoughts.
- If necessary, set a new, reachable goal.
- Boost your positive thoughts by posting your positive thoughts on the refrigerator.
- Think about your reasons for being involved in this physical activity programme, the benefits you will reap.
- Look back at your exercise diary sheet and look at the progress you've made.
- Call a friend or exercise buddy for support and motivation.

The following is a list of barriers and possible solutions to the barriers

### PERSONAL, SOCIAL, & ENVIRONMENTAL BARRIERS TO EXERCISE

BARRIER	STRATEGIES TO OVERCOME BARRIER
Personal Barriers	
Lack of time	<ul style="list-style-type: none"> <li>• Document how you use your time for one week and identify areas where you can incorporate exercise.</li> <li>• Make use of active transportation and make active lifestyle choices (e.g., bike to work, take the stairs).</li> <li>• Chunk your exercise routine into several smaller bouts of exercise (3 to 6 bouts of 5-10 min each) can be as effective as one longer bout of 30 min exercise daily.</li> </ul>
Lack of motivation	<ul style="list-style-type: none"> <li>• Reflect on your reasons for exercising.</li> <li>• Self-regulate your behaviour by overriding a well-established response (e.g., watching TV) and replacing it with a less common but desirable response (e.g., taking a brisk walk).</li> <li>• Find effective activities which are safe and the ones that you enjoy.</li> </ul>
Lack of energy	<ul style="list-style-type: none"> <li>• Reflect on the benefits of exercise, including increased energy.</li> <li>• Think about the time of day you think you could consistently participate in exercise.</li> <li>• Discuss your diet with a dietician to ensure that you have energy for exercise or follow dietary strategies that are cheap and in line with the dietary requirements for persons living with HIV.</li> <li>• Consider doing sitting/chair exercises.</li> </ul>
Lack of knowledge about exercise	<ul style="list-style-type: none"> <li>• Try to make use of simple home-based exercises that are offered in this manual.</li> </ul>
Dislike of sweating or vigorous	<ul style="list-style-type: none"> <li>• Exercise for longer durations at lower intensities.</li> <li>• Understand that exercising at lower intensities</li> </ul>

exercise	<p>can still provide health benefits.</p> <ul style="list-style-type: none"> <li>• Understand the benefits of vigorous exercise.</li> <li>• Slowly integrate high intensity exercises into your programme to build your intrinsic motivation for vigorous exercise.</li> </ul>
Physical barriers (e.g., obesity, injury, disease)	<ul style="list-style-type: none"> <li>• Take time to rest when not feeling well and increase your exercise gradually.</li> <li>• Avoid workouts that do not exacerbate any pre-existing or past conditions.</li> <li>• Reflect on the benefits of exercise, as physical barriers may be accompanied by fear.</li> <li>• Develop realistic goals.</li> </ul>

## PERSONAL, SOCIAL, & ENVIRONMENTAL BARRIERS TO EXERCISE

BARRIER	STRATEGIES TO OVERCOME BARRIER
Extrinsic motivation	<ul style="list-style-type: none"> <li>• If you are driven by external goals to exercise you may be discouraged by lack of results or become complacent once extrinsic goals are met. Develop an internal drive to exercise.</li> <li>• Be aware of the long-term effectiveness of intrinsic goals compared to the short-term extrinsic goals, such as weight loss.</li> </ul>
Fear of injury	<ul style="list-style-type: none"> <li>• Safety comes first, refer to this manual for safe exercising.</li> </ul>
Social	
Family/friend/work obligations	<ul style="list-style-type: none"> <li>• Have serious discussions with family and close friends about your needs and goals.</li> <li>• Look for social support you may need to allay these obligations.</li> <li>• Identify any instances in which obligations are self-imposed (e.g., saying 'yes' to everyone</li> </ul>

	who asks).
Lack of social support	<ul style="list-style-type: none"> <li>• Have serious discussions with family and close friends to discuss your needs and goals.</li> <li>• Identify the social support you may need to exercise. In this programme, we will teach you how you may access this support.</li> <li>• Identify activities that you can do with your friends and family, i.e., activities your friends and family enjoy.</li> </ul>
Culturally inappropriate activities and gender role expectations	<ul style="list-style-type: none"> <li>• Gender roles can vary by family, age, and culture. Be aware of differences in obligations between men and women. Develop strategies for overcoming barriers that fit into your lifestyle and belief system.</li> </ul>
Environmental	
Lack of access to programmes or facilities; cost of programs and facilities	<ul style="list-style-type: none"> <li>• Engage in active transport, lifestyle, home, and outdoor activity ideas that are cost-effective. Walking is a cost-effective way of engaging in physical activity.</li> <li>• Become independent in your exercise behaviours. Engage in activities such as gardening if need be.</li> <li>• Become aware of cheap exercise opportunities within your community.</li> <li>• In this programme, we will provide you with a list of home-based exercises.</li> </ul>
Bad weather	<ul style="list-style-type: none"> <li>• Develop contingency plans, so that you have backup plans for each workout.</li> <li>• Plan for varying weather conditions. In this programme we will discuss with you the appropriate clothing/apparel you should wear in extreme temperatures. For example when exercising indoors or outdoors.</li> </ul>
Lack of shower facilities	<ul style="list-style-type: none"> <li>• Consider low intensity activity options and activities you can do in short bouts.</li> </ul>

Biological barriers (e.g., puberty, pregnancy, aging)	<ul style="list-style-type: none"> <li>• Understand that certain biological changes may affect your current or past participation in exercise. Tailor exercise programs to meet your situation and refer to an exercise specialist when necessary.</li> </ul>
Poor body image	<ul style="list-style-type: none"> <li>• Consider the health and psychological benefits of exercise, as opposed to weight loss/maintenance.</li> <li>• Develop goals and rewards not related to weight loss.</li> <li>• Recognise qualities you like about yourself, including body and non-body related attributes.</li> <li>• Utilize strategies to build clients' self-efficacy.</li> </ul>

## THE FITT PRINCIPLE

Now I want to talk with you about something called the FITT principle. We'll use the FITT principle to help monitor how hard we're working during our walking and strength exercises. **FITT is an acronym for Frequency, Intensity, Time, and Type.** When you exercise, you should pay attention to these four things to get the most effective exercise you can while also staying safe.

F = FREQUENCY (HOW OFTEN?)

- We recommend that you perform the aerobic (walking), strength, and balance activities at least 3 times per week.
- You can increase frequency gradually, as tolerated.

I = INTENSITY (HOW HARD?)

- Refers to the weight of you might be using for your resistance training workout (e.g.) lifting a 10kg set of dumbbells.

T = TIME (HOW LONG?)

- Gradually increase the total number of minutes you exercise based on how you feel.
- You may perform your physical activity in short bouts, such as taking five 10-minute walks, if that suits you better.

T = TYPE (WHAT KIND?)

- Perform aerobic activities that use large muscle groups like brisk walking, swimming, or cycling.
- Perform the activities you will learn in strength in the workshop.

**WHAT ARE MY GOALS IN EXERCISING?**

To help you to set your physical activity goals fill out the following form.

**Short-Term and Long-Term Goals**

Please fill out the entire goal sheet below. Be as thorough as you can.

My long-term physical activity goal is to:

---



---

2. My Physical Activity Goals for this week are:

(A) Frequency: \_\_\_\_\_

(B) Intensity: \_\_\_\_\_

(C) Time: \_\_\_\_\_

(D) Type: \_\_\_\_\_

3. What days do I plan to be physically active?

---

4. How many minutes will I be physically active?

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Where will I be physically active? What activities will I do?

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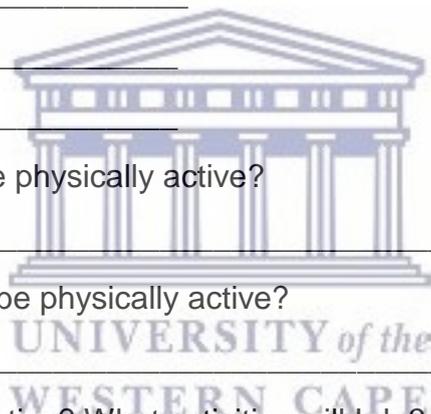
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I plan to achieve my Physical Activity Goals by (what day):

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# Home Based Exercises

## Warm up

### Pulse raising (movement activities)

Walking, marching on the spot, or low-level cycling are suitable ways of raising your pulse. Do this for the first 5 minutes of the warm-up, starting very gently and gradually increasing the intensity. The purpose is to warm up the muscles in preparation for stretching, and to increase the heart rate gradually.



Marching on the spot

### Mobility exercises

The following mobility exercises should be carried out after or during the pulse raising activities.

#### Punches into the air - 30 seconds

This can be done standing or seated. Punch out in front of you. Keep the movements slow and controlled.



Punches into the air

**Arm curl - 10 on each arm**

With the palm of your hand facing up straighten the arm out in front of you and then bring your hand back towards your body. Take care not to lock the elbows out when straightening the arms.



Arm curl

## Gentle Trunk Rotation - 5 times to each side

Can be done seated or standing. Keeping the hips facing forward turn slowly to the side leading with the shoulders. Make sure you return to the centre each time for 3 seconds.



Gentle Trunk Rotation

## Knee Lifts - 10 on each leg

When seated start with your feet on the floor and alternatively lift each knee towards the ceiling keeping your leg bent. Only lift as high as is comfortable.



Knee lifts

## Heel-toe - 12 times

Keeping your feet on the ground raise onto tip toes and then go back on to your heels pointing toes upwards.



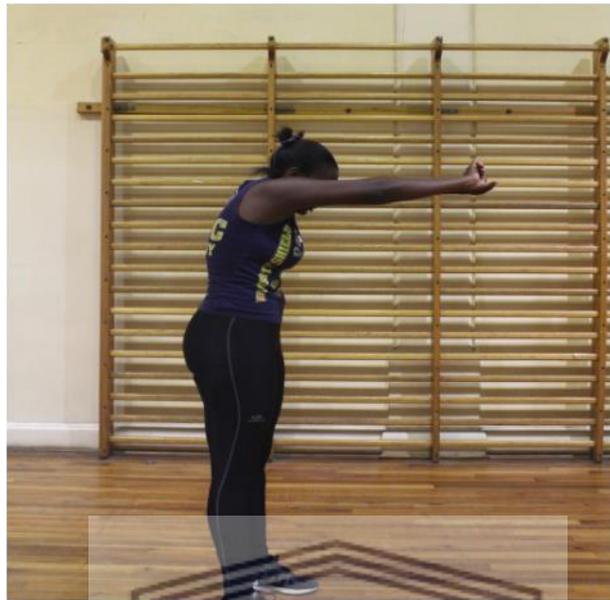
Heel-toe

## Stretching

The next 5 minutes of your warm up should be to stretch the muscles that you are going to be using. Only stretch as far as your muscles allow. It is important to remember to keep your feet moving in between the stretches so that your body remains warm and your heart rate is still raised slightly.

### **Upper Back Stretch - 10 – 15 seconds**

Sit or stand tall, abdominal muscles pulled in with back straight. Clasp hands in front of the body, push forward, drop head down.



Upper Back Stretch

### **Chest Stretch- 10 -15 seconds**

Sit or stand tall, abdominal muscles pulled in with back straight. Place hands on the lower back, squeeze shoulders blades together, push chest forward. To increase the stretch clasp hands behind, squeeze shoulders blades together, push chest forward.



Chest stretch

**Lower back and waist mobility- Repeat 5 times**

Side bends. Stand with your feet shoulder width apart either with hands on your hips or down by your side. Slowly lean to one side from your waist, being careful not to move your hips. Come back to an upright position and lean to the other side.



Lower back and waist mobility

**Back Upper Leg Stretch (Hamstrings) (Repeat on opposite leg) 10 – 15 seconds**

Sit tall, abdominal muscles pulled in with back straight. One leg extended in front with opposite leg bent, support body with hands on the thigh. Lean slightly forwards maintaining posture. Stretch should be felt in back of extended leg.



Back Upper Leg Stretch (Hamstrings)

**Front Upper Leg Stretch (Quadriceps) (Repeat on opposite leg) - 10 – 15 seconds**

Stand holding on to a wall or chair for support lift foot up behind and reach to hold onto the foot. Ease leg towards buttocks. Keep knees together and back in neutral. If you are finding it difficult to reach your foot hold on to back of shoe or trouser leg.



Front upper leg stretch

### Calf Stretch-10 – 15 seconds

Stand tall, abdominal muscles pulled in with back straight. One leg forward with hand in knee, back leg straight. Slightly leaning forward and keep both feet facing forward. Stretch should be felt in the lower leg of the straight leg.



Calf stretch

## Main exercises

### Lower body

#### Squats

Stand with your feet shoulder width apart in front of a chair. Stand up straight with your shoulders back, and then bend down to sit on the chair. Keep back straight, knees facing forward, and arms out in front or on your hips. Keep heels on the ground at all times. Stand up again without using your arms, and repeat the exercise.



Squats

#### Lunges

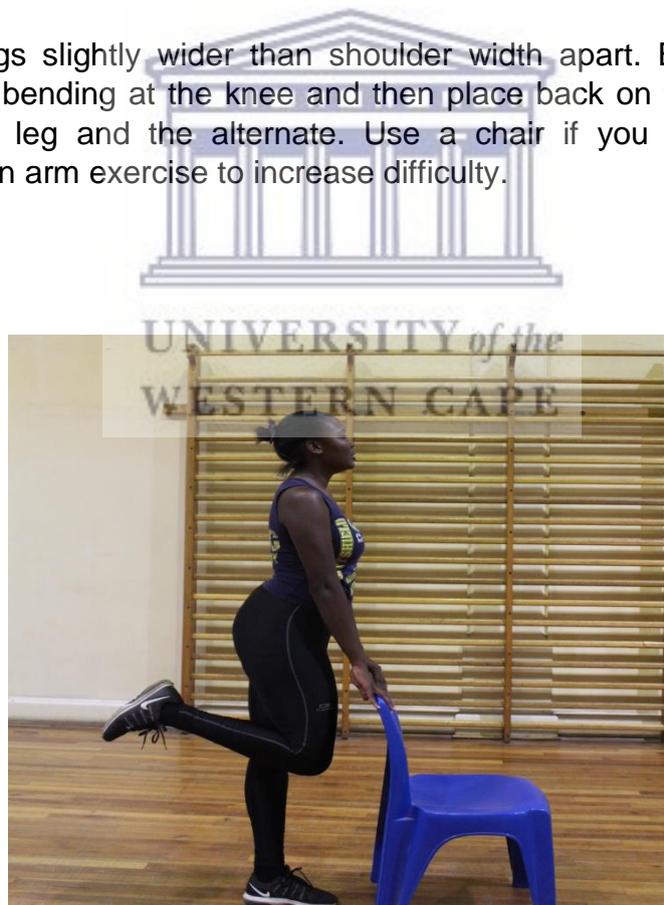
Stand up straight with your shoulders back. Take one step forward, keep the front knee in line with your toes, and drop the back knee as low as you can but don't let it touch the floor. Using your front leg push backwards to the start position, alternate legs. To increase the difficulty, take a larger step or incorporate side and backward lunges. The same principles apply with a backwards and side lunge other than the direction.



Lunges

### Leg curls

Stand tall with legs slightly wider than shoulder width apart. Bring one leg back towards the bum, bending at the knee and then place back on the ground. Repeat with the opposite leg and the alternate. Use a chair if you have difficulty with balance. Include an arm exercise to increase difficulty.



Leg curls

### Heel raises

Stand tall with feet shoulder width apart, stand near a wall or chair so you have something to hold onto for balance. Slowly rise up onto your toes as high as possible and then hold it for 2 seconds. Repeat the exercise making sure it's performed nice and slowly. To increase difficulty this can be done on one leg at a time, then change legs.



Heel raises

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### Outer thigh

Back straight & stomach pulled in. Stand behind a chair/wall for support with feet hip distance apart. Raise and lower leg to the side in a controlled motion. Alternate legs.



Outer thigh

### Inner thigh

Back straight & stomach pulled in. Feet hip distance apart. Raise leg across standing leg, to the front of body. Repeat process using other leg.

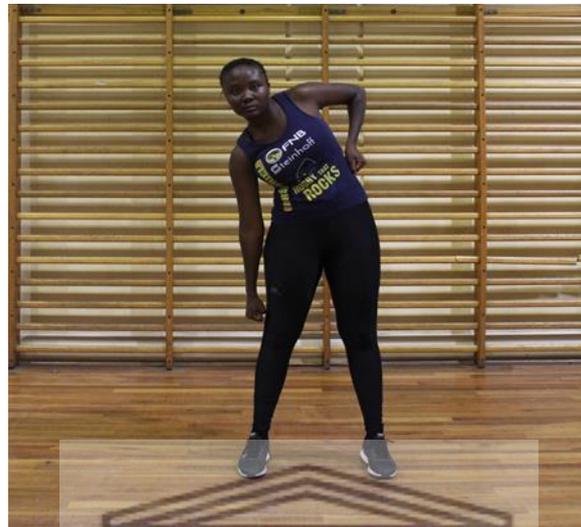


Inner thigh

## Core exercises

### Side bends

Back straight & stomach pulled in. Feet shoulder width apart. Grasp a 2 liter empty filled with water in each hand. Bend to one side reaching for the knee and repeat on opposite side.

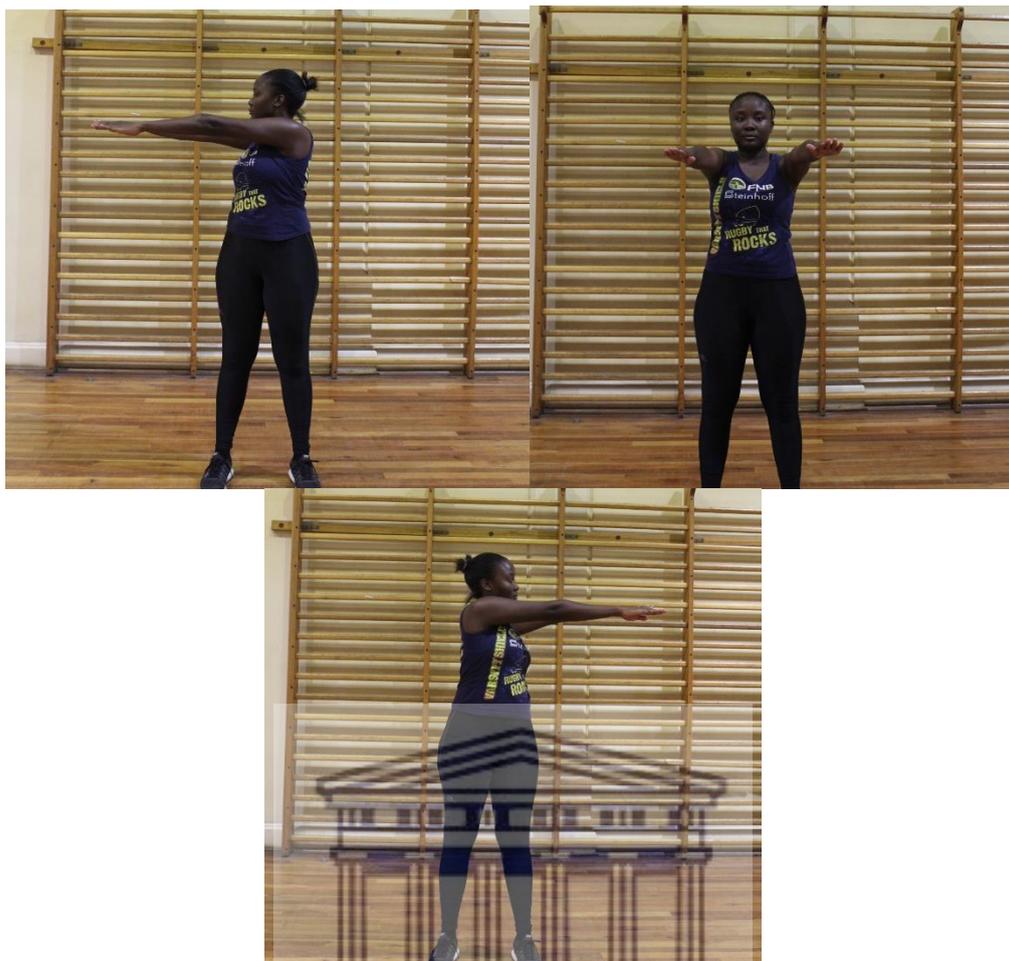


Side bends

### Trunk Twist

Keep your back straight & stomach pulled in. Extend your arms and hold weighted object at chest height. Twist from waist, turning shoulders. The hips must remain facing forwards.

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Trunk twist

### **Bicep curls**

This exercise can be performed sitting, standing or to increase difficulty, whilst marching on the spot. Remember to keep your elbows tucked into your sides. Holding some light weights bring your hands from down by your sides up towards your shoulders with wrists facing up. Lower the weights back down, slowly and controlled and repeat.



Bicep curls

## Upper body exercises

### Wall push ups

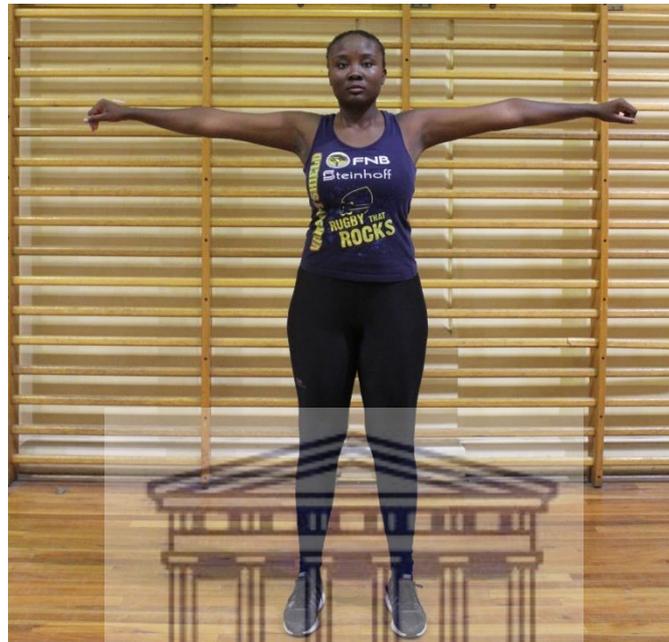
Stand with feet shoulder width apart about 2 steps away from a wall. Place your hand on the wall slightly wider than shoulder width apart but at shoulder height. Slowly lower yourself towards the wall until you are roughly a centimeter away, and then push yourself back up. To make this exercise easier stand closer to the wall, and to make it more difficult stand further away. Try to keep your back and hips straight throughout the whole exercise.



Wall push ups

## Lateral raises

This exercise can be performed sitting, standing or marching. Stand tall with feet shoulder width apart. Arms should start down by your sides, and then bring them out to the sides until they are in a straight line. Then nice and slowly bring them back to the starting position. The movement on the way up should take 3 seconds and also 3 on the way down, counting this will help control the movement.



Lateral raises

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## Front raises

This exercise can also be performed sitting, standing or marching. Stand tall with feet shoulder width apart. Start with your arms down in front of you resting on your thighs, slowly counting to 3 raise your arms up in front of you until shoulder height, and then, lower them back down also to the count of 3.



Front raises

### Triceps kickbacks

This exercise can be done with weighted objects, sitting or standing. Stand tall abdominal muscles pulled in with back straight. Keep elbows in at waist and start with elbows at 90 degrees. Extend the arms back, and then curl the arms forward and repeat.



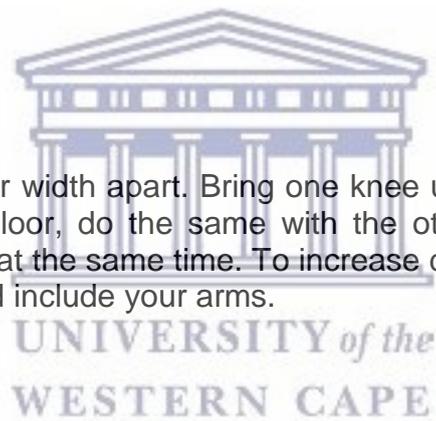


Triceps kickbacks

## Aerobic exercises

### High knees

Stand tall with feet shoulder width apart. Bring one knee up as high as you can and then lower it back to the floor, do the same with the other leg and repeat. Keep marching moving the arms at the same time. To increase difficulty raise knees higher to work at a faster pace and include your arms.

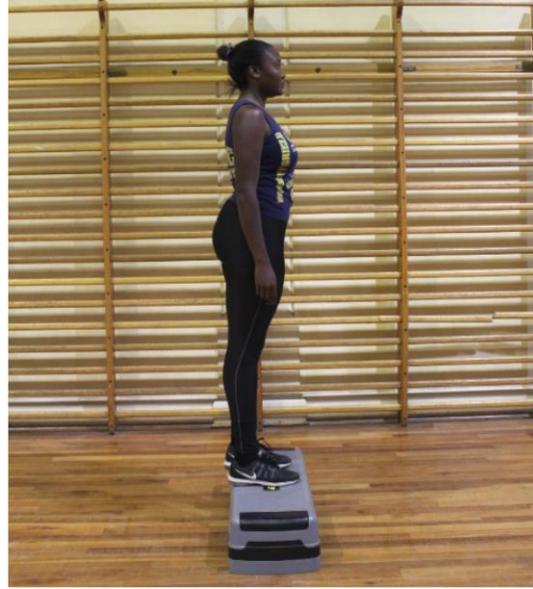
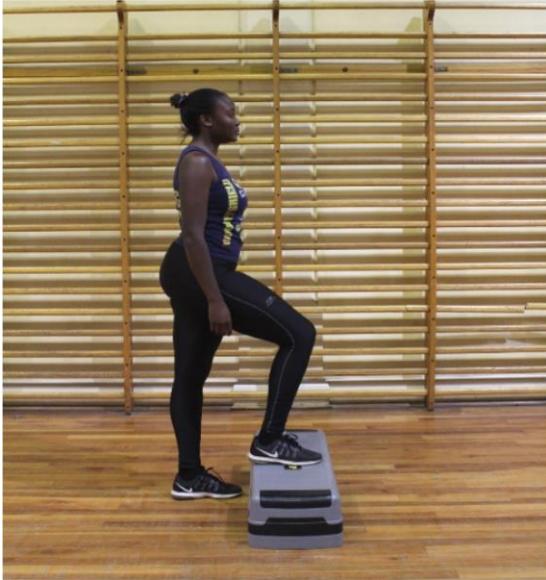




High knees

### Step-ups

Step ups can be used as aerobic exercise. You can use the door step or the stairs. Stand tall, then step up onto the step making sure your whole foot is in the step, with second leg following. Step back down and repeat. After a certain amount of steps or time, change your leading leg. To make it more difficult increase the pace, use a higher step, and incorporate your arms by raising them as you step up. If you increase the speed in which you go up and down the step it becomes aerobic exercise as well as working your lower body.



Step-ups

### Punches in the air

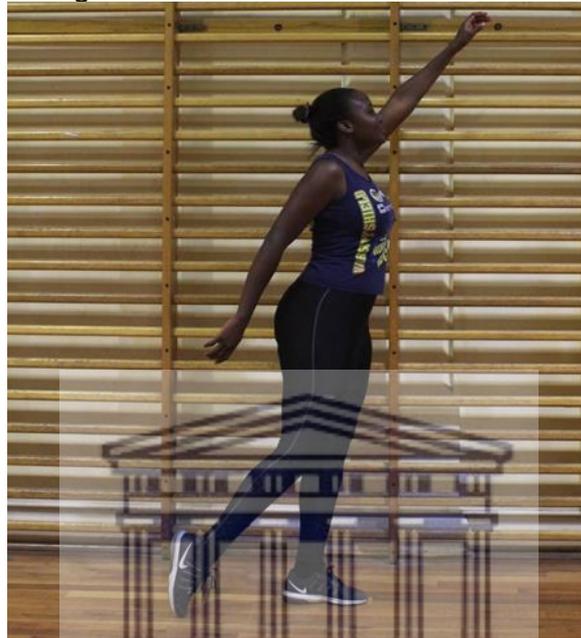
Punches in the air can be completed with clenched fists or with small weights in your hands. While punching make sure your back is straight & your stomach is pulled in. Feet should be an open stance. Punch across to opposite side at shoulder height or punch across your body.



Punches in the air

## Spotty Dogs

Standing tall with your feet together and arms by your sides, start by raising one arm in front of you to head height. At the same time take a stride back with the opposite leg (e.g. right arm, left leg). Then return your arm and leg back to the starting position and repeat using the other arm and leg (e.g. left arm, right leg) and again return to the starting position. By repeating this process in a brisk and controlled manner you will raise your heart rate to a level in which you can gain health benefits if maintained for long enough.



Spotty Dogs

## Walking

Walking is a great way to keep active. Make sure you walk at a brisk pace so you get the most out of your walk.



## Walking

Most of the exercises above can be performed at home. If you don't have any dumbbells you can use other weighted items around the home for example tins of beans or bottles of water. Try picking a few different exercises and doing 2 sets of 10 repetitions with a rest in between. The other option is to do the exercises for a certain time i.e. 2 x 45 seconds.

If you feel you need more of a challenge or the exercises feel too easy go through them three times and/or reduce the rest time. You can also increase the difficulty of each exercise by doing more repetitions (e.g. 12 times instead of 10 times) or increasing its duration (1 minute rather than 45 seconds). Make sure that you do not overdo it by pushing yourself beyond your limits.

### **Cool down**

It is important you leave enough time at the end of your session to cool down properly. Gradually lower your pace during the cool down. The goal is to bring your body back to its resting state.

- A thorough cool down for 10 minutes reduces the risk of fainting or dizziness that could result from a sudden drop in blood pressure if you suddenly stop exercising.
- Cooling down also reduces the risk of disturbances in your heart rhythm that could happen if you stop exercising suddenly.
- Stretching during the cool down also helps to reduce any muscle soreness that may be caused by the activity.

- The cool down should be performed at a gradually slower speed. The aim is to bring your body back to its resting state gradually.

### **Stretches**

Repeat your stretches after cooling down as shown in the stretches section at the beginning of this manual.



## RESOURCES

***The following resources were used and adapted to come up with this physical activity manual:***

Active People, Active Places BRITISH COLUMBIA PHYSICAL ACTIVITY STRATEGY NOVEMBER 2015\*

Physical activity strategy for the WHO European Region 2016–2025\*\*

Warburton D, Whitney N, Bredin S. Health benefits of physical activity: the evidence. Canadian Medical Association Journal, 2006; 174 (6). doi:10.1503/cmaj.051351

Public Health Agency of Canada. Benefits of Physical Activity. [www.phac-aspc.gc.ca/hp-ps/hl-mvs/paap/02paap-eng.php](http://www.phac-aspc.gc.ca/hp-ps/hl-mvs/paap/02paap-eng.php)

Hutchinson S, Brooks E. Physical Activity, Recreation, Leisure, and Sport: Essential Pieces of the Mental Health and Well-Being Puzzle. Report prepared for Recreation Nova Scotia and Nova Scotia Department of Health and Wellness, 2011. [www.recreationns.ns.ca/wp-content/uploads/2012/05/MentalHealthLit.pdf](http://www.recreationns.ns.ca/wp-content/uploads/2012/05/MentalHealthLit.pdf)

Jagers, J. R & Hand, G.A. (2014). Health Benefits of Exercise for People Living With HIV: A Review of the Literature. American Journal of Lifestyle Medicine. 1559827614538750

Coaching Session 1: Welcome to the STEP Physical Activity Program. October 2014. Agency for Healthcare Research and Quality, Rockville, MD.

<http://www.ahrq.gov/professionals/education/curriculum-tools/stepmanual/stepcoach1.html>

[https://www.cornwallhealthyweight.org.uk/pdfs/Exercise to do at home with warm up and cool down - sept 2012.pdf](https://www.cornwallhealthyweight.org.uk/pdfs/Exercise%20to%20do%20at%20home%20with%20warm%20up%20and%20cool%20down%20-%20sept%202012.pdf)



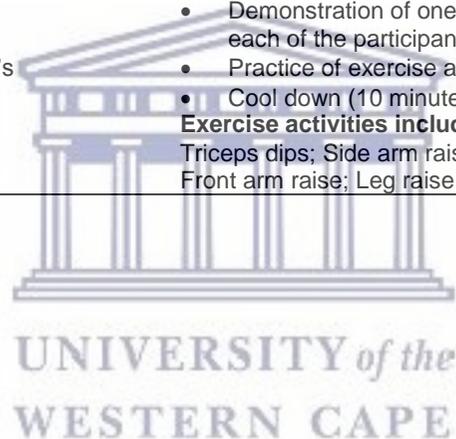
## APPENDIX L: Outline of the six-week physical activity intervention

Table 14. Outline of the six-week physical activity intervention

Week/Session	60-minute classroom sessions	30-minute exercise activities learning session	30-minute group aerobics exercise session
1	<ul style="list-style-type: none"> <li>• Introduction to the programme</li> <li>• Aims of the programme and expectations for each participant</li> <li>• Classroom topic: Understanding PA; Discuss current experiences about PA.</li> <li>• Barriers to PA and strategies for overcoming them.</li> </ul>	<ul style="list-style-type: none"> <li>• Warm-up (10-15 minutes; depends on fitness level of participant)</li> <li>• Demonstration of exercises by lead researcher with key points.</li> <li>• Practice of exercise activities.</li> <li>• Cool down (10 minutes).</li> </ul> <p><b>Exercise activities included</b> Marching on the spot; Punches into the air. Shoulder circles or shrugs; Arm curl.</p>	<p><b>Exercise activities included</b> Jogging; Side steps at mild-tempo; Diagonal knee lifts; Arm reach out while walking on the spot.</p>
2	<ul style="list-style-type: none"> <li>• Reviewing and discussing barriers to PA.</li> <li>• Role of PA for managing HIV; Health benefits of PA for PLWH.</li> <li>• Safety issues when exercising.</li> <li>• Exercising at the correct intensity and duration.</li> </ul>	<ul style="list-style-type: none"> <li>• Warm-up (10-15 minutes; depends on fitness level of participant)</li> <li>• Demonstration of exercises by lead researcher with coaching points.</li> <li>• Practice of exercise activities.</li> <li>• Cool down (10 minutes).</li> </ul> <p><b>Exercise activities included</b> Toe raises; Gentle trunk rotation. Knee lifts; Free-weight squats.</p>	<p><b>Exercise activities included</b> Jogging; Side steps at mid-tempo; Arm jab (left arm then right arm); Overhead arm raises.</p>
3	<ul style="list-style-type: none"> <li>• Reviewing and discussing the role of PA for managing HIV and health benefits of PA for PLWH.</li> <li>• The warm-up and cool down.</li> <li>• Structuring the exercise session and goal-setting.</li> <li>• Simple home-based exercises; Discuss activities of daily living.</li> </ul>	<ul style="list-style-type: none"> <li>• Warm-up (10-15 minutes; depends on fitness level of participant)</li> <li>• Demonstration of exercises by lead researcher with coaching points.</li> <li>• Practice of exercise activities.</li> <li>• Cool down (10 minutes).</li> </ul> <p><b>Exercise activities included</b> Lunges; leg curls. Calf raises; Side bends.</p>	<p><b>Exercise activities included</b> Jogging; Side steps at mid-tempo; Marching on the spot; side-to-side cross punch.</p>
4	<ul style="list-style-type: none"> <li>• Reviewing and discussing the warm up and cool down, structure of an exercise session and goal-setting, simple home-based exercises.</li> <li>• Self-efficacy and PA; Discuss strategies for</li> </ul>	<ul style="list-style-type: none"> <li>• Warm-up (15 minutes).</li> <li>• Demonstration of one exercise activity by each of the participants with coaching points.</li> <li>• Practice of exercise activities.</li> </ul>	<p><b>Exercise activities included</b> Jogging; Side steps at mid-tempo; Diagonal knee lift; side stepping with leg kick back.</p>

	increasing self-efficacy for PA.	<ul style="list-style-type: none"> <li>Cool down (10 minutes).</li> </ul> <b>Exercise activities included</b> Trunk twists; wall push-ups. Lateral arm raises; Triceps kickbacks.	
5	<ul style="list-style-type: none"> <li>Reviewing and discussing self-efficacy and PA and strategies for increasing self-efficacy for PA.</li> <li>Social support and PA; Discuss strategies for increasing social support for PA.</li> </ul>	<ul style="list-style-type: none"> <li>Warm-up (15 minutes).</li> <li>Demonstration of one exercise activity by each of the participants with coaching points.</li> <li>Practice of exercise activities.</li> <li>Cool down (10 minutes).</li> </ul> <b>Exercise activities included</b> Step-ups; Kickbacks. Knee lifts; Glute squeeze.	<b>Exercise activities included</b> Jogging; Side steps at mid-tempo; Diagonal knee lifts; Arm reach out while walking on one spot.
6	<ul style="list-style-type: none"> <li>Reviewing and discussing social support and PA.</li> <li>Reviewing of general progress.</li> <li>Discussion on integrating PA into one's everyday lifestyle.</li> </ul>	<ul style="list-style-type: none"> <li>Warm-up (15 minutes).</li> <li>Demonstration of one exercise activity by each of the participants with coaching points.</li> <li>Practice of exercise activities.</li> <li>Cool down (10 minutes).</li> </ul> <b>Exercise activities included</b> Triceps dips; Side arm raise. Front arm raise; Leg raise.	<b>Exercise activities included</b> Jogging; Side steps at mid-tempo; Arm jab (left arm then right arm); Overhead arm raises.

PA=Physical activity; PLWH=People living with HIV

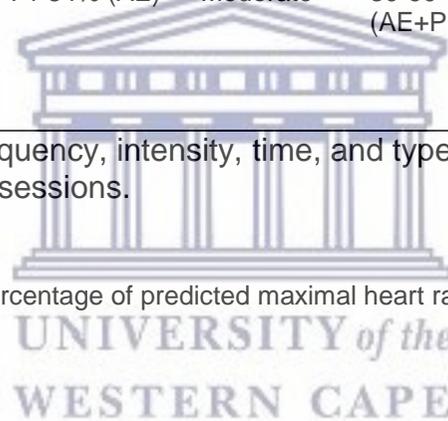


## APPENDIX M: The FITT framework applied during the exercise group sessions

Physical fitness classification	Frequency		Intensity			Time		Type (mode)
	Kcal/wk	d/wk	HRR/VO <sub>2</sub> R	%HR <sub>max</sub>	Perception of effort	Total weekly duration per day (min)	Total weekly duration per week (min)	
Fair-average	1500-2000	3-5 (AE) 2-3 (PRE)	55-70% (AE) 55-85%1-RM or 2 sets of 10-12 reps (PRE)	74-84% (AE)	Moderate	30-90 (AE+PRE)	200-300	AE: cycling, walking, jogging PRE: target major muscle groups using weights, body weight and plyometrics.

Table 13. The recommended FITT framework (frequency, intensity, time, and type) of aerobic exercise and progressive resistance exercise that was used during the group exercise sessions.

AE=aerobic exercise; HRR=heart rate reserve; %HR<sub>max</sub>= percentage of predicted maximal heart rate; PRE=progressive resistance exercise; VO<sub>2</sub>R= oxygen uptake reserve. Adapted from Grace et al. (2015).



## APPENDIX N: Implementation of the BCTs in the intervention

Table 15. Implementation of the BCTs in the intervention

Behavioural change technique	Content
Goal-setting (behaviour)	Each participant will walk an individualised number of steps per week and do a certain number of exercises from the compiled list of home-based exercise activities. Activities also will include domestic chores, such as gardening, etc.
Self-monitoring of the behaviour	The number of steps walked per week will be recorded by a pedometer in the first and last week of the intervention. Participants will be asked to record their daily physical activities in an exercise diary.
Goal-setting (outcome)	A goal will be set for the number of exercises to be done per day and the number of steps to be walked in the first and last weeks of the intervention by each individual.
Action planning	It was planned that participants would walk from home to and from the community centre, and to-and-from other places, e.g., to church, to the store, etc. and to do a specific number of low-to-moderate intensity exercises per day.
Review the behaviour goal(s)	Each week, each person's performance will be examined to determine if the person had accomplished the agreed exercise goals. Considerations to modify future exercise goals will be based on previous exercise behaviour.
Feedback on the goal-setting behaviour	Participants will be informed on the number of aerobic steps they walk (as recorded on the pedometer) and on the recorded exercises in the exercise diary. The S.M.A.R.T approach to goal-setting will be included in the feedback in order to make the goals S.M.A.R.T.
Feedback on the outcome(s) of the behaviour	Following implementation of the programme, participants will be informed if their participation in PA had improved, based on a comparison of their PA measures at baseline and post-intervention.
Social support (unspecified)	Participants will be advised to try and engage in exercise in groups or with family and friends.
Social support (practical)	The group facilitator/Social worker working with the participants at the Community centre will be asked to remind the participants to exercise every day.
Instruction on how to perform the behaviour	Participants will be taught and instructed on how to do the prescribed home-based exercises.
Information about the health consequences	It will be explained to the participants during the exercise classes that not engaging in enough PA can increase susceptibility to various health conditions.
Demonstration of the behaviour	Home-based exercises will be demonstrated and taught to the participants by the lead researcher and research assistants.
Behavioural practice/rehearsal	Participants will practice the taught exercises at the community centre or at home in their free time.
Provide information on where and when to perform the behaviour	Participants will be given information instructing them to make use of specific recreational facilities in their neighbourhoods.

Barrier identification/Problem - solving	Participants will be taught how to overcome barriers to PA, such as a lack of time or inclement weather.
Provide rewards contingent upon achieving the successful behaviour.	Participants with the most number of walking steps on the pedometer in the last week of the intervention will receive an achievement reward such as a food and fruit pack.
Time management	To create exercise time, participants will be educated on an individualised basis of fitting exercise into their daily schedule, including being taught how to use activities of daily living for PA.



## APPENDIX O: Processes of change and their application in the intervention

Table 12. Processes of change and their application in the intervention.

<b>Process</b>	<b>Definitions and examples of how they were used in the intervention</b>
Consciousness raising	Increasing information about self and problem: educating participants about the health benefits of PA for persons living with HIV/AIDS.
Self-re-evaluation	Assessing how one feels and thinks about oneself with respect to a problem: teaching strategies for increasing physical exercise self-efficacy.
Self-liberation	Choosing and commitment to act or belief in ability to change: use of commitment-enhancing techniques, such as the setting of specific and measurable short-term goals with each participant.
Counter conditioning	Substituting alternatives for problem behaviours: use of strategies to increase PA, such as using stairways at the shopping mall than opting for using the lift or escalator.
Stimulus control	Avoiding or countering stimuli that elicit problem behaviours: encouraging participants to walk more often than using public transport.
Reinforcement management	Rewarding oneself or being rewarded by others for making changes: use of an achievement award for the participant with the greatest number of steps recorded on the pedometer.
Helping relationships	Being open and trusting about problems with someone who cares: use of social support-enhancing strategies.
Dramatic relief	Experiencing and expressing feelings about one's problems and solutions: understanding participants' barriers to PA and developing strategies to overcome them.
Environmental re-evaluation	Assessing how one's problem affects the physical environment: empathy training, documentaries.
Social liberation	Increasing alternatives for non-problem behaviours available in society: advocating for participants to engage in more PA.

Adapted from Prochaska, DiClemente and Norcross (1992).