PHYSICAL ACTIVITY, LIFESTYLE HABITS AND GENERAL HEALTH STATUS OF RECREATIONAL SPORT PARTICIPATING AND NON-RECREATIONAL SPORT PARTICIPATING MALES IN KIMBERLEY, NORTHERN CAPE

Shabnam Johnson

2014120253

MSc (Physiotherapy) with specialisation in Sports Physiotherapy

University of the Free State

A research report (mini-dissertation) submitted in partial fulfilment of the requirements of the degree MSc (Physiotherapy) with specialisation in Sports Physiotherapy) in the Department of Physiotherapy, Faculty of Health Sciences, University of the Free State

Supervisors

Prof Corlia Janse Van Vuuren

Mrs Karen Bodenstein

Ex Officio Supervisors

Dr Robyn Smith

Mrs Heleen Nel

Bloemfontein
January 2020

CONTENTS

DECLARATION

I, Shabnam Johnson declare that this research report is my own, unaided work and submitted for the Master of Science in Physiotherapy (with specialisation in Sports Physiotherapy) degree at the University of the Free State, Bloemfontein. This research report has not been submitted for any degree or examination at any other University before.

_____

(Signature of student)

Signed on this 31st day of JANUARY 2020 in Kimberley, NORTHERN CAPE

ACKNOWLEDGEMENTS

I wish to acknowledge the following people for the roles they have played in the completion of this study.

Firstly, I would like to thank the Almighty Allah for assisting me and guiding me to walk this path and to have reached the end of it.

A big thanks goes to Dr Corlia Janse Van Vuuren and Mrs Karen Bodenstein for taking me under their wing, going the extra mile with me and ensuring I complete my dissertation. The second chance you have given me will always be remembered and appreciated.

I would like to thank my parents Yasin and Fatima Banu Johnson for supporting me through it all and always encouraging me. To my extended family in Kimberley, thank you for all the motivation.

Lastly, but most importantly, thank you to Furlyn Cloete, my partner through thick and thin, your patience and support is more than appreciated.

SUMMARY

Introduction

An individual's health is based on his or her mental and physical well-being (WHO, 2020a), while general health status may refer to the level of health of an individual as well as the level of health of the general population or an individual (Durstine & Moore, 2003). In line with this, the United Nations (UN) has set 17 sustainable developmental goals for the year 2030 (UN, 2015), which are aimed at encouraging and informing relevant health professionals on how to improve the general health status of the global community (UN, 2015). *Goal 3* is specifically aimed at ensuring healthy lives and promoting well-being for all people of all ages, with the main objective being to reduce premature death resulting from non-communicable diseases (i.e. chronic lifestyle diseases (CLD)) (UN, 2015). Good lifestyle habits such as regular physical activity are associated with an improved life expectancy and an improved general health status (Kaptoge et al., 2018).

The concept "lifestyle" refers to the way in which an individual lives and copes in his/her physical, psychological, social and economic environments on a day-to-day basis (Trovato, 2012). A healthy lifestyle improves the general health status of an individual by lowering the risk of developing CLD, being or becoming seriously ill or even early mortality (Takashi et al., 2013).

Positive lifestyle habits such as regularly eating, and participating in physical activity can improve general health status whereas lifestyle habits such as excessive alcohol consumption, smoking and unhealthy eating are adverse lifestyle habits and can predispose the individual to CLD and poor general health (Borgan et al., 2015).

Physical activity is one of the most important contributors to a good general health status. Physical activity is crucial in improving muscular strength and improving aerobic capacity (Garber et al., 2011). There is a decrease in sport participation after leaving school (Bloemhoff, 2010) which is where physical activity guidelines could become even more helpful. According to the American College of Sports Medicine's (ACSM) recommendations for physical activity, a minimum of 150–300 minutes of moderate-intensity aerobic exercises or 75–150 minutes of vigorous aerobic exercises per week is advised in order to achieve health benefits (Riebe et al., 2018). The more time spent participating in physical activity, the better the health benefits which are

achieved. However, Kyu et al. (2016) warn that exceeding the optimal physical activity levels and intensity may cause detrimental effects on the body.

In particular, with regard to physical activity prescription, leisure-time physical activity is the most neglected area of physical activity. Recreational sport (as a form of leasure-time physical activity) can lead to increased opportunities to improve health by increasing aerobic capacity and strengthening muscles. It also provides social support and motivation while participating in physical activity which additionally allows for an improved mental state (Moore et al., 2012). Participation in recreational sports creates a sense of belonging, and provides positive and motivating social interaction (Eime et al., 2015). Chen et al. (2017) agreed that recreational sport has physiological and psychological benefits, but found the promotion of recreational sport by health professionals, such as physiotherapists, to be lacking.

Recreational cricket is the most structured amateur sport in Kimberley making the inclusion of these players into a research study convenient. Cricket, as a professional or recreational sport, is a technical game and a test of endurance – mentally and physically (Webster, 2017). Physically, cricket improves stamina, endurance (aerobic fitness) and hand-eye coordination as well as perceptual skills. According to Ainsworth et al. (2011), the MET value of cricket was updated to 4.8 METS in 2011 after the previous two versions of the *Compendium of Physical Activities* listed the MET value as five. Mentally, cricket requires toughness and perseverance as individuals have to endure harsh conditions for long periods at a time, constantly and consistently thinking on their feet to plan and strategies (Filbay et al., 2017).

Physiotherapists play an important role in the screening of patients and the prevention of complications from disease by means of health promotion. They also have the knowledge to prescribe exercises and incorporate everyday activities into a treatment programme considering current chronic diseases (O'Donoghue et al., 2012), such as type 2 diabetes, hypertension, increased cholesterol levels and obesity (UN, 2015). Physiotherapists are thus in an ideal position to promote healthy lifestyle habits such as physical activity and, in particular, promote recreational physical activity (Lowe et al., 2016) whilst improving the general health status of individuals and communities (Holm et al., 2015) and supporting the global drive towards better health for all.

Aim

The primary aim of this research study was to investigate the physical activity levels, lifestyle habits and general health status of recreational sport participating and non-recreational sport participating adult males in Kimberley, Northern Cape Province, South Africa.

Methods

A quantitative research design was used in this case-control study to compare the general health status, lifestyle habits and physical activity levels of recreational sport participating and non-recreational sport participating participants. Participants willing to partake in this study provided written consent before their participation.

Data was collected using four self-administered questionnaires: a demographic questionnaire (compiled by the researcher), and three standardised questionnaires, the International Physical Activity Questionnaire (IPAQ), the Belloc and Breslow seven lifestyle habits questionnaire and the SF-36v2 health survey.

Results and discussion

A total of 102 participants were included in this study with 51 participants in the recreational sport participating group and 51 in the non-recreational sport participating group.

The recreational sport participating group had an overall higher level of physical activity per week compared with the non-recreational sport participating group. These results are in agreement with literature that found that recreational sport participation was a way of increasing physical activity levels and MET-minutes per week and limiting sedentary behaviour which is often associated with sedentary occupational duties (Owen et al., 2010).

The majority of participants in both the recreational sport participating and non-recreational sport participating group presented with moderately healthy lifestyle habits. Recreational sport participation is found to be associated with healthy lifestyle habits (Eime et al., 2015), however, in this research study the same level of lifestyle habits were found in the sport participating and non-recreational sport participating groups. Both groups had a similar number of participants who smoked, but more participants in the non-recreational sport participating group consumed alcohol. This could be as a result of the social or environmental influences as well as the socio-economic environment (Keates et al., 2017), such as the occupational environment.

The self-perceived general health status of both groups were comparable whereas the recreational sport participating group presented with slightly more participants with an improved mental health status. This could be attributed to the evidence that cricket, in particular, requires and improves mental concentration more than other sport types (Webster & Travill, 2018). However, participating in any recreational sport increases the overall level of physical activity of an individual which is associated with an improved mental and physical health status (Eime et al., 2015). Whilst this improved mental and physical functioning in return leads to an improved general health status of the individual (Eime et al., 2015).

Conclusion

Participating in recreational sporting activities can increase the level of physical activity in an individual and promote the benefits associated with higher physical activity levels. It is, however, also important to include healthy lifestyle habits in general to optimise these health benefits and improve the general health status of an individual. Physiotherapists can play an important role in elevating physical activity levels and promote healthy lifestyle choices by education and referral to other members of the interprofessional team. Based on physiotherapists' knowledge of exercise prescription and general health status, recreational sport should be promoted by physiotherapists to improve physical activity levels and general health status of individuals, and more importantly on community level to reach a larger portion of the population. Participation in recreational sport provides mental and physical health benefits, and could play an important role in health promotion and long term disease prevention, as expected through the UN's sustainable development goals. This study provides important baseline information on physical activity levels, lifestyle habits and general health status of the 25-35-year-old male population in Kimberley, Northern Cape (by including both recreational sport participating and non-recreational sport participating individuals). This baseline information can now be utilised to inform, especially community interventions by physiotherapists, to support the UN's drive towards ensuring "*healthy lives and promote well-being for all at all ages*".

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

AHA	American Heart Association
ACSM	American College of Sports Medicine
BMI	Body Mass Index
BMJ	British Medical Journal
CDC	Centres for Disease Control and Prevention
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CLD	Chronic lifestyle disease
COPD	Chronic obstructive pulmonary disease
CVD	Cardiovascular disease
DM	Diabetes mellitus
FITT	Frequency, intensity, time, type
PCS	Physical Component Summary
NHANES	National Health and Nutrition Examination Survey
HSREC	Health Sciences Research Ethics Committee
MCS	Mental Component Summary
MET	Metabolic equivalent of task
QOL	Quality of life
SPSS	Statistical Package for the Social Sciences
UFS	University of the Free State
UN	United Nations
WCPT	World Confederation of Physical Therapy
WHO	World Health Organization

DEFINITIONS

Physical activity	Physical activity is any bodily movement produced by skeletal muscles that result in energy expenditure (Lowe et al., 2016).
Aerobic activity	In this kind of physical activity, the body's large muscles move in a rhythmic manner for a sustained time. Commonly referred to as endurance training (Patel et al. 2017).
Sedentary behaviour	Activity that involves little or no movement or physical activity, having an energy expenditure of about 1–1.5 METs (Garber et al. 2011).
Exercise	Exercise is a subcategory of physical activity and is planned, structured, and repetitive with the final or intermediate objective being the improvement or maintenance of physical fitness (Garber et al., 2011).
Well-being	The perception of people that their lives are going well (CDC, 2018).
Metabolic equivalent Task	An index of energy expenditure. A MET is the ratio of the rate of energy expended during an activity to the rate of energy expended at rest (Garber et al., 2011).
MET-minute	An index of energy expenditure that quantifies the total amount of physical activity performed in a standardized manner across individuals and types of activities. Calculated as the product of the number of METs associated with one/more physical activities and the number of minutes the activities were performed (Garber et al., 2011).
Chronic lifestyle diseases	Diseases such as obesity, diabetes mellitus Type 2, cardiovascular disease, elevated cholesterol levels and

	hypertension which are caused by everyday lifestyle habits (Trovato, 2012).
Recreational sports	Recreational sport includes a diverse range of sport for fitness and fun and includes instructional sport, informal sport, intramural sport, extramural sport, and club sport. Each of these five areas represents a variety of participant ability levels and interests (Mull, Forrester & Barnes, 2013).
Non-recreational sport	Non-recreational sport can also be referred to as leisure activities performed in leisure time and refer to activities, which are not work-orientated and do not involve life maintenance or life existence tasks such as housecleaning, eating and/or sleeping (Hurd & Anderson, 2011).
Lifestyle habits	The concept “lifestyle” refers to the way in which an individual lives and copes in his/her physical, psychological, social and economic environments on a day-to-day basis (Trovato, 2012).
Health status	Health status is a multidimensional concept, requiring multiple indicators and multiple methodologies for adequate measurement (Madans & Webster, 2015). Health status is thus the range of manifestation of disease in an individual including symptoms, functional limitation, and quality of life (Rumsfeld, 2002).

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION AND BACKGROUND

Individuals worldwide, including South Africans, are not living as healthily as they should. This is quite evident when considering the general health status and current state of well-being of many in our modern society (Gray & Vawda, 2018). The general health status of individuals, in its turn, is directly influenced by changes in lifestyle habits and the adaptation to rapid, unplanned urbanisation (UN, 2015). Changes such as forming unhealthy dietary habits, the sometimes frequent consumption and overconsumption of alcohol, tobacco usage, increased and constant stress and reduced sleep have even brought about new and alarming health threats (Acharya, Lin & Dhingra, 2018). These health threats increase the risk of developing chronic lifestyle diseases (CLD), such as cardiovascular disease (CVD), obesity and/or type 2 Diabetes Mellitus (type 2 diabetes) (UN, 2015; Keates et al., 2017).

There is an increase in the prevalence of CVD-related mortality and CLD in South Africa (Keates et al., 2017). It is estimated that in South Africa 215 people die daily due to CVD, making it one of the main causes of premature deaths in the country (Zuhlke, 2017). According to of South Africa, in 2016 at least 31% of global deaths were also related to CVD; of this 80% were premature deaths that could have been prevented with a healthy lifestyle (The Heart & Stroke Foundation, 2018). In South Africa specifically, CVD is responsible for 17.3% of premature deaths (The Heart & Stroke Foundation, 2016), whilst the American Heart Association (AHA) found that 34.4% of the American population is physically inactive with 13.2% presenting with CVD (AHA,2017). These statistics once again highlight the importance of a health-promoting lifestyle. Healthy lifestyle habits and an increased level of physical activity is an effective way to reduce the prevalence of CVD and improve an individual's general health status (Keates et al., 2017).

A health-promoting lifestyle is described as self-initiated actions and perceptions that serve to maintain and enhance the level of health and wellness (Bryer et al., 2013). Physical activity as one of the healthy lifestyle habits results in optimal health and the well-being of an individual (Olson et al., 2018). Lifestyle barriers, nonetheless, often

prevent individuals from taking care of their health and leads to poor lifestyle habits. These habits, as described earlier, are major risk factors to the occurrence of CLD (Groenewald, 2012; Bryer et al., 2013).

Linked to poor lifestyle habits and the consequent prevalence of CLD, the United Nations (UN) has set, as part of their 17 sustainable development goals for 2030, a goal to improve the global general health status of all individuals (UN, 2015). *Goal 3* specifically relates to healthy living and promoting well-being amongst individuals of all ages (UN, 2015). Mohammed and Ghebreyesus (2018) further relate *Goal 3* of the UN's sustainable goals to increasing levels of physical activity and reducing the occurrence of CLD. Despite the drive to improve the current health status globally, premature deaths due to CVD are still expected to rise by 40% by 2030, if a drastic change is not made to increase the level of physical activity and improve lifestyle habits in individuals (Keates et al., 2017). In support hereof, Romé et al. (2009) state that cardiovascular health is greatly improved through adequate levels of physical activity and the practice of healthy lifestyle habits.

Physical activity guidelines were created by the American College of Sports Medicine (ACSM) to promote and maintain a good general health status (Riebe et al., 2018). These guidelines were intended to be utilised by policyholders and health professionals for further prescription and monitoring of physical activity in the public (WHO, 2020c). According to Garber et al. (2011) there are alternative versions of physical activity guidelines, all of which are based on the guidelines proposed by the ACSM. They all, however, have the same basic recommendations for minimum health benefits. Even so, the ACSM guidelines remain the most highly recommended guidelines to be prescribed (Garber et al., 2011). Recently the ACSM guidelines were updated based on the latest scientific evidence highlighting its quality (ACSM, 2017).

When prescribing physical activity, it is commonly done in accordance with the FITT principles (Phillips & Kennedy, 2012). These principles cover the basic components necessary for the prescription of the optimal or possibly the most beneficial exercise programme, namely the *frequency* (F) and *intensity* (I) of the exercise, the suggested *time* (T) to ensure health benefits as well as the *type* (T) of exercise that needs to be performed (Phillips & Kennedy, 2012). According to the FITT principles, the recommended ACSM guidelines for physical activity is a *frequency* of at least three times a week at *moderate* and/or *vigorous intensity* (Olson et al., 2018). The *type* of

exercise recommended is aerobic exercise and can range from everyday duties such as occupational, recreational and domestic duties as well as transportation, such as walking to get a taxi or a bus. Physical activity can also be accumulated throughout the day (Garber et al., 2011) as long as the *time* spent on exercise is at least 150–300 minutes of moderate-intensity exercises or 75–150 minutes of vigorous exercises per week (Olson et al., 2018).

The most neglected physical activity of moderate- and vigorous-intensity is leisure-time physical activity (Moore et al., 2012). Leisure-time physical activity consists of activities such as recreational sport, cycling, swimming, and jogging (Olson et al., 2018). Recreational sport also has additional benefits such as improved social support and coping mechanisms for everyday stressors due to the support from teammates (Moore et al., 2012). Whilst Moore et al. (2012) allude to the relaxation effects of leisure-time physical activities, Olson et al. (2018) add that aerobic physical activity is most beneficial as it focuses specifically on improving cardiovascular health and preventing CVD.

There are many recognised health benefits associated with increased levels of physical activity and healthy lifestyle habits (Sezgin, 2019). These include improved muscle strength and joint flexibility, reduced stress, improved cognitive functioning, improved cardiovascular and cardiorespiratory functioning and neuromuscular awareness (Garber et al., 2011). Improving the general health status of an individual can prevent or limit the prevalence of CLD and lead to an improved general health status (Kastien-hilka et al., 2017). Increased levels of physical activity are also strongly associated with improved lifestyle habits (Losper, 2013).

Despite the numerous and widely reported benefits of physical activity, only 43% of South African males participate in leisure-time physical activity (Garber et al., 2011). When considering the barriers to participating in some form of physical activity, the decrease in physical activity may be linked to internal barriers such as a lack of time, a lack of self-motivation or even a lack of self-esteem (Nolan et al., 2011). Garber et al. (2011) added a lack of knowledge regarding the benefits of physical activity and the health risks associated with inactivity as yet another contributing factor to low levels of activity. Also, external barriers such as lack of facilities, a lack of safe environments and high crime rates were found to prevent or limit participation in physical activity (Nolan et al., 2011).

Current research indicates that general health status is not only represented by physical health status, as discussed above, but also by the mental health status of the individual. The physical and mental health status is determined by the influence of everyday encounters such a social, physical and emotional functioning (Pedisic et al., 2014). The World Health Organization (WHO) encourages healthcare professionals to integrate health promotion and the prescription of physical activity in their treatment intervention as this ensures that treatment is holistic and patient-centred (WHO, 2020c).

Health promotion can potentially enable people to increase control over their health and to subsequently improve their quality of life (QOL) (Walkeden & Walker, 2015). These interventions prescribed by healthcare professionals are seen as non-invasive treatment methods (Holm et al., 2015) and should be based on the current general health status of the individual and be aimed at restoring well-being and function (O'Donoghue et al., 2012).

1.2 PROBLEM STATEMENT

A major concern at the moment is the global population's current general health status (Sezgin, 2019). Low physical activity and unhealthy lifestyle habits can lead to a poor general health status (Sezgin, 2019). The practice of prescribed physical activity and healthy lifestyle habits over time have positive health benefits (Holm et al., 2015) and contribute to the prevention of CLD. Currently, the trend in physiotherapy clinical practice is that physiotherapists play a more curative role in these lifestyle conditions, as patients mostly seek physiotherapy intervention after injury. This trend is also portrayed in physiotherapy literature which focuses more on the treatment and rehabilitation of patients and not necessarily health promotion (Walkeden & Walker, 2015). This trend should be carefully interpreted as physiotherapy clinicians don't necessarily publish on their practice regularly.

Physiotherapists are in the ideal position to promote a healthy lifestyle and prescribe physical activity (Holm et al., 2015) during their contact with a wide variety of patient populations, ranging from healthy sport participating individuals to chronically ill patients. Physiotherapists are in many cases already involved with recreational sport teams where they are ideally placed to promote a healthy lifestyle. They also play a key role in primary healthcare by providing individuals with self-management

programmes to promote health and to prevent disease (O'Donoghue et al., 2012). However, for physiotherapists to shift their focus from being more curative to providing more preventative healthcare through health promotion, in line with the UN's sustainable development goals (as discussed earlier), baseline evidence on physical activity, lifestyle habits and general health status of different populations is needed as a starting point.

1.3 RESEARCH AIM

The primary aim of this research study was to investigate the physical activity levels, lifestyle habits and general health status of recreational sport participating and non-recreational sport participating adult males in Kimberley, the capital city of the Northern Cape Province, South Africa.

1.4 RESEARCH OBJECTIVES

To achieve the primary aim of the study, two research objectives were set, namely to:

- Determine and describe the physical activity levels, lifestyle habits and general health status of recreational sport participating and non-recreational sport participating adult males.
- Determine if any association exists between physical activity levels, lifestyle habits and general health status in recreational sport participating and non-recreational sport participating adult males.

1.5 RESEARCH METHODOLOGY

1.5.1 Research Design

A quantitative, case-control study design was used.

1.5.2 Study population and sampling methods

The sample population consisted of males between the ages of 25 and 35 years in Kimberley, Northern Cape Province. The recreational sport participating group included cricketers from Northern Cape Cricket participating in the promotional club league. The non-recreational sport participating group included individuals permanently employed in the Northern Cape government sector. Stratified sampling

by age was used, including 51 participants per group. More detail regarding the sampling technique is included in section 3.8.

1.5.3 Data collection tools

For the data collection, four questionnaires were utilised, namely: a demographic questionnaire (see Appendix H), the International Physical Activity Questionnaire (IPAQ) (see Appendix I), the Belloc and Breslow seven lifestyle habits questionnaire (see Appendix J) and the SF-36v2 Health Survey questionnaire (see Appendix K).

1.5.4 Data analysis

More complex data analysis was performed by the Department of Biostatistics at the University of the Free State (UFS) using Statistical Package for the Social Sciences (SPSS). Descriptive statistics, as analysed by the researcher, namely frequencies and percentages for categorical data, medians and ranges for continuous data were overseen by the Department of Biostatistics at the University of the Free State (UFS). Sample characteristics, level of physical activity, lifestyle habits and general health status for recreational sport participating and non-recreational sport participating groups were compared.

1.6 ETHICAL CONSIDERATIONS

Ethical clearance for this research study was granted by the Health Sciences Research Ethics Committee (UFS-HSD2017/0914) of the Faculty of Health Sciences, UFS (see Appendix A). Approval for the data collection was provided by Northern Cape Cricket (see Appendix B) and the head of each Northern Cape government department included in the study (see Appendix C-G). The questionnaires was available in Setswana, Afrikaans, and English, as these are the most commonly spoken languages in Kimberley. Written informed consent was provided by participants before voluntary participation in the study. Confidentiality of participant information was maintained through the use of numbers for each participant instead of personal identifiable information. Hard copy data was stored in a locked cabinet to which only the researcher had access and the electronic data files were saved as password-protected documents on the researcher's computer.

1.7 VALUE OF THE STUDY

This study provides baseline evidence on physical activity levels, lifestyle habits and general health status of recreational sport participating and non-recreational sport participating groups. Based on this evidence, the role of physiotherapists in preventative healthcare and health promotion is highlighted and some recommendations are included for physiotherapists to make a shift towards more preventative health care. Such a preventative approach promotes a better general health status, by including physical activity and healthy lifestyle habits to prevent CLD.

1.8 ORGANISATION OF THE DISSERTATION

The information included in this mini-dissertation is organised under the following chapters:

Chapter 1: Introduction and Background

Chapter 1 provides an overview of the content and layout for the research study.

Chapter 2: Literature Review

Chapter 2 is dedicated to providing an in-depth literature review discussing the literature relevant to the aims and objectives of the study. The literature review considers the general health status globally as well as in South Africa and relates health status to the two most important contributing factors, namely physical activity and lifestyle habits, and the impact thereof on general health status. The literature review also emphasises the significant role of health professionals, especially physiotherapists, in preventative health care.

Chapter 3: Research Methodology

Chapter 3 describes the research methodology used in the research study, including the study design, population, and sampling. The data collection and data analysis methods as well as the ethical considerations and measurement errors are also reported on in this chapter.

Chapter 4: Results

The results of the research study are presented in Chapter 4. A description of the results for each of the research groups (i.e. recreational sport participating and non-

recreational sport participating males) is presented while the association between physical activity, lifestyle habits and general health status is described.

Chapter 5: Discussion and Conclusion

This chapter provides an in-depth discussion of this research study's results in context with available research on general health status, physical activity and lifestyle habits. The conclusions, limitations and recommendations emanating from this research study are also presented in this concluding chapter.

1.9 CONCLUSION

This chapter provided a broad overview of the study, including aspects such as the background to the problem and problem statement, research aim and objectives, as well as the value of the study. Chapter 2 will provide a review of the relevant literature as it relates to the scope of this study.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter deals with literature related to general health status and the influence of lifestyle habits and physical activity on general health status. Furthermore, the influence that physical activity, such as recreational sport, has on an individual's general health status will be discussed as well as the role of physiotherapists in improving the general health status of individuals.

Articles were sourced via the EBSCO host platform including the following databases: CINAHL with full text, Medline with full text*, BMJ online*, Science Direct, and Google Scholar. The keywords that were used, in isolation and in different combinations, included physical activity, recreational sport, general health status, health professionals, physiotherapy, health promotion, and lifestyle habits. The search period extended up to and included articles published from 1 January 2009 to 30 June 2019.

2.2 GENERAL HEALTH STATUS

2.2.1 Definition of general health status

According to the WHO (2020a), "*health is a state of complete physical, mental and social well-being and not merely the absence of disease of infirmity".* The general health status of an individual is also influenced by social, cultural, economic, geographic and nutritional factors (Durstine & Moore, 2003). The presence of a chronic disease or disability further affects the general health status of an individual, as a restriction of activities of daily living can lead to distress affecting the individual's mental and physical well-being (Durstine & Moore, 2003).

2.2.2 Improving global general health status

The health status of a population can be improved by, amongst others, participating in regular physical activity and healthy eating (Durstine & Moore, 2003). Factors such as good lifestyle habits (see 2.3.2.2) carried out every day influence the general health status directly. In an effort to improve the general health status globally, strategies have been introduced to reduce the burden of disease around the world. Seventeen

sustainable developmental goals have been set by the United Nations (UN) for the year 2030 (UN, 2015). These developmental goals are aimed at encouraging and informing relevant stakeholders and health professionals on how to improve the general health status of the global community (UN, 2015). Out of the 17 goals, *Goal 3* is specifically aimed at ensuring healthy lives and promoting well-being for all people of all ages. The main objective, linked to *Goal 3*, is to reduce premature death resulting from non-communicable diseases (i.e. CLD) – such as cardiovascular disease, type 2 diabetes and hypertension – through prevention, treatment and health promotion (UN, 2015). Good lifestyle habits such as regular physical activity are associated with an improved life expectancy and an improved general health status (Kaptoge et al., 2018).

2.2.3 The role of physiotherapists in improving general health status

Physiotherapists can play an important role in addressing *Goal 3* of the UN's sustainable developmental goals, by improving health and well-being which could eventually lessen the burden of disease (Narain et al., 2016). Physiotherapists play an important role in the screening of patients and preventing complications of disease by means of education. Prescribing physical activity, also one of the key competencies of physiotherapists, is a behaviour modification that will improve lifestyle patterns and increase longevity in individuals (Narain et al., 2016).

Previous studies have found a positive correlation between physiotherapy interventions and general health status. In an occupational setting, physiotherapy interventions to improve an individual's work environment improved both the physical and mental health status (Pizzari & Davidson, 2013). In another study, patients in Denmark referred to physiotherapy treatment for musculoskeletal pain had lower physical and mental health status with poor defined diagnoses when compared to patients with a well-defined diagnosis. Based on the findings of the aforementioned study, the authors highlighted the importance of a holistic approach to physiotherapy treatment, rather than only focusing on the physical health status of patients (Jørgensen et al., 2001).

The next section explores physical as well as mental well-being in more detail, as these form the most important components of general health status (see 2.2.1).

2.3 PHYSICAL WELL-BEING

2.3.1 Definition of physical well-being

Physical well-being refers to the ability to perform physical activities and carry out social roles unhindered by physical limitations and experiences of bodily pain and biological health indicators (Capio et al. 2014). The presence of a disease or a chronic injury can thus influence the physical well-being of an individual.

2.3.2 Chronic lifestyle diseases

Chronic lifestyle diseases (CLD) are on the rise (Keates et al., 2017). Bernell and Howard (2016) allude to the possible misinterpretations and/or use of the word *chronic disease* in the literature. For the purposes of this study, chronic lifestyle diseases (CLD) include those diseases classified as chronic by the Centres for Disease Control and Prevention (CDC), namely heart disease, stroke, cancer, type 2 diabetes, obesity, and arthritis. In addition, chronic diseases classified by Harvard Medical School authors and based on the National Health and Nutrition Examination Survey (NHANES) data (1999–2004) – namely cardiovascular disease, hypertension, diabetes mellitus, hypercholesterolemia, asthma, chronic obstructive pulmonary disease (COPD) and previous cancer – are also included in this study.

2.3.2.1 Factors that precipitate CLD

Factors such as age, ethnicity, gender and lifestyle habits influence the development of CLD. The risk of developing CLD often occurs between the ages of 20 and 65 years, but in the presence of poor lifestyle habits, CLD can even present at a much younger age (Keates et al., 2017). Genetically, Africans are more predisposed to developing cardiovascular disease, because of the higher lipid levels found in their DNA (Keates et al., 2017). For the same reason (higher lipid levels), males are also more at risk of developing cardiovascular disease (Keates et al., 2017). Due to its significance in this study, lifestyle habits are described in more detail below.

2.3.2.2 Lifestyle habits

The concept “lifestyle” refers to the way in which an individual lives and copes in his or her physical, psychological, social and economic environments on a day-to-day basis

(Trovato, 2012). A healthy lifestyle improves the general health status of an individual by lowering the risk of developing CLD, being or becoming seriously ill or even early mortality (Takashi et al., 2013). On the other hand, poor lifestyle habits which include smoking, excessive alcohol consumption, an unhealthy diet, physical inactivity, and an increased Body Mass Index (BMI) (Kaptoge et al., 2018) contribute to a poor general health status and an increase in the prevalence of CLD (Takashi et al., 2013).

A lifestyle habit such as smoking is detrimental as it increases the risk of high blood pressure by weakening the blood vessel walls (Walkeden & Walker, 2015). In the Northern Cape alone, 52% of males have been diagnosed with hypertension, with half of the males smoking as well (Heart and Stroke Foundation, 2016). The practice of smoking tobacco deprives the body of necessary nutrients and oxygen which causes this weakness of the blood vessels and the heart muscle (Walkeden & Walker, 2015). Hypertension, in return, increases the risk of having a stroke (Zhang et al., 2016).

Unhealthy eating can lead to obesity and increased cholesterol levels, which are precursors for CLD. In the Northern Cape, Statistics South Africa (2016) reported that in 2015, 14.8% of the population were obese. Obesity is the increase of adipose tissue caused by unhealthy lifestyle habits and is linked to various CLD such as hypertension and type 2 diabetes (Wilding, 2010). The increased adipose tissue causes the heart to work harder to ensure that all areas of the body are perfused (Wilding, 2010). Obese individuals, therefore, need a higher cardiac output to assist the body, but the excessive adipose tissue makes effective perfusion more difficult (Wilding, 2010). Increased metabolic demands are placed on the heart from the increased cardiac activity and difficulty with perfusion resulting in an increased strain on the heart to perform (Wilding, 2010).

Obesity is also strongly linked to type 2 diabetes (Van Rooyen et al., 2010). Type 2 diabetes is a metabolic disorder mostly affecting the vascular system (Daya et al., 2016). When compared to the rest of Africa, South Africa is one of five sub-Saharan countries with a high percentage of type 2 diabetes (Keates et al., 2017). The prevalence of type 2 diabetes in South Africa was at 5.4% in 2015 (Zuhlke, 2017) and is on the rise. Type 2 diabetes combined with poor lifestyle habits and physical inactivity weakens the blood vessels and decreases circulation (Daya et al., 2016).

Keates et al. (2017) reported that in 2015, 40% of South African men presented with high cholesterol levels. High levels of cholesterol can be associated with or attributed to a genetic predisposition and/or poor dietary habits (Carraro et al., 2018). High cholesterol increases one's risk of cardiovascular disease by causing atherosclerotic plaques that occlude the arteries leading to ischaemic heart disease, which increases the risk for myocardial infarction (Masana et al., 2017). According to the Heart and Stroke Foundation of South Africa (2016), cardiovascular disease is the leading cause of disability and deaths globally and is responsible for 31% of the world's total deaths (Heart and Stroke Foundation, 2016). In South Africa alone, 215 people die from cardiovascular disease each day (Zuhlke, 2017), which equates to one in every six individuals (17.3%). Fortunately, 80% of cardiovascular-related deaths are preventable by adhering to a healthy lifestyle (Heart and Stroke Foundation, 2016).

2.3.2.3 The role of physiotherapy in preventing and managing CLD and promoting good lifestyle habits

Physiotherapists, with professional roles such as health promotion and disease prevention (Walkeden & Walker, 2015), can assist in reducing the prevalence of CLD through the education of patients on how to better manage their lifestyle habits. CLD can be prevented by behavioural changes such as adopting a more physically active lifestyle and breaking adverse habits such as smoking, excessive alcohol consumption and an unhealthy diet (O'Donoghue et al., 2012).

Through health promotion, physiotherapists can assist individuals and communities to improve their health-related fitness knowledge and increase their awareness of healthy living and healthy lifestyle habits (Garber et al., 2011). Health promotion also includes education on the amount and/or level of physical activity that should be performed to achieve health benefits as well as how this can be achieved (Holm et al., 2015). When indicated, physiotherapists can also refer individuals to other members of the interprofessional health care team to address unhealthy lifestyle habits.

Physiotherapists are equipped with the knowledge to understand the initial cause of disease and prescribe appropriate habitual lifestyle changes such as increased physical activity (Lowe et al., 2016). Physiotherapists are, furthermore, also aware of the high levels of physical inactivity within communities and have adequate knowledge

in musculoskeletal medicine (Lowe et al., 2016) to address this in an attempt to ultimately reduce the global prevalence of CLD.

2.4 PHYSICAL ACTIVITY

2.4.1 Definition of physical activity

Physical activity is defined as any body movement produced by the skeletal muscles that results in a substantial increase over resting energy expenditure (Lowe et al., 2016). Exercise is a sub-category of physical activity with the objective to improve or maintain physical fitness whilst physical activity includes exercise as well as any other activity which involves bodily movement (WHO, 2020b) South Africans, in particular, have low levels of physical activity with only 49% of men being physically active (Parker et al., 2017). Levels of physical activity are also found to be lower in those with CLD such as type 2 diabetes, hypertension and cardiovascular disease (Parker et al., 2017).

Physical activity is one of the most important actions that can be taken to improve mental and physical health to prevent CLD (Carraro et al., 2018) and improve life expectancy (Moore et al., 2012). Any form of physical activity has a magnitude of health benefits and can improve general health status at an individual level as well as at a community level.

Everyday physical activity can include work, domestic duties, transportation such as public transport, walking or using a motor vehicle, and leisure activities (Olson et al., 2018). Besides everyday activities to ensure that the recommended levels of physical activity are met, planned exercise such as leisure-time physical activity should also be incorporated into weekly schedules to ensure that the associated health benefits are achieved (Pate et al., 2009).

2.4.2 Benefits of physical activity

The two main physiological benefits of physical activity related to physiotherapy are the improvement of or increase in muscular strength and the improvement of aerobic capacity (Garber et al., 2011). Improved aerobic capacity improves the cardiovascular fitness level, which reduces fatigue and shortness of breath, improves cardiovascular health and makes performing everyday tasks physically easier (Garber et al., 2011). Physical activity also improves joint flexibility, bone mass, exercise tolerance (aerobic

capacity) and reduces body weight (Olson et al., 2018; Garber et al., 2011). A physically stronger body can decrease the risk of physical injuries – such as a fracture or a contusion – resulting from a fall (Olson et al., 2018). Daily physical activities will also be easier to perform owing to the increased physical strength (Sezgin, 2019).

The physical and mental benefits, as described above, highlight the influence physical activity has on functional status and general health status (Dhurup & Garnett, 2011). Physical activity is, therefore, found to be a key component in improving health and reducing the burden of disease (Pedisic et al., 2014). Despite the importance of physical activity, there is still a high rate of physical inactivity (see par.2.4.5) worldwide (Parker et al., 2017).

2.4.3 Guidelines for exercise prescription and achieving health benefits

The World Health Organization (WHO), the Centres for Disease Control and Prevention (CDC), the American Heart Association (AHA) and the American College of Sports Medicine (ACSM) have all proposed physical activity guidelines to improve health through physical activity.

In 1995, the ACSM published the first set of physical activity guidelines and along with the CDC released these recommendations to the public (Riebe et al., 2018). Since this release, there were many other organisations who released their own physical activity recommendations. In 1996, a report issued by the Surgeon General of the United States contained contradictory recommendations to what was released by the ACSM (Riebe et al., 2018). This resulted in major confusion amongst all health professionals using the ACSM physical activity guidelines (Riebe et al., 2018). Recently (in 2018) the AHA, ACSM and the WHO released agreed-upon physical activity guidelines to empower the public to improve their level of physical activity (Garber et al., 2011) and ultimately their general health status. These guidelines are also accepted globally and are in line with *Goal 3* of the UN's sustainable development goals (see 2.2.2).

The physical activity guidelines put forward by the ACSM are focused on strategies to increase physical activity on a daily basis by means of everyday physical activities (Riebe et al., 2018). It covers strategies that can be carried out in various settings such as at school, in the work environment and at home. With the rapid disadvantageous change in lifestyle and disease prevalence, a second edition was released by 2018 containing updated strategies and statistics (Riebe et al., 2018). According to these

ACSM recommendations, a minimum of 150–300 minutes of moderate-intensity aerobic exercises or 75–150 minutes of vigorous aerobic exercises per week is advised in order to achieve health benefits (Riebe et al., 2018). The more time spent participating in physical activity, the better the health benefits achieved. However, Kyu et al. (2016) warn that exceeding the optimal physical activity levels and intensity may cause detrimental effects on the body such as overexertion, cardiac arrest or muscle spasms.

2.4.4 Physical activity measurement

Physical activity is classified according to the intensity of the activity which is the total energy demands of the physical activity at hand (Garber et al., 2011). The exercise intensity can be measured according to calorie expenditure, oxygen uptake and metabolic expenditure, referred to as the *metabolic equivalent of task* (MET). However, these measurements do not take into consideration age, weight, gender and current fitness level (Garber et al., 2011). This can easily lead to misclassification of the physical activity and inappropriate prescription depending on the goal of the individual (Garber et al., 2011). Inappropriate prescription occurs when the physical activity is not age-appropriate, gender-specific and goal-orientated, which could lead to over-exhaustion, physical injury or an insignificant improvement in mental and physical health. The ACSM physical activity guidelines are expressed as MET-minutes per week or according to the maximum heart rate to ensure physical activity is sufficient to produce health benefits.

MET is a unit of energy expenditure and according to the World Confederation of Physical Therapy (WCPT, n.d.), one MET equals the energy used while sitting. The MET value for exercises is then calculated accordingly. Each physical activity has its own MET value, for example, the WCPT indicates that cycling is 7.5 METS, jogging is 6 METS and general household activities are 4 METS. To calculate the intensity of a physical activity, the METS value is multiplied by the number of minutes spent on the activity. For example, if someone cycles for 40 minutes, this is multiplied by 7.5 METS which equals 300 MET-minutes. If this activity is repeated for three days a week, the calculation will then be 3 days multiplied by 7.5 METS multiplied by 40 minutes which equals 900 MET-minutes. The whole week's MET-minutes are added to provide the total MET-minutes per week.

Besides MET-minutes per week, aerobic capacity can also be measured according to the maximum heart rate. This is the number of heart beats per minute that can be reached during physical activity before strain is placed on the heart (Garber et al., 2011). The maximum heart rate is calculated by subtracting the individual's age from 220 (Pate et al., 2009). Maximum heart rate can then distinguish whether the training intensity is moderate (40-60% of maximum heart rate) or vigorous (60-84% of maximum heart rate), taking age, fitness level and body composition into consideration (Pate et al., 2009).

MET-minutes per week and the maximum heart rate can be used interchangeably to express the intensity of the physical activity performed (Olson et al., 2018). It is accepted that vigorous physical activity is double the intensity of physical activity performed at a moderate level (Olson et al., 2018). For example, 75 minutes of vigorous physical activity is equivalent to 150 minutes of moderate physical activity. Therefore, 6 METS of physical activity at a vigorous intensity can be seen as 3 METS (i.e. half of the energy expenditure) of an activity at a moderate intensity (Olson et al., 2018).

When prescribing physical activity, the concept of the FITT-principles (*frequency*, *intensity*, *time* and *type*) is additionally recommended to organise physical activity and ensure all required aspects are covered (see 1.1) (Olson et al., 2018). The *frequency* refers to how often physical activity should be performed in a week (Olson et al., 2018). The *intensity* can either be moderate or vigorous depending on the effort exerted during exercise and can be measured by the percentage of the maximum heart rate or METS (Riebe et al., 2018). Everyday activities for moderate-intensity physical activity may be brisk walking, carrying light loads, gardening, mopping, moderately paced cycling and recreational level sports (Riebe et al., 2018). Vigorous physical activity can include activities such as jogging, cycling, swimming, aerobic dancing and tennis (Riebe et al., 2018). *Time* refers to the minutes spent on physical activity. Lastly, the *type* of physical activity recommended is aerobic physical activity (endurance training) as it is the best type of physical activity to enhance cardiovascular fitness (Garber et al., 2011). Aerobic recreational activities include endurance activities such as swimming, running and cycling (Riebe et al., 2018). Table 2.1 provides a layout on the guidelines for physical activity observing the FITT-principles, maximum heart rate and METS.

Table 2.1 ACSM physical activity guidelines

	FREQUENCY	INTENSITY	TIME	TYPE
Moderate aerobic physical activity	3 times a week	40-60% of maximum heart rate 3-6 METS	150 minutes per week	Aerobic physical activity
Vigorous aerobic physical activity	3 times a week	60-84% of maximum heart rate 6-12 METS	75 minutes per week	Aerobic physical activity

2.4.5 Barriers to physical activity

The barriers to participation in a physical activity can assist in identifying the reasons for inadequate levels of physical activity. Firstly, there is a lack of appropriate facilities such as sporting fields and gymnasiums in South Africa (Noorbhai, 2013). The risk of falling victim to crime may also prevent communities from engaging in physical activities in public spaces (Groenewald, 2012) as there are few safe spaces such as pavements and parks in certain areas.

Technology has made it possible to communicate, work, shop and bank from home (Noorbhai, 2013), becoming yet another barrier to physical activity. In modern society, individuals consequently do not have to move around by means of walking as much as before as public transport as well as vehicles are widely available and consequently also widely utilised.

Another barrier is that there is often a lack of motivation and interest amongst young adults to be physically active as the benefits of physical activity in young adults are not that apparent as one would expect or even hope for (Bloemhoff, 2010). Bloemhoff (2010) further reported that the level of physical activity decreases after leaving school and entering adulthood (Bloemhoff, 2010) with an added decline especially after the

age of 35 years in males (Dhurup & Garnett, 2011). Physical activity is organised and structured at school level and often there is encouragement from peers, educators, and parents (Ko et al., 2015). After leaving school, young adults have to make lifestyle choices for themselves. The decision to continue to exercise and to look after one's health and well-being will ensure a good general health status. The choices made and the healthy lifestyle habits followed after leaving school tend to persist through adulthood (Ko et al., 2015). Poor lifestyle habits in early adulthood, however, are risk factors to develop CLD and if not managed correctly contribute to premature mortality and disability (Ko et al., 2015).

2.4.6 Physiotherapy and exercise prescription

Physiotherapists, as health professionals, have the knowledge to prescribe exercises and incorporate everyday activities into a treatment programme considering current chronic diseases (O'Donoghue et al., 2012). Physiotherapists can easily promote healthy lifestyle habits such as physical activity and, in particular, promote recreational physical activity (Lowe et al., 2016). This is a way to simplify physical activity for the general public to ensure that it is understood and hopefully implemented. Specific everyday activities such as walking to work, using the stairs instead of elevators and escalators and domestic duties are all physical activities that can accumulate a certain amount of MET-minutes per week (Sezgin, 2019). If the required 500-1000 MET-minutes per week for substantial health benefits as recommended by the US Department of Health and Human Services are not achieved solely by these activities, recreational sport is an ideal option to supplement the number of MET-minutes per week. Apart from the physical benefits, recreational sport also has positive effects on the mental well-being of individuals (Elavsky & McAuley, 2007).

2.5 MENTAL WELL-BEING

2.5.1 Definition of mental well-being

Mental well-being is defined as a state of well-being in which every individual realises his or her own potential, is able to cope with the normal stresses of life and is able to work productively (WHO, 2020d). A weak mental state, poor lifestyle habits and a lack of medication contribute to an increased risk for CLD such as a stroke or cardiac arrest.

This results in impaired general health status and high health costs for hospitalisation, medication and doctor's consultations (Ruf et al., 2010).

2.5.2 Benefits of physical activity on mental well-being

Psychologically, physical activity improves cognitive function, reduces stress and anxiety and improves self-confidence (Patel et al., 2009). Concentration and memory are also improved with adequate physical activity. Such an improved mental state and reduced stress levels decrease blood pressure and eventually the risk of a stroke (Olson et al., 2018). In agreement with this, Vancampfort et al. (2018) found that aerobic and strengthening exercises improve mental health and reduce anxiety. The progressive muscle relaxation from leisure-time physical activity also reduces anxiety and psychological distress (Vancampfort et al., 2018).

Leisure-time physical activity, such as recreational sport, provides social support and motivation while participating in physical activity which allows for an improved mental state (Moore et al., 2012). Cricket, as a recreational sport, has both mental and physical benefits. Cricketers have to endure long periods of concentration, constant adaptation of strategies and performing different techniques (e.g. in batting, fielding, and bowling) all while participating in a game (Filbay et al., 2017). Due to this high level of mental training in cricket, it was found that cricketers that the benefits of continuing with their recreational participation for an extended period tend to present with an improved cognitive, perceptual skills and motor skills (Low et al., 2013).

2.5.3 The role of physiotherapy in mental health

In the past, physical health has been the main focus of physiotherapy, but in order for physiotherapy to impact the general health status of individuals and achieve *Goal 3* of the sustainable development goals, an additional focus on mental well-being is necessitated. Poor mental health influences the functional ability of an individual and ultimately his or her motivation to participate in physical activity (Delany et al., 2015). Physiotherapy can have a positive effect on both the physical and mental well-being of individuals through the promotion of participation in recreational sport.

2.6 RECREATIONAL SPORT

2.6.1 The role of recreational sport

Warner (2019) noted that the integration of physical activity, recreation and sport can lead to increased opportunities to improve health. Recreational sport participation is, therefore, a key element in the prevention of CLD and improving general health status (Edwards & Rowe, 2019). Any form of recreational sport participation is considered to be leisure-time physical activity with elements of exercise (Warner, 2019). Unlike conventional exercise, recreational sport participation occurs in a group setting which emphasises leisure and play, offers a social reward (Warner, 2019), creates a sense of belonging, and provides positive and motivating social interaction (Eime et al., 2015). Chen et al. (2017) agreed that recreational sport has physiological and psychological benefits by providing additional social interactions, but found the promotion of recreational sport by health professionals, such as physiotherapists, to be lacking.

2.6.2 Physiotherapy and recreational sport

Physiotherapists are in an ideal position to promote and/or implement recreational sport participation at a community level to improve the general health status of the community and to create awareness of healthy living (Chen et al., 2017). As mentioned in 2.4.2, the more physical activity participation, the less sedentary behaviour will occur due to positive habit formation, increased self-esteem and increased aerobic fitness levels (Freene et al., 2017).

Research on the role of physiotherapy in the promotion of recreational sporting activities is lacking. Despite physiotherapists being in the ideal position to promote physical activity such as recreational sport, as mentioned above, physical activity promotion by physiotherapists is still not optimally implemented (Freene et al., 2017). This limited promotion of recreational sporting activities by physiotherapists could be due to a lack of knowledge, especially when prescribing condition-specific physical activity (Freene et al., 2017). Based on this perceived lack of knowledge and the importance of physical activity, a gap in research on how physiotherapists can improve physical activity promotion is identified. To investigate the association between physical activity, lifestyle habits and general health status in recreational sport

participating and non-recreational sport participating individuals, cricket was chosen for this baseline study, as it is the most structured recreational sport in Kimberley. Cricket, as a recreational and/or non-recreational sport, is discussed in more detail below.

2.7 CRICKET

2.7.1 Definition of cricket

Cricket is a team sport and is one of the many sports that are played recreationally in South Africa. It is played as a club-based recreational sport mostly for adults from the age of 18 years. Club teams often play against each other at a provincial or even national level. Generally, cricket matches can be played as one-day games, multi-day games or in the format known as Twenty20 cricket (or Twenty-20, often abbreviated as T20) referring to games restricted to a maximum of twenty overs per team (Webster, 2017). Those who participate in cricket as a recreational sport may not be as physically fit as those who play professionally, but mental and physical health benefits are nonetheless still indicated and achieved (Webster & Travill, 2018).

2.7.2 Physical and mental well-being in cricket

Cricket, at all levels, is a technical game and a test of endurance – mentally and physically (Webster, 2017). Physically, cricket improves stamina, endurance (aerobic fitness) and hand-eye coordination as well as perceptual skills. According to Ainsworth et al. (2011), the MET value of cricket was updated to 4.8 METS in 2011 after the previous two versions of the *Compendium of Physical Activities* listed the MET value as 5.

Mentally, cricket participation is found to assist with retirement challenges. Psychological characteristics such as mental toughness, confidence and resilience is developed from playing long periods of cricket. (Filbay et al., 2017).

2.7.3 Cricket and physiotherapy

Physiotherapists play an important role in injury prevention and treatment, but currently, available research on the involvement of physiotherapists in cricket is related to professional cricket and not cricket as a recreational sporting activity (Barrett, 2019). On a recreational level, physiotherapists can play an important role in promoting cricket

to improve physical activity, especially in those who would like to participate in a recreational sporting activity, but do not necessarily want to participate in contact sport and stand the risk of injury. Cricket at an amateur level has a low injury prevalence rate and it has also been found to have additional mental benefits (Olivier et al., 2016) (see 2.5.2). Based on a physiotherapist's knowledge of exercise prescription and general health status, recreational cricket can be promoted by a physiotherapist for mental and physical health benefits as well as to increase general physical activity (Narain et al., 2016).

2.8 SUMMARY

Healthy living is promoted globally to reduce the occurrence of CLD, such as type 2 diabetes, hypertension, increased cholesterol levels and obesity (UN, 2015). Physiotherapists are in the ideal position to improve the general health status of individuals and communities, by providing education on healthy lifestyle habits and prescribing physical activity (Holm et al., 2015). Physical activity interventions, such as recreational sport participation, can be implemented to improve physical, mental and social well-being with minimal risk of injury (Garber et al., 2011) and concurrently reduce the prevalence of CLD and address the burden of disease (Chen et al., 2017). Cricket, as one of the mainstream recreational sports (Barrett, 2019), was used in this study to investigate the association between physical activity, lifestyle habits and general health status in recreational sport participating and non-recreational sport participating males.

Chapter 3 will now outline the methodology of this research study by explaining in detail the study population and sampling method, the inclusion criteria, measurement tools, the study procedure as well as details regarding the coding of data and data analysis.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter, the study methodology will be discussed, including aspects such as participant recruitment and ethical considerations. Measurement tools used in the study will be described, including their validity and reliability, scoring procedures and interpretation. The study procedure and data analysis are also included.

3.2 OUTLINE OF THE STUDY

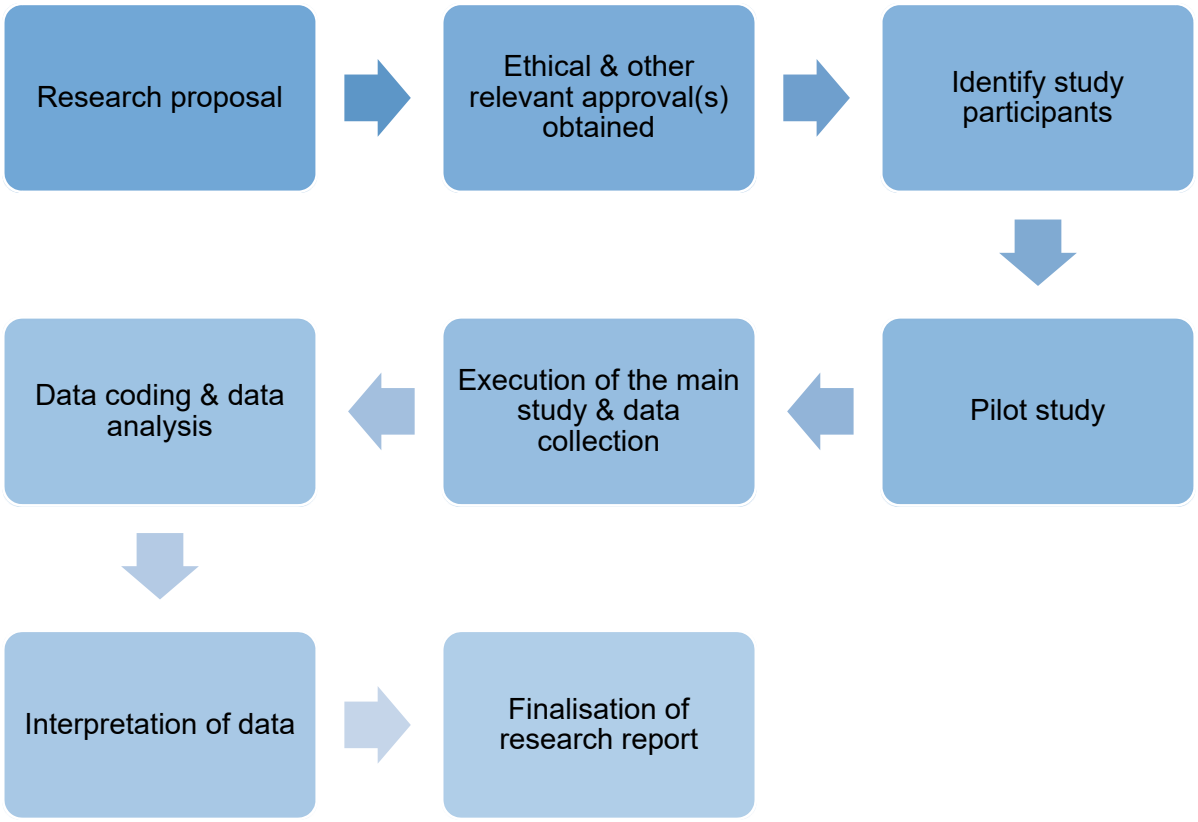


Figure 3.1 Outline of the study

3.3 RESEARCH AIM

The overall aim of this research study was to investigate the physical activity levels, lifestyle habits and general health status of recreational sport participating and non-recreational sport participating adult males in Kimberley, Northern Cape Province.

3.3.1 Research objectives

To achieve the overall aim of the study, two research objectives were set, namely to:

- Determine and describe the physical activity levels, lifestyle habits and general health status of recreational sport participating and non-recreational sport participating adult males.
- Determine if any association exists between physical activity levels, lifestyle habits and general health status in recreational sport participating and non-recreational sport participating adult males.

In order to realise the above-mentioned aim and objectives, the methodological process followed is discussed in detail below.

3.4 RESEARCH DESIGN

A quantitative research design was used in this case-control study to compare the general health status, lifestyle habits and physical activity levels of recreational sport participating and non-recreational sport participating participants.

3.5 DATA COLLECTION TOOLS

Data was collected using four questionnaires. These questionnaires included a self-developed demographic questionnaire as well as three standardised questionnaires, namely the International Physical Activity Questionnaire – Short Form (IPAQ-SF), Belloc and Breslow's seven lifestyle habits questionnaire, and the Standard Health & Well-being Survey – Short Form (SF-36v2) (Appendices H–K). Each of these measurement tools will be discussed in more detail below.

3.5.1 Demographic questionnaire

3.5.1.1 Description of demographic questionnaire

A self-developed demographic questionnaire was used to collect information on age, occupation, language and morbidities such as hypertension, congestive cardiac disease, type 2 diabetes, obesity and high cholesterol levels (see Appendix H). This questionnaire was designed to gather basic information on the participants and the information on morbidities was essential to link morbidities to the level of physical activity and general health status. Content validity was enhanced through the inclusion of morbidities identified through an extensive literature review.

The questionnaire was translated into Afrikaans and Setswana and then back-translated into English by the Unit of Language Facilitation at the University of the Free State (UFS) to ensure that no meaning was lost or the context of any of the questions changed.

3.5.2 International Physical Activity Questionnaire – Short Form (IPAQ-SF)

3.5.2.1 Description of the International Physical Activity Questionnaire – Short Form (IPAQ-SF)

The IPAQ-SF is a standardised, self-administered questionnaire which measures the level of physical activity amongst any given population. Three levels of intensity of physical activity are included, namely walking, moderate-intensity activities, and vigorous-intensity activities. Each question asks for the time (in minutes) and the number of days on which these activities were performed in the last seven days, only to ensure its relevance (see Appendix I). The IPAQ-SF was found to a reliable tool to measure the level of physical activity in a given population (Craig et al., 2003).

3.5.2.2 Validity and reliability of the International Physical Activity Questionnaire – Short Form (IPAQ-SF)

From 2000 to 2003 the IPAQ-SF underwent reliability and validity testing in twelve different countries, the countries being South Africa, the United Kingdom, the United States of America, Australia, Japan, the Netherlands, Portugal, Brazil, Finland, Canada, Guam and Swaziland (Craig et al., 2003). The IPAQ-SF was then standardised across these 12 countries (including South Africa). A test-retest was

performed to determine the standardisation of the questionnaire and a coefficient of 0.8 was found indicating high repeatability (Craig et al., 2003).

Craig et al. (2003) found the short form of the IPAQ to have a reliability coefficient of 0.96, indicating that for the test and retest, the IPAQ has good repeatability. Similar to Craig et al. (2003), a study was conducted by Dhurup and Garnett (2011) who found the IPAQ to have a reliability coefficient of 0.89 for repeatability. Concurrent validity was used to differentiate between the groups' capabilities and a median of 0.80 was found which indicated a good validity (Dhurup & Garnett, 2011).

The IPAQ-SF has been found to be feasible, reliable and valid for use in the South African context (Holm et al., 2015; Losper, 2013; Pengpid & Peltzer, 2013; Bloemhoff, 2010).

3.5.2.3 Scoring and interpretation of the International Physical Activity Questionnaire – Short Form (IPAQ-SF)

Each individual's activity levels were scored by multiplying the number of minutes indicated per activity level with the number of days spent on each activity level. The total number of minutes over the last seven days spent on walking, moderate-intensity and/or vigorous-intensity activities were then multiplied by the MET value for each activity (3.3, 4.0 and 8.0 respectively) to calculate the total MET-minutes for each activity. The MET-minutes for all activities during the past week were then added together to indicate MET-minutes per week (www.ipaq.ki.se) for physical activity (see Table 3.1).

Table 3.1 Calculation of MET-minutes per week

Level of physical activity	MET-minutes per week calculation
Walking	3.3 x minutes x days
Moderate physical activity	4.0 x minutes x days
Vigorous physical activity	8.0 x minutes x days
Total MET-minutes per week = Walking + Moderate-intensity + Vigorous-intensity.	

The level of physical activity according to intensity was then classified using the MET-minutes per week and categorised into low, moderate, and high levels of physical activity using a specific classification system as included in Table 3.2 (www.ipaq.ki.se).

Table 3.2 MET-minutes per week classification

Level of physical activity	Low	Moderate	High
Metabolic expenditure of task (MET-minutes per week)	<600 MET-minutes per week	600-3000 MET-minutes per week	>3000 MET-minutes per week

3.5.2.4 User agreement

The IPAQ-SF and long-form, including the questionnaire and manual, are freely available online to download from the official website (International Physical Activity Questionnaire Homepage, n.d.).

3.5.2.5 Language availability of the IPAQ

The IPAQ is available in English but had to be translated for use in this study. According to the IPAQ website, the IPAQ can be translated as long as the wording remains the same. The questionnaire was translated into Afrikaans and Setswana and then back-translated into English by the Unit of Language Facilitation at the UFS to ensure that no meaning was lost or the context of the questions changed.

3.5.3 Belloc and Breslow seven lifestyle habits questionnaire

3.5.3.1 Description of the Belloc and Breslow seven lifestyle habits questionnaire

The Belloc and Breslow seven lifestyle habits questionnaire is a standardised questionnaire that measures the practice of current healthy lifestyle habits. Belloc and Breslow (1972) reported their lifestyle habit questionnaire to be based on the causes of chronic lifestyle diseases. Belloc and Breslow (1972) also stated that if the lifestyle habits mentioned below were followed, there would be a decrease in the occurrence of diseases and it would lead to increased longevity and prevention of chronic

diseases. The seven optimal lifestyle habits are: eating three meals a day without in between eating, having breakfast every day, participating in moderate physical activity at least two to three times a week, not smoking, reduced alcohol consumption, having seven to eight hours of sleep a night, and maintaining a healthy body weight (Belloc & Breslow, 1972) (see Appendix J). This questionnaire has also been used in a number of previous studies to determine lifestyle habits (Malan, 2019; Dreyer & Merwe, 2015; Losper, 2013).

3.5.3.2 Validity and reliability of the Belloc and Breslow seven lifestyle habits questionnaire

The Belloc and Breslow seven lifestyle habits questionnaire is widely accepted in Western and Asian countries and has been used in many studies in Japan over the last 40 years as reported by Noguchi et al. (2015). In the South African context a number of authors have also found it to be valid and adequate for assessing lifestyle habits (Malan, 2019; Dreyer & Merwe, 2015; Losper, 2013).

3.5.3.3 Scoring and interpretation of the Belloc and Breslow seven lifestyle habits questionnaire

Participants were required to indicate their current lifestyle habits by answering “yes” or “no” to the seven healthy habit questions posed. The “yes” responses were allocated a numerical score of 1 and the “no” responses a numerical score of 0. The scores were tallied to give a total score out of 7. The total score was then used to classify each individual’s level of healthy lifestyle habits (Losper, 2013) (see Table 3.3).

Table 3.3 Lifestyle habit classification

Classification	Response score
Healthy Lifestyle	6-7 positive responses
Moderate Lifestyle	4-5 positive responses
Poor Lifestyle	3 or less positive responses

3.5.3.4 User agreement for the Belloc and Breslow seven lifestyle habits questionnaire

The Belloc and Breslow seven lifestyle habits questionnaire is accessible for use from the original article (Belloc & Breslow, 1972).

3.5.3.5 Language availability of the Belloc and Breslow seven lifestyle habits questionnaire

The Belloc and Breslow seven lifestyle habits questionnaire is available in English and was translated for use in this study. The questionnaire was translated into Afrikaans and Setswana and back-translated to English by the Unit of Language Facilitation at the UFS, to ensure that no meaning was lost or the context of the questions changed.

3.5.4 Standard Health & Well-being Survey – Short Form (SF-36v2)

3.5.4.1 Description of the SF-36v2

The SF-36v2 is a revised and improved version of the SF-36. It was updated in 2009 by *QualityMetric Incorporated* to better suit the current population and to make the questionnaire more compact. The SF-36v2 is a standardised questionnaire that determines the general health status and well-being of an individual (Maruish, 2011) (see Table 3.4).

Table 3.4 Description of SF-36v2 subscales

	Subscale	No. of questions	Short description	High score interpretation	Low score interpretation
PHYSICAL COMPONENT SUMMARY (PCS)	Physical functioning (PF)	10	Activities you might do during a typical day	Little or no limitations	Significant limitations
	Role-physical (RP)	4	The influence of physical health on work and/or daily activities	Little or no influence	Significant influence
	Bodily pain (BP)	2	The interference of bodily pain with daily activities	No pain and no interference	High levels of pain and high interference
	General health (GH)	5	The individual's view of his/her health	Favourable health	Poor health
MENTAL COMPONENT SUMMARY (MCS)	Vitality (VT)	4	Energy level and fatigue	Feeling full of energy	Tiredness and being worn-out
	Social functioning (SF)	2	The interference of physical and emotional problems on social activities	No interference	Extreme and/or frequent interference
	Role-emotional (RE)	3	The influence of emotional health on work and/or daily activities	Little or no influence	Significant influence
	Mental health (MH)	5	The influence of psychological well-being (including anxiety, depression, loss of behavioural/ emotional control)	Experiencing peace, happiness and/or feeling calm	Feeling nervous and/or depressed

The SF-36v2 component analyses showed that there are two distinct concepts measured by the SF-36v2, namely physical as well as mental health, represented respectively by the Physical Component Summary (PCS) and the Mental Component Summary (MCS). All dimensions contribute to these two concepts in different proportions.

3.5.4.2 Validity and reliability of the SF-36V2

The uniformity of the SF-36v2 questionnaire was determined by measuring internal reliability. The Cronbach coefficient for the SF-36v2, as a measure of internal consistency, was determined as 0.821 for the mental and physical component score and >0.70 for the subscales. Both of these scores indicate good internal consistency. The split-half reliability (0.798) was used to measure the internal stability of the questionnaire. The Spearman-Brown prediction indicated that the SF-36v2 is relatively stable (0.798) and the test-retest reliability has relatively good stability (>0.70) (Qu et al., 2010).

Structural validity was determined by means of factor analysis and a coefficient value of 0.50 indicated relatively good structural validity of the questionnaire (Qu et al., 2010). Bunevicius (2017) also tested the validity of the questionnaire using convergent validity testing. The coefficient result was >0.70 indicating adequate internal consistency.

The SF-36v2 has previously been used in the South African population by Nel (2016) as well as Van Aartsen and Van Aswegen (2018) and was found to be a feasible, reliable and valid measure for establishing self-perceived mental and physical general health status in a South African population.

3.5.4.3 Scoring and interpretation of the SF-36v2

The correct calculation of the SF-36v2 PCS and MCS requires the use of special algorithms, which are strictly controlled by a private company. The raw data for the SF-36v2 was entered into a quality metric health outcome scoring software program, named OPTUM, for recording and scoring. The response of each participant was entered and the software was able to calculate the total for each domain as well as for the PCS and MCS. Figure 3.2 indicates the step-by-step process whereby the OPTUM software calculated the PCS and MCS (Maruish, 2011).

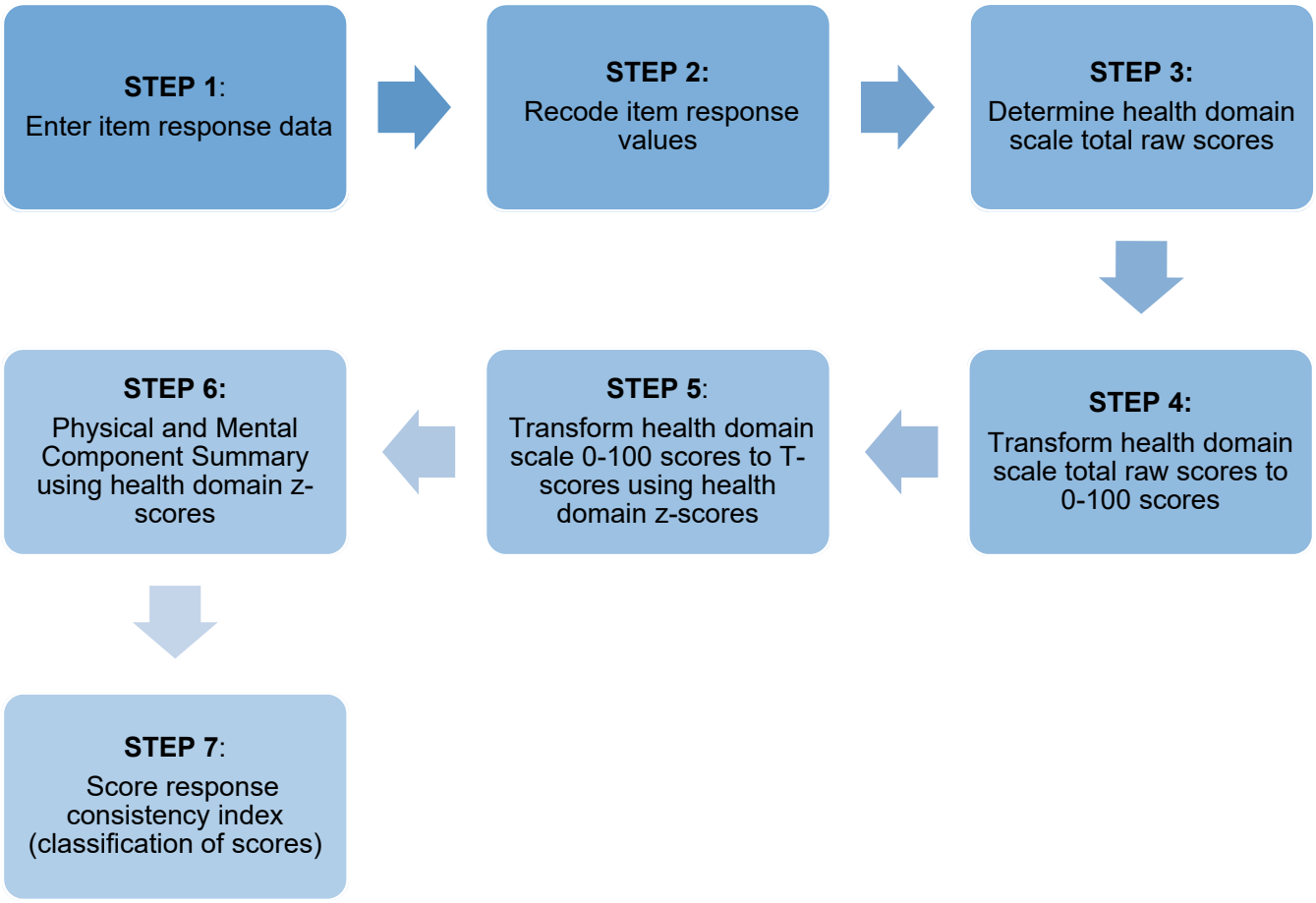


Figure 3.2 OPTUM step-by-step calculation of the mental and physical component summary

The software program also classified the mental and physical component summary according to the level of general health status for each of the participants. A higher score indicates a better general health status (Maruish, 2011) (see Table 3.5).

Table 3.5 SF-36v2 classification (Physical and Mental Component Summary)

Level of Classification	Scoring out of 100
Above Average	Above 55
Average	45-55
In between	40-44
Below Average	Below 40

3.5.4.4 User agreement

A user agreement was signed with OPTUM and a fee was paid for the use of the SF-36v2 questionnaire. Access to capture and administrate data was permissible for one year.

3.5.4.5 Language availability

The questionnaire was received from the licensing company, OPTUM, in English, Afrikaans, and Setswana.

3.6 ETHICAL CONSIDERATIONS

Before conducting the study, ethical clearance was obtained from the Health Sciences Research Ethics Committee, Faculty of Health Sciences, at the UFS (UFS-HSD2017/0914) (see Appendix A). Approval to conduct this research study was also obtained from the Northern Cape Cricket board (see Appendix B), the Director-General of the Northern Cape as well as the Heads of the respective government departments (see Appendices C-G).

All the questionnaires and the information documents were available in English, Afrikaans, and Setswana, in line with the language demographics of the Kimberley region. Participation in this study was voluntary and written informed consent was obtained from all participants prior to participation in this study. Confidentiality of participant information was maintained by assigning numbers to participants' questionnaires, to also ensure that participants would not be identifiable. Questionnaires were kept in a safe, locked environment that only the researcher had access and the electronic data files were saved as password-protected documents on the researcher's computer.

The research study was conducted at a place of convenience for participants. No remuneration was offered or provided to the participants.

3.7 STUDY POPULATION

The study population consisted of recreational sport participating and non-recreational sport participating males in Kimberley, Northern Cape Province, South Africa.

3.8 SAMPLING

The case and control group participants were selected based on their recreational sport participating or non-recreational sport participating status. Stratified sampling, according to age, was used to include participants in the case and control groups. After stratification adults with ages between 25 – 35 years were included.

3.8.1 Case group

Recreational cricket is a structured amateur sport in Kimberley making the inclusion of these players into a research study convenient. All 28 amateur cricket clubs in Kimberley, which form part of the promotional league, were included in the study population. The promotional league consists of six promotional A and six promotional B teams, each with 12 cricketers who follow the same exercise program and have the same number of matches. From the 28 amateur cricket clubs included in the study population, five clubs (the first five that consented to participation) were randomly selected for this study. Study participants were recruited from the promotional A and B teams of these five clubs. A sample size of approximately 50 was planned and those who first fulfilled the inclusion criteria (see below) and agreed to participate in the study were included, eventually including participants from five promotional A teams.

Inclusion criteria

- All male recreational cricketers playing in the randomly selected cricket clubs during the 2016-2017 season.
- Adults aged between 25 and 35 years.
- Participants who provided written informed consent for their participation.

The case group study sample consisted of 51 male adult recreational cricketers.

3.8.2 Control group

The control group consisted of male adults who do not participate in any organised recreational sport e.g. an amateur sport club, irrespective of whether they participated in any other form of sport. For the recruitment of study participants for the control group, all five provisional government departments in Kimberley were included in the study population, as they conveniently provided access to a large number of people with a varying age distribution. The provincial government departments included were

the Departments of Health, Education, Agriculture, Land Reform and Rural Development, Roads and Public works and Social Development (Appendices C-G). Fifty-one participants, stratified with the ages from the control group participants and fulfilling the inclusion criteria, provided consent and were included as participants in this study.

Inclusion criteria

- Males who do not participate in organised recreational sport.
- Adults aged between 25 and 35 years.
- Participants who provided written informed consent for their participation.

3.9 PILOT STUDY

The pilot study was conducted, after ethical clearance and the relevant permissions from the authorities were obtained, in line with the final protocol as approved by the HSREC (see 3.6). Around 10% of the sample size of each group was included in the pilot study, thus six participants from the case group and six participants from the control group. The pilot study took place two weeks prior to the execution of the main study, while the pilot study for the case and control groups took place on two separate days. Case participants were selected from one of the included cricket clubs and control participants from the Department of Health.

The pilot study served several purposes. Participants included for the pilot study were selected from the various language demographics represented in Kimberley in order that the English, Afrikaans, and Setswana versions of the questionnaires could be tested. The ease of administration and understanding of the questionnaires were also tested. The pilot study also served to determine how much time was needed by participants to complete the questionnaire.

In addition, the pilot study served to test the feasibility of the recruitment process at the cricket clubs and various government departments. The data collection process in its entirety was piloted in order to identify any logistical challenges which needed to be addressed before the execution of the main study.

The recruitment and data collection procedures posed no challenges and were found to be feasible. The venues for the recruitment and data collection for both the case and control groups were comfortable, spacious, and well ventilated. No challenges were

experienced by the participants with the use of the various language versions of the questionnaires and participants understood all the questions. Participants were able to complete all the questionnaires independently within approximately 30 minutes.

No changes were made to the study procedure or data collection tools following the pilot study. The results from the pilot study were, therefore, included in the main study.

3.10 EXECUTION OF THE MAIN STUDY

Following ethical clearance, the recruitment of both the case and control groups commenced. The recruitment procedure for both the case and control group is outlined in the following sections.

3.10.1 Recruitment procedure for the case group

The Northern Cape Cricket board granted written permission for the researcher to contact the team managers to inform them about the study. The team managers then had to provide permission for the researcher to contact the team members of the selected teams (see Appendix B). The five team managers were contacted telephonically by the researcher to set up a meeting at the cricket stadium on a Saturday during the data collection period. At these scheduled team meetings, the researcher verbally informed the cricketers about the aim of the study and what it entails. All interested cricketers were provided with an information sheet to read (see Appendix L). Participants were given a reasonable time to read through the information sheet and consider their participation. Participation was voluntary and those cricketers who decided to participate and who met the inclusion criteria (see above) were provided with written informed consent documents to complete before their participation in the study (see Appendix M).

3.10.2 Recruitment procedure for the control group

Each of the five government departments who provided permission to partake in the study was visited by the researcher to inform them of the study. All potential participants were invited to participate and verbally informed by the researcher as regards the aim of the study and what the study entails at their official weekly departmental meeting. Participation was voluntary, and government employees who met the inclusion criteria were invited to participate and provided with an information

sheet to read (see Appendix N). Reasonable time was provided to potential participants to read through the information sheet and consider their participation. Government employees who were willing to participate remained behind after the closing of the meeting. They were then provided with written informed consent documents to complete before their participation in the study (see Appendix M).

Once participants were recruited, the same data collection procedure was followed for both the control and the case groups (see below).

3.10.3 Data collection procedure for both the case and control groups

The data collection for the nine cricket teams and five government departments took place as scheduled in two sessions for each participant group, due to the time restrictions of both the researcher and the participants to complete all questionnaires during one session. With the first session the demographic questionnaire, the IPAQ-SF, and the Belloc and Breslow seven lifestyle habits questionnaire (see Appendices H-J) were completed, with the SF-36v2 Health Survey (see Appendix K) completed during the second session.

The data collection sessions for the control group were completed first by allocating one cricket team per Saturday, over a period of nine consecutive weeks, repeated twice. The two data collection sessions thus took place within 9 weeks for each participant group, to limit changes in physical activity, lifestyle factors and general health status of participants (see Table 3.6). If players immediately agreed to participate after recruitment (see 3.9.1), the questionnaires for the first session were then handed out to them in their language of choice. The questionnaires were handed to the participants in hard copy format along with pens and clipboards. The researcher was available at all times to clarify any uncertainties. The researcher collected the questionnaires after completion, checked them for completeness and stapled each participant's questionnaires together. The completed questionnaire sets for each participant were immediately placed in a sealed box, which was only accessible to the researcher. The data collection took approximately 30 minutes per session.

Once the two nine-week cycles for the case group were completed, the researcher followed the same procedure in two five-week cycles for the non-recreational sport participating (control) group.

3.11 CODING OF QUESTIONNAIRES

On completion of the data collection for both the case and control groups, the completed questionnaires were removed from the sealed boxes by the researcher, coded, and the coded data were subsequently entered into an Excel spreadsheet. This procedure was used for the demographic questionnaire, the IPAQ-SF, and the Belloc and Breslow seven lifestyle habits questionnaire. The coded data were double-checked by the researcher to ensure accuracy. Spot checks, to ensure the correctness of the captured data, were also performed by an external individual.

For the SF-36v2 datasheet, the raw scores were entered into the OPTUM software by the researcher. The software calculated the PCS and MCS reflecting the health status of each participant. The data was again double-checked by the researcher and spot checks were also performed by an external individual to ensure accuracy and correctness.

3.12 DATA ANALYSIS

Data analysis was performed and overseen by the Department of Biostatistics at the University of the Free State (UFS) using Statistical Package for the Social Sciences (SPSS). Descriptive statistics, namely frequencies and percentages for categorical data, medians and ranges for continuous data were calculated. Sample characteristics, level of physical activity, lifestyle habits and general health status for recreational sport participating and non-recreational sport participating groups were compared.

3.13 MEASUREMENT ERRORS

The possible measurement errors that could have occurred in this research study as well as suggestions for future studies are explained in Table 3.6.

Table 3.6 Measurement errors

Possible Measurement Errors	Explanation of methodology	Suggested future methodology
Time-lapse between data collection sessions	Questionnaires were completed in two separate sessions for all participants, due to time constraints for both the researcher and the participants. The two sessions were conducted within a maximum time lapse of nine weeks to limit variance in physical activity, lifestyle habits, and general health status.	All questionnaires should be completed in one session. Participants should be informed in advance regarding the time needed to complete all questionnaires in one session.
Population limitation	In a small population of under 100 participants, the SF-36v2 was found not to be very effective and should be used in larger populations only (Xu et al., 2012). This research study included just over 100 participants in total, fulfilling the criteria set by Xu et al. (2012).	Future studies should aim at including a 100 participants in each group (i.e. case and control group)
SF-36v2	This questionnaire was found not to take age and gender into consideration which may influence the results (Maruish, 2011).	In this research study participants in the case and control groups were only males and stratified according to age and therefore results were not influenced.

Validity and reliability of measurement tools	The IPAQ-SF, the Belloc and Breslow seven lifestyle habits questionnaire and the SF-36v2 are all patient-reported questionnaires. The accuracy is based on the participants' perception of physical activity, well-being and lifestyle habits which could have an influence on the results.	Participants were requested to make a mental note of their lifestyle for the week ahead. In future studies participants could be asked to document their lifestyle for that week to help them to recall the information more accurately.
Errors could occur during data collection due to participants misunderstanding the questions in the questionnaires	A pilot study was performed to test the English, Afrikaans, and Setswana versions of the questionnaires. The ease of administration and understanding of the questions in the questionnaires were tested. The researcher was also available during data collection in the main study to answer any questions that arose.	Performing a pilot study is essential to test the user-friendliness of the questionnaires. It is also advisable that the researcher be available during data collection to address any queries.
Researcher is unfamiliar with the procedure and the measurement tools	By performing the pilot study the researcher was able to familiarise herself with the necessary procedures for data collection related to the outcome measures.	Always perform a pilot study to ensure the study procedure runs smoothly and the researcher is familiar with the measurement tools.

Errors could occur during the finalisation and capturing of data	The data capturing was rechecked by the researcher before data analysis. Data were also cross-checked after capturing by an external individual.	Re-checking the captured data before data analysis and cross-checking the data entered, preferably by an external individual, is essential to ensure accuracy and reliability of captured data and study results.
Errors could occur during the analysis and interpretation of data	Data analysis was performed by the Department of Biostatistics, UFS, in accordance with the information stipulated in the approved study protocol.	The Department of Biostatistics at the UFS performed the data analysis to improve the accuracy of the data analysis, as data analysis is not necessarily part of the researcher's skill set. The interpretation of analysed data was, however, performed by the researcher herself.

3.14 SUMMARY

This chapter explained the research methodology and execution of this study in detail. Possible measurement errors were identified and the actions taken to prevent them were explained. Against the background of the research methodology, design and procedures, Chapter 4 will consist of a detailed layout of the results obtained during this research study.

CHAPTER 4

RESULTS

4.1. INTRODUCTION

The results for this research study will be presented in this chapter in the form of tables and figures. Demographic characteristics, level of physical activity, lifestyle habits and general health status of males, participating in recreational sport, and age-matched peers, not participating in recreational sport, in Kimberley, Northern Cape in South Africa will be described and compared. The association between physical activity levels and health habits; and between physical activity levels and physical and mental health status for the two groups were also determined.

4.2 PARTICIPANT RECRUITMENT

One hundred and two participants were recruited for this study, 51 participants who participated in recreational sport and 51 who did not participate in any recreational sport.

4.3. DEMOGRAPHIC CHARACTERISTICS

Demographic characteristics of the participants included age, occupation and the presence of co-morbidities of interest (see Table 4.1).

Table 4.1 Demographic characteristics

Variable (n=102)	**Recreational sport participating group (n=51)** Frequency (%)	**Non-recreational sport participating group (n=51)** Frequency (%)
Unemployed	3 (5.9%)	0
Employed	48 (94.1%)	51 (100%)
Occupations		
Medical Professional	1 (2%)	8 (15.7%)
Finance	7 (13.7%)	9 (17.7%)
Construction	2 (3.9%)	0
Education	3 (5.9%)	5 (9.8%)
Mine worker	5 (9.8%)	0
Trained craftsman	2 (3.9%)	0
Policeman	2 (3.9%)	0
South African Defence force	2 (3.9%)	0
Admin Clerk	8 (15.7%)	**19 (37.2%)**
Other	**16 (31.4%)**	10 (19.6%)
Language		
Afrikaans	**24 (47.1%)**	20 (39.2%)
English	21 (41.2%)	10 (19.6%)
Setswana	6 (11.8%)	**21 (41.2%)**
Illnesses		
Hypertension	4 (7.8%)	2 (3.9%)
None	47 (92.2%)	49 (96.1%)

As mentioned in Chapter 3 (see 3.8), the participants were stratified according to age with the age of both groups ranging between 25 and 35 years and the mean age being 28 years. The majority of participants in the non-recreational sport participating group were admin clerks (37.2%) and Setswana speaking (41.2%). In the recreational sport participating group with regard to occupation 31.4% of participants indicated *Other* (which included occupations not listed in the questionnaire for example sales, consultants and marketing) and 47.1% were Afrikaans speaking. Most of the recreational (92.2%) and non-recreational (96.1%) sport participating group reported not having any illnesses. The only illness reported was hypertension, in respectively 7.8% of the recreational sport participating group and 3.9% of the non-recreational sport participating group. Other illnesses included in the questionnaire were type 2 diabetes, high cholesterol, obesity, congestive cardiac failure and cardiac arrhythmia (see Appendix H).

4.4 THE PHYSICAL ACTIVITY LEVELS, LIFESTYLE HABITS AND GENERAL HEALTH STATUS OF RECREATIONAL SPORT PARTICIPATING AND NON-RECREATIONAL SPORT PARTICIPATING ADULT MALES

In this section, the descriptive statistics are included separately for each questionnaire namely International Physical Activity Questionnaire, Bellow and Breslow seven lifestyle habits questionnaire and SF-36v2 health study.

4.4.1 Physical activity levels

The IPAQ (see 3.5.2; Appendix I) was used to determine the levels of physical activity of participants. The total MET-minutes per week are reported as medians with ranges in Table 4.2. The median is reported as the range of the data is wide and contains outliers i.e. non-parametric data.

Table 4.2 MET-minutes per week

MET-minutes (n=102)	**Recreational sport participating group (n=51)** Median [Range]	**Non-recreational sport participating group (n=51)** Median [Range]
Vigorous MET- minutes/week	**1920 [0-34560]**	0 [0-2880]
Moderate MET- minutes/week	**720 [0-5040]**	480 [0-9600]
Walking MET- minutes/week	**495 [0-12474]**	330 [0-7920]
Total MET- minutes/week	**3045 [720-40500]**	1125 [0-17520]
Sedentary time	300 [0-600]	**420 [0-560]**

The recreational sport participating group presented with higher medians for all levels of physical activity as well as total MET-minutes per week. The non-recreational sport participating group had a higher median for sedentary time than the recreational sport participating group and a median of 0 for vigorous physical activity.

The IPAQ's specific criteria were used to classify the levels of physical activity of participants as either high, moderate or low according to their MET-minutes achieved per week (see Table 4.2). The results are presented as frequencies and percentages in Table 4.3.

Table 4.3 Classification of level of physical activity based on MET-minutes per week.

Level of physical activity (n=102)	**Recreational sport participating group (n=51)** Frequency (%)	**Non-recreational sport participating group (n=51)** Frequency (%)
Low	**0 (0%)**	**14 (27.5%)**
Moderate	25 (49%)	32 (62.7%)
High	**26 (51%)**	**5 (9.8%)**

No participants in the recreational sport participating group were classified as having low levels of physical activity compared to 27.5% of participants in the non-recreational sport participating group. At the other end of the classification, 51% of participants in the recreational sport participating group and only 9.8% in the non-recreational sport participating group achieved high levels of physical activity.

A cross tabulation of physical activity according to age was also done and is presented in Figure 4.1. Greater variation in physical activity between the recreational sport participating group (group A) and the non-recreational sport participating group (Control group) was noted for the 25- to 29-year age range.

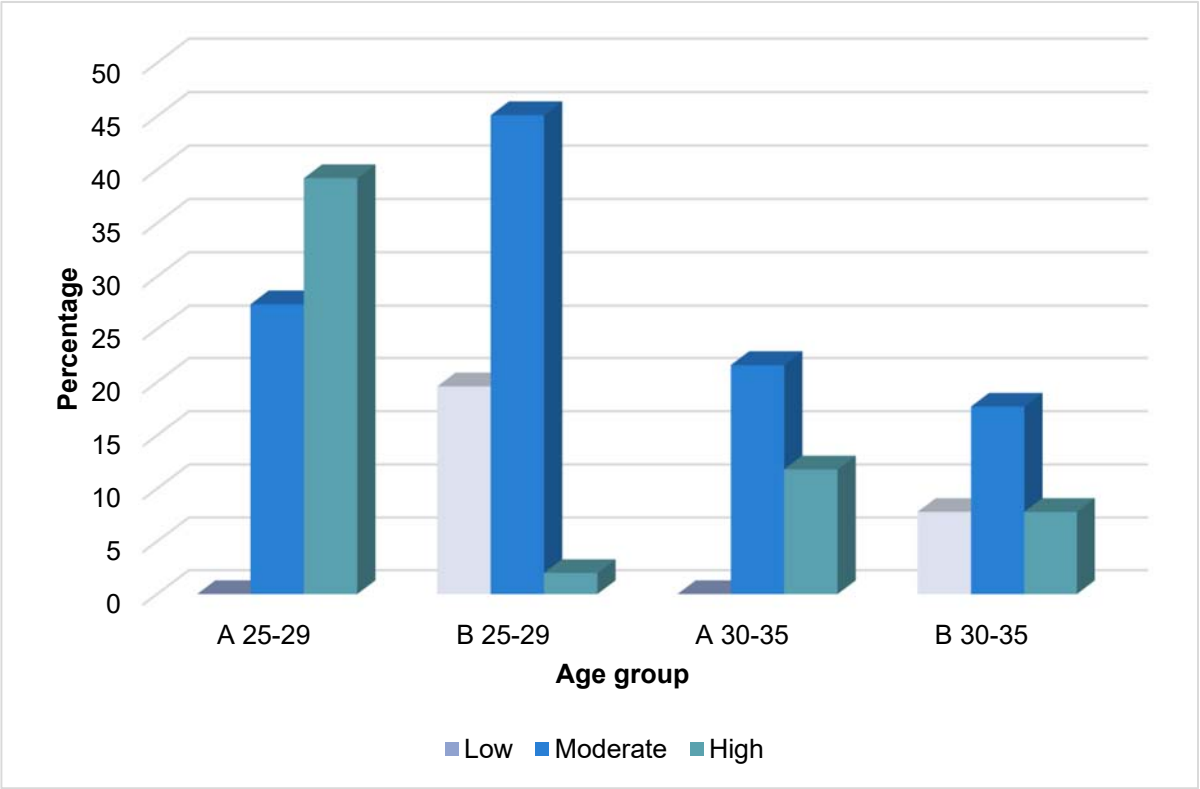


Figure 4.1 Physical activity according to age

4.4.2 Lifestyle habits

The lifestyle habits of participants were determined using the Belloc and Breslow's seven healthy lifestyle habits self-report questionnaire (see 3.5.3; Appendix J). The practice of healthy lifestyle habits of participants is reported as frequencies with percentages in Table 4.4.

Table 4.4 The practice of healthy lifestyle habits

Lifestyle habits (n=102)	**Recreational sport participating group (n=51)** Frequency (%)	**Non-recreational sport participating group (n=51)** Frequency (%)
Eats three meals a day	14 (27.4%)	8 (15.6%)
Eats breakfast	22 (43.1%)	30 (58.8%)
Participates in regular physical activity	**48 (94.1%)**	**38 (74.5%)**
Gets 7 to 8 hours of sleep	**24 (47.0%)**	**7 (13.7%)**
Non-smoker	24 (47.0%)	28 (54.9%)
Maintaining of healthy body weight	35 (68.6%)	38 (74.5%)
Consumption of little or no alcohol	36 (70.5%)	33 (64.7%)

**Bold values indicate the most notable results.*

More recreational sport participating participants reported participating in regular physical activity (94.1%) and getting sufficient sleep (47%) when compared to non-recreational sport participating participants (74.5% and 13.7%, respectively). The groups' eating habits as well as habits regarding tobacco use, maintaining a healthy body weight and alcohol consumption were comparable.

The lifestyle habits of participants were classified as healthy, moderately healthy or poor using measure-specific criteria (see 3.5.3.3). The classification outcomes are presented as frequencies with percentages in Table 4.5.

Table 4.5 Classification of lifestyle habits

Classification of lifestyle habits (n=102)	**Recreational sport participating group (n=51)** Frequency (%)	**Non-recreational sport participating group (n=51)** Frequency (%)
Healthy lifestyle habits	**4 (7.8%)**	**4 (7.8%)**
Moderately healthy lifestyle habits	29 (56.9%)	24 (47.1%)
Poor lifestyle habits	**18 (35.3%)**	**23 (45.1%)**

According to the self-reported lifestyle habits, the same number of participants in both groups (7.8%) were classified as healthy. More participants in the non-recreational sport participating group reported having poor lifestyle habits (45.1%) than in the recreational sport participating group (35.3%). When looking at the number of healthy lifestyle habits met by participants in both groups, a median of four was achieved.

A cross tabulation of lifestyle habits according to age was also done and is presented in Figure 4.2. Greater variation in lifestyle habits between the recreational sport participating group (group A) and the non-recreational sport participating group (Control group) was noted for the 25 to 29-year age range.

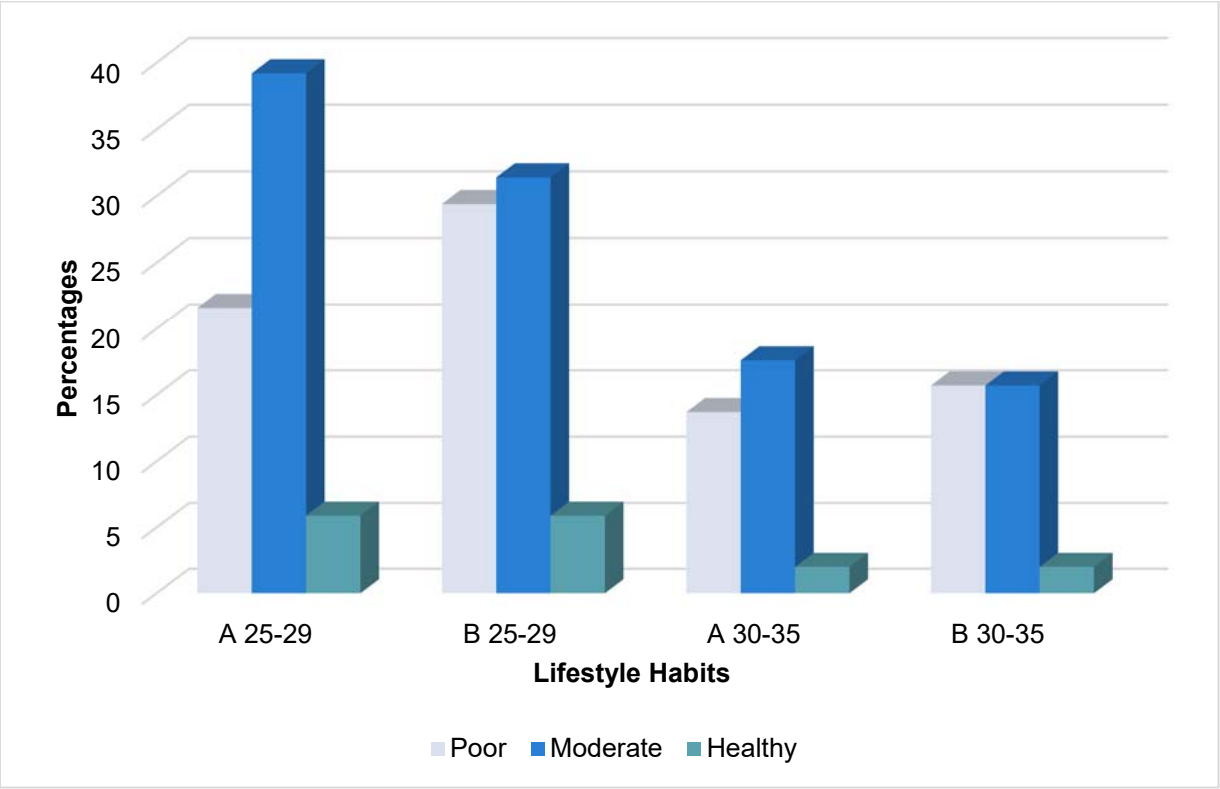


Figure 4.2 Lifestyle habits according to age

4.4.2.1 Physical activity levels and lifestyle habits

Physical activity levels were cross-tabulated with lifestyle habits according to the classification included in Table 4.3 and Table 4.5. In this study the majority of the participants in both groups had a moderate level of physical activity and a moderate level of healthy lifestyle habits (33.3%). However, the difference between the two groups were in the recreational sport participating group having no combined low levels of physical activity and poor levels of lifestyle habits, whilst in the non-recreational sport participating 19.6% of participants had such low and poor combined levels (see Table 4.6).

Table 4.6 Physical activity and lifestyle habits

Groups (n=102)	Physical activity levels	Lifestyle habits		
		Poor Frequency (%)	**Moderate** Frequency (%)	**Healthy** Frequency (%)
Recreational sport participating group (n=51)	Low	**0 (0%)**	0 (0%)	0 (0%)
	Moderate	8 (15.7%)	**17 (33.3%)**	0 (0%)
	High	10 (19.6%)	12 (23.5%)	4 (7.9%)
Non-recreational sport participating group (n=51)	Low	**10 (19.6%)**	4 (7.9%)	0 (0%)
	Moderate	11 (21.6%)	**17 (33.3%)**	4 (7.9%)
	High	2 (3.9%)	3 (5.8%)	0 (0%)

4.4.3 General health status

The SF-36v2 is used to measure general health status from the participant's point of view. The physical and mental health status of the participants, presented as component summary (PCS and MCS) scores is taken as a reflection of their general health status (see 3.5.4). The results are reported as medians with ranges in Table 4.7.

Table 4.7 SF-36v2 component summary scores (PCS and MCS)

Component score (n=102)	**Recreational sport participating group (n=51)** Median [Range]	**Non-recreational sport participating group (n=51)** Median [Range]
Physical Component Summary (PCS)	**52.7 [30.5-59.8]**	**51.7 [34.5-61.3]**
Mental component Summary (MCS)	**50.7 [35.5-60.3]**	**45.1 [24-54.7]**

The PCS scores for both groups were similar whereas the MCS score for the recreational sport participating group (50.7) was higher than for the non-recreational sport participating group (45.1).

The PCS and MCS scores were classified as below average, in-between, average and above average (see 3.5.4). This classification is given as frequencies and percentages in Table 4.8.

Table 4.8 Classification of PCS and MCS Scores

Classification (n=102)		**Recreational sport participating group (n=51)** Frequency (%)	**Non-recreational sport participating group (n=51)** Frequency (%)
Physical Component Summary (PCS)	Below Average	3 (5.9%)	1 (2.0%)
	In-between	2 (3.9%)	1 (2.0%)
	Average	**38 (74.5%)**	**40 (78.4%)**
	Above average	8 (15.7%)	9 (17.6%)
Mental Component Summary (MCS)	Below Average	2 (4.0%)	7 (13.7%)
	In-between	7 (13.7%)	14 (27.4%)
	Average	**38 (74.5%)**	**29 (56.9%)**
	Above average	4 (7.8%)	1 (2.0%)

The majority of participants in both groups' PCS and MCS scores were classified as having an *average* PCS and MCS score. The PCS scores were comparable but the recreational sport participating group had higher scores within the *average* classification for the MCS (74.5%) than the non-recreational sport participating group (56.9%).

4.4.4 General health status and lifestyle habits

4.4.4.1 MCS and lifestyle habits

When considering MCS and lifestyle habits, the majority of the participants in the recreational sport participating group (45%) presented with moderately healthy lifestyle habits and an average MCS score. In the non-recreational sport participating group, an equal percentage of participants (25.4%) presented with moderately healthy lifestyle habits and an average MCS score, and poor lifestyle habits and an average MCS score (see Table 4.9).

Table 4.9 MCS and lifestyle habits

Groups (n=102)	**Mental Component Summary (MCS) score**	**Lifestyle habits**		
		Poor Frequency (%)	**Moderate** Frequency (%)	**High** Frequency (%)
Recreational sport participating group (n=51)	Below Average	1 (2%)	1 (2%)	0 (0%)
	In Between	2 (3.9%)	3 (5.9%)	2 (3.9%)
	Average	14 (27.4%)	**23 (45%)**	1 (2%)
	Above average	1 (2%)	2 (3.9%)	1 (2%)
Non-recreational sport participating group (n=51)	Below Average	3 (5.9%)	3 (5.9%)	1 (2%)
	In between	6 (11.8%)	8 (15.7%)	0
	Average	**13 (25.4%)**	**13 (25.4%)**	3 (5.9%)
	Above Average	1 (2%)	0	0

4.4.4.2 PCS and lifestyle habits

PCS and lifestyle habits were cross-tabulated and the majority of the participants in the recreational sport participating group (43.2%) presented with moderately healthy lifestyle habits and an average PCS score. In the non-recreational sport participating group, the majority of the participants (37.2%) presented with poor lifestyle habits and an average PCS score (see Table 4.10).

Table 4.10 PCS and lifestyle habits

Groups (n=102)	**Physical Component Summary (PCS) score**	**Lifestyle habits**		
		Poor Frequency (%)	Moderate Frequency (%)	High Frequency (%)
Recreational sport participating group (n=51)	Below Average	1 (2%)	0 (0%)	2 (3.9%)
	In Between	0 0 (0%)	2 (3.9%)	0 0 (0%)
	Average	14 (27.4%)	**22 (43.2%)**	2 (3.9%)
	Above average	3 (5.9%)	5 (9.8%)	0 0 (0%)
Non-recreational sport participating group (n=51)	Below Average	0 0 (0%)	1 (2%)	0 0 (0%)
	In between	0 0 (0%)	0 0 (0%)	1 (2%)
	Average	**19 (37.2%)**	18 (35.3%)	3 (5.9%)
	Above Average	4 (7.8%)	5 (9.8%)	0 0 (0%)

4.5 THE ASSOCIATION BETWEEN PHYSICAL ACTIVITY LEVELS AND THE GENERAL HEALTH STATUS

The reliability of the SF-36v2 for the two domains of general health status namely PCS and MCS was calculated by means of Cronbach's alpha before associations could be calculated. The Cronbach's alpha for the PCS was .511 and for the MCS .708. As the Cronbach's alpha for PCS was below .6, the reliability of the individual subscales were considered. With the exclusion of the general health (GH) subscale, the Cronbach's alpha increased to .676, indicating that for this study's specific population, participants could have misinterpreted these specific questions influencing the reliability of this subscale. The GH subscale contributes mostly to the calculation of the PCS and therefore it was excluded in the calculation of the associations. Associations were then calculated for the remaining MCS and individual subscales, namely for the PCS the subscales physical functioning (PF), role-physical (RP), and bodily pain (BP) were included and for the MCS, vitality (VT), social functioning (SF), role-emotional (RE) and mental health (MH). Table 4.11 displays the associations between physical activity levels (total METs) and the above-mentioned subscales.

Table 4.11 Pearson correlations between physical activity levels and PCS and MCS subscales

	Case group Recreational sport participating group (n=51)						Control group Non-recreational sport participating group (n=51)					
	MH	BP	VT	RE	RP	MCS	MH	BP	VT	RE	RP	MCS
Total METs	-.340*	-.368**					-.349*					
MCS	.762**		.530**	.337*			.714**		.662**	.766**		
MH			.570**						.542**			
RE					.342*				.317*			
SF		.347*					.278*	.312*	.333*			
PF		.407**				-.522**		.590**			.345*	

*p<0.05 (2-tailed); **p<0.01 (2-tailed). A positive correlation at the p<0.01 level is indicated in green text and a negative correlation at the p<0.01 level in red text. Correlations at the p<0.05 level is indicated in black text.

MH: Mental Health; BP: Bodily pain; VT: Vitality; RE: Role-emotional; RP: Role-physical; MCS: Mental component summary; PF: Physical functioning; SF: Social functioning.

Statistically significant high correlations were found between the MCS and MH for both groups ($p<0.001$) as well as for the MCS and RE ($p<0.001$) in control group.

Moderate statistically significant correlations were found between the MCS and VT ($p<0.001$), between MH and VT ($p<0.001$) as well as PF and BP ($p>0.001$ for case group and $p<0.05$ for control group) for both groups.

Low statistically significant correlations were found for case group between MCS and RE ($p<0.05$) and between RE and RP ($p<0.05$). For control group, low statistically significant correlations were found between RE and VT ($p<0.05$), SF and MH ($p<0.05$), PF and RP ($p<0.001$) as well as SF and VT ($p<0.05$). The only low statistically significant correlation between a subscale of the PCS and a subscale of the MCS was found for both groups between SF and BP ($p<0.05$).

In the recreational sport participating group (case group), a low statistically significant negative correlation was found between the total MET-minutes per week and BP ($p<0.05$).

Unexpectedly, a low statistically significant negative correlation was found between total MET-minutes per week and MH for both groups ($p<0.05$) and a moderate statistically significant negative correlation between PF and MCS for case group ($p<0.001$).

4.6 SUMMARY

This chapter reported the descriptive statistics as well as associations between physical activity, lifestyle habits and general health status. In chapter 5, these results will be discussed and conclusions made. Limitations and recommendations will also be included.

CHAPTER 5
DISCUSSION AND CONCLUSION

5.1 INTRODUCTION

The results of the study as presented in Chapter 4 will be discussed in this chapter and compared to available published research. Possible reasons for the findings will be provided and the chapter will conclude with recommendations emanating from the study as well as a discussion on the limitations encountered during the course of study.

5.2 DEMOGRAPHIC PROFILE OF PARTICIPANTS

Males were chosen as study participants in this study as it was found that males in general are more physically active than females and are more prone to participate in recreational sporting activities (Bloemhoff, 2010). The participants were stratified according to age and the study included participants aged 25-35 years as it has been reported that there is often a decrease in physical activity after leaving school (Pengpid & Peltzer, 2013). Lifestyle habits adopted after leaving school and entering adulthood tend to carry through as age increases, therefore setting healthy lifestyle habits in early adulthood is beneficial in the long term (Noorbhai, 2013).

The majority of the participants reported being in good health with hypertension the only illness reported by 11.7% of the participants (see Table 4.1). This is to be expected as the age range of the study sample was between 25-35 years. When comparing these results to other countries, the results in this study was slightly higher than that found in the USA, with 7.3% of males between the ages of 18 and 39 years diagnosed with hypertension. The occurrence of hypertension globally among adult males (older than 19 years) is 20% (Keates et al., 2017), thus being higher than that reported in this study. As age increases there is a reduction in the elasticity of the blood vessels which can also be brought on earlier in life by poor diet or the lack of exercise. In males aged between 18 and 65 years in the Northern Cape, South Africa, 52% reported having hypertension (Statistics South Africa, 2016). While ethnicity has an influence on the occurrence of

hypertension, with Africans being more prone to develop hypertension because of the high level of lipids found in their genetic makeup (Keates et al., 2017), ethnicity was not enquired about in this study.

5.3 PHYSICAL ACTIVITY LEVELS

In the current research study, recreational sport participating participants reported achieving more vigorous, moderate and walking MET-minutes per week compared to the non-recreational sport participating group (see Table 4.2). As would then be anticipated, their overall physical activity (total MET-minutes per week) was also found to be higher than the non-recreational sport participating group (see Table 4.2). This is confirmed by results indicating 51% of participants from the recreational sport participating group reporting high levels of physical activity compared to only 9.8% of participants in the non-recreational sport participating group (see Table 4.3). No participants in the recreational sport participating group were categorised in the low physical activity category with 27.5% of participants categorised as such in the non-recreational sport participating group. According to these results, participating in recreational sport positively influences the total physical activity and MET-minutes per week achieved. Sufficient physical activity has many health benefits which are well described in literature and includes lowering the risk of CVD, hypertension and diabetes mellitus Type 2. Additionally, physical activity also has positive effects on mental and physical health. The clustering of risk factors including physical inactivity as well as poor diet and smoking has also been associated with ill health (Forrester & Arterberry, 2006).

According to the ACSM (2017), between 500 and 1000 MET-minutes per week is required to achieve health benefits and reduce the risk of early morbidity and CVD. The WHO, as referenced by Kaminsky and Montoye (2014) states that at least 1200 MET-minutes a week is required to provide health benefits, with higher MET-minutes per week associated with still greater health benefits (Sezgin, 2019). According to the median values for MET-minutes per week for both groups (see Table 4.2), they achieved the required MET-minutes per week to achieve health benefits. This demonstrates that MET-minutes per week can be accumulated through a variety of physical activities and not only through recreational sporting activities. This is in agreement with research which shows that

physical activity to achieve health benefits can be accumulated by including activities from many domains such as occupational, transport (public transport), recreational and household chores (Kyu et al., 2016). Accumulating physical activity by everyday activities can be supplemented by recreational sport to reach higher MET-minutes per week as can be seen by the recreational sport participating group in this study presenting with more than double the median MET-minutes per week (see Table 4.2). It is anticipated that the recreational sport participating group would achieve greater health benefits as a result of their increased physical activity.

A 4% reduction in chronic disease was found when participating at a level of 600-3600 MET-minutes per week, whereas only a 2% reduction was found with activities totalling more than 9000 MET-minutes per week (Kyu et al., 2016). This shows that too vigorous physical activity can overwork the body and diminish the benefits of physical activity (Kyu et al., 2016). Of all the participants in this study, only 9.8% achieved more than 9000 MET-minutes per week which may lead to adverse effects. When considering individual values, 33.3% of the participants achieved fewer than 1200 MET-minutes and 13.7% of these achieved below 500 MET-minutes per week, thus not reaching the total MET-minutes per week for optimal health benefits. Factors influencing physical activity will be discussed below.

5.3.1 Factors influencing physical activity participation

In this study, the non-recreational sport participating group, in particular, presented with low levels of physical activity (see Table 4.3). Maintaining levels of physical activity after the age of 18 has been found to be a challenge globally and can be seen by rising inactivity levels (Pengpid & Peltzer, 2013). The level of physical activity decreases dramatically after leaving school and this might occur because many schools have structured sporting activities which encourage sporting participation (Bloemhoff, 2010). Sport participation is also encouraged by the support from peers and parents at a school level (Pengpid & Peltzer, 2013).

The barriers to physical activity in students and the working population are a lack of time, a lack of motivation, and low self-esteem (Bloemhoff, 2010). In South Africa, a lack of

access to exercising facilities and high crime rates also prevent many from walking or running outside, and plays a role in inactivity (Bloemhoff, 2010). Modern technology – for example the use of cell phones and computers for communication, the ease of online shopping and the possibility of concluding business transactions online – also contribute to a more sedentary lifestyle (Dhurup & Garnett, 2011) which in its turn reduces the MET-minutes per week accumulated through activities of daily life. Changes in transportation due to improved technology and convenience – such as Ubers, taxis and delivery services (Noorbhai, 2013) – also reduce physical activity, although in South Africa, a large portion of the population are still dependant on walking as their main transport method. In the non-recreational sport participating group, the high MET-minutes per week for sedentary activities can be as a result of sedentary activities especially due to clerical work occupations (Noorbhai, 2013)(see Table 4.1).

Globally, 23.4% of adult men and 17.9% of sub-Saharan African men are reported to be insufficiently physically active (Guthold et al., 2018), which is comparable with the 27.5% in this study (see Table 4.2). As there is a strong link between physical inactivity and major non-communicable diseases, the WHO has advocated for a 10% relative reduction in insufficient physical activity by 2025, as one of the nine global targets to improve the prevalence of non-communicable diseases (UN, 2015). From the results of my study it is clear that recreational sport improves the level of physical activity and total MET-minutes per week which will have health benefits and may prevent disease in the long run.

In South Africa, cricket is a popular sport played on both a professional and recreational level (Webster, 2017). A certain level of fitness is required to carry out the skills and techniques required for cricket (Webster, 2017). Due to the interchanging roles players participate in during a cricket match, cricket also contributes to improve mental health and, thus, to improve the player's general health status (Webster & Travill, 2018). For these reasons recreational cricket was chosen as the focus point for this study in order to collect baseline information on the effect of participation in recreational sport on the general health status and physical activity levels of Northern Cape Cricketers (see 4.3 and 4.11). The results from this study may also provide valuable information and proposed recommendations to physiotherapists within the field of health promotion and disease prevention (see 2.2.3 and 5.7).

5.3.2 The role of the physiotherapist in prescribing physical activity

The role of a physiotherapist is, amongst others, to improve health and well-being in individuals, which can result in the prevention of disease and ultimately reduce the burden of disease (Narain et al., 2016), as also envisaged by the WHO through their sustainable developmental goals (see 2.2.3). Prescribing physical activity as a behaviour modification tool to improve lifestyle patterns and increase longevity in individuals is one of the main interventions suggested by Narain et al. (2016). Results from this study support Narain et al. (2016) as it indicated the positive effect of participation in recreational sport on achieving more MET-minutes per week (see Table 4.2) and, therefore, physiotherapists can by introducing and/or facilitating recreational sport participation such as cricket, reach larger portions of the population and make an important positive contribution to health promotion, disease prevention and reducing the burden of disease. These positive outcomes of an increase in physical activity could be further enhanced if individuals combine such activity with healthy lifestyle habits, as will be discussed in the next section.

5.4 LIFESTYLE HABITS

Lifestyle habits play an important role in enhancing an individual's general health status (Bryer et al., 2013; Losper, 2013) and even to increase life expectancy (Kaptoge et al., 2018). Most of the recent available literature identify five health habits of importance in adulthood, namely following a healthy diet, exercising regularly, keeping a healthy body weight, not drinking too much alcohol, and not smoking (Borgan et al., 2015)(see 2.3.2.2). Belloc and Breslow's lifestyle habits, the questionnaire used in this study, enquire about eating three times a day and eating breakfast whereas Borgan et al. (2015) identify a healthy diet as one of their five lifestyle habits. The other four lifestyle habits are consistent with Belloc and Breslow's seven lifestyle habits. Sufficient sleep is also included by Belloc and Breslow as a healthy lifestyle habit whereas it is not identified by Borgan et al. (2015). Lifestyle barriers (see 2.3.2.2) often prevent individuals from taking care of their health, resulting in poor lifestyle habits such as tobacco usage, alcohol consumption, and unhealthy eating habits and which are major risk factors to the occurrence of illness (Bryer et al., 2013; Groenewald, 2012).

In the current research study, the majority of participants from both groups presented with moderately healthy lifestyle habits (see Table 4.5). In South Africa, a study conducted by Losper (2013) – and using the Belloc and Breslow seven lifestyle habits questionnaire – found that individuals in their third year at university had moderately healthy lifestyle habits when compared to the first-years, who presented with healthy lifestyle habits. The age group of the third-year students are closer to the age group of participants in this study (25-35 years) and could be a reason for the comparability of results.

Researchers found that men in the United States who maintained the healthiest lifestyles were 82% less likely to die from CVD and 65% less likely to die from cancer when compared to those with the least healthy lifestyles over the course of a 30-year study period (Kyu et al., 2016). This clearly highlights the important role physiotherapists can play in advocating healthy lifestyle habits in the general population (either in recreational sport participating individuals or non-recreational sport participating individuals).

The next section specifically considers the Belloc and Breslow lifestyle habits investigated in this research study (see 2.3.2.2; Appendix J).

- **Sufficient sleep**

More participants in the recreational sport participating group indicated getting sufficient sleep at night when compared to the non-recreational sport participating group (see Table 4.4). Less than seven hours sleep per night has been found to negatively influence an individual's general health status (Liu et al., 2018). Inadequate sleep over time is also linked with poorer mental health and psychological morbidities such as depression, difficulty in maintaining attention throughout the day, delayed response time and poor memory (Pagan, 2017). The recreational sport participating group had positive associations between physical activity and physical and mental emotional health, i.e. minimal physical and emotional problems (see Table 4.11). This is in agreement with literature that states that physical activity, in particular recreational sport, improves the emotional status of an individual (Eime et al., 2015). Enhanced sleep quality and duration is one of the many benefits of physical activity (Garber et al., 2011).

The non-recreational sport participating group presented with a negative association between physical functioning ability and emotional problems (see Table 4.11). Therefore,

limitation in functional ability and bodily pain could result in depression or feeling anxious (Maruish, 2011). Increased physical activity positively influences an individual mentally as well as physically and reduces negative emotional feelings and improves an individual's ability to move without limitations or pain (Maruish, 2011). This is consistent with Parker et al. (2017) who found chronic pain to have adverse mental effects on the South African population (Parker et al., 2017).

- **Eating breakfast**

More participants in the non-recreational sport participating group than in the recreational sport participating group reported eating breakfast, but the recreational sport participating group ate more regularly (see Table 4.4). Breakfast is universally identified as the most important meal of the day as at least 20% of our daily energy intake is consumed through breakfast (Spence, 2017). The energy consumed is slowly released throughout the morning and influences the cognitive performance of an individual, improves mental alertness, improves mood and provides fuel for the body (Spence, 2017). A lack of breakfast consumption may therefore negatively influence the physical and mental health status of an individual. Spence (2017) also found that the younger generation is less likely to consume breakfast, which could provide some explanation for the results from this study as study participants fell in the age group of 25-35 years (see Table 4.1). Even though there are some discussion on eating breakfast, it is not within the scope of a physiotherapy and interprofessional referrals is highly recommended.

- **Regular physical activity**

As expected, more participants in the recreational sport participating group reported participating in regular physical activity (see Table 4.4). Literature on the topic has found physical activity to be one of the most important lifestyle habits to prevent CVD, reduce hypertension and reduce obesity (Sezgin, 2019). It is suggested that those who participate in physical activity are more likely to adopt a healthy lifestyle (Garber et al., 2011). In this study, the recreational sport participating group had a higher level of physical activity participation (see Table 4.4) as well as a higher total MET-minutes per week (see Table 4.2), but both groups presented with moderately healthy lifestyle habit choices (see Table 4.5). It is expected that high physical activity levels would be

associated with healthy lifestyle habits (Bezner, 2015), but the results in this study showed that regardless of their level of physical activity participation, the lifestyle habit choices between the two groups were comparable and only moderately healthy, thus somewhat different than the results obtained by Bezner (2015). A clear explanation of this finding cannot be given, but could possibly be as a result of differing socio-economic status, environmental and/ behavioural influences.

- **Smoking tobacco and consuming alcohol**

Smoking was slightly higher in the recreational sport participating group with the consumption of alcohol slightly higher in the non-recreational sport participating group (see Table 4.4). When comparing the percentage of smokers in this study (see Table 4.4) with results provided by Statistics South Africa (2016), both groups had a slightly higher percentage of smokers – 53% for the recreational sport participating group and 45.1% for the non-recreational sport participating group – than the average for South Africa within the same age group at 43.5% and the Northern Cape at 44.9%. The relatively high levels of smoking found in this study could be attributed to environmental and behavioural influences, as Statistics South Africa reported on the Northern Cape as the province with the highest percentage of smokers in South Africa (Statistics South Africa, 2016).

With regards to alcohol consumption, results from the recreational sport participating group in this study is comparable with national statistics for the age group of 25-34 years with the study participants in the recreational sport participating group consuming alcohol at 29.5% and the national average at 29.2%; however, for the non-recreational sport participating group, the alcohol consumption was higher (35.3%) than the national average. This could possibly be linked to the Northern Cape having the highest percentage of risky drinkers (11%) in South Africa (Statistics South Africa, 2016).

5.4.2 The role of the physiotherapist in advocating healthy lifestyle habits

Physiotherapists are equipped with the knowledge to improve health and run health promotion activities within a population, as physiotherapists are aware of the high physical inactivity levels within communities and have adequate knowledge in musculoskeletal medicine and physical activity prescription (Lowe et al., 2016; Bezner, 2015). Health

promotion by physiotherapists include education on the amount of physical activity that should be performed to achieve health benefits as well as how this can be achieved (Holm et al., 2015). This could influence and improve healthy lifestyle habits by ensuring regular and sufficient physical activity.

The role physiotherapists could play in addressing the other lifestyle habits (besides physical activity) is briefly referred to here as well. Smoking tobacco may negatively influence multiple body systems resulting in delayed healing time and poor response to physiotherapy interventions. Physiotherapists are therefore encouraged to address smoking behaviour to ensure a positive response to treatment and prevent CLDs (Bezner, 2015). Sleep deprivation is a public health issue and sleep disorders may lead to a wide variety of other health conditions such as obesity and heart attacks. Prescription of physical activity and advice on sleeping habits can be addressed through physiotherapy treatment (Bezner, 2015). Obesity can also be addressed by referral of patients from physiotherapy for dietary counselling, mostly when it comes to weight loss and the management of CLDs (Abaraogu et al., 2016). Increased stress may also lead to many illnesses and injury, but which could nonetheless be treated by physiotherapists as part of a interprofessional healthcare team as increased health and wellness is the primary focus of healthcare interventions (Bezner, 2015).

The discussion up to now focused on physical activity and lifestyle habits separately, but through the optimal integration of physical activity and healthy lifestyle habits even more health benefits may be achieved (Bezner, 2015).

5.5 PHYSICAL ACTIVITY AND LIFESTYLE HABITS

Adequate physical activity in conjunction with other healthy lifestyle habits such as smoking cessation, minimal alcohol consumption and consuming healthy food will prevent the risk of illness and improve general health status (Takashi et al., 2013). Increased physical activity is also found to be related to other healthy lifestyle habits such as healthy eating and abstaining from tobacco and alcohol (Takashi et al., 2013).

Results of physical activity and lifestyle habits for participants in this study were cross-tabulated and reviewed (see Table 4.6). The majority of the participants in both groups

presented with moderate levels of physical activity and moderate levels of healthy lifestyle habits. However, no participants in the recreational sport participating group presented with low levels of physical activity in combination with poor lifestyle habits whereas 19.6% of the non-recreational sport participating group presented with low levels of physical activity in combination with poor lifestyle habits. Additionally, 7.9% of the recreational sport participating group presented with high levels of physical activity in combination with healthy lifestyle habits while no participants in the non-recreational sport participating group presented with high levels of physical activity in combination with healthy lifestyle habits. This is consistent with results by Keates et al. (2017) who found physical inactivity to be linked to poor lifestyle habits and Santha et al. (2018) linking increased physical activity with overall positive lifestyle habits. From this current study it can, however, be suggested that although an individual partakes in regular physical activity, this is not necessarily a predictor of other healthy lifestyle choices which are also influenced by environmental and social factors as well as the socio-economic environment (Keates et al., 2017).

Consideration of physical activity and lifestyle habits are furthermore important as it influences the overall general health status of individuals.

5.6 GENERAL HEALTH STATUS

General health status is often presented through two different components, namely the mental and the physical health status. Although numerous studies using the SF-36v2 do report on the general health and well-being of participants, the developers of the SF-36v2 clearly indicate that an overall score cannot be generated from the questionnaire. The developers furthermore view it as pointless trying to combine the two SF-36v2 summary measures to produce an overall score of general health status (Lins & Carvalho, 2016). Therefore, for the purpose of this discussion, physical and mental health status will be discussed separately.

5.6.1 Physical health status

In physical health status the domains physical functioning (PF) is how everyday functional activities may be influenced (limited by pain or not), physical role (PR) is the influence of pain on physical health and everyday activities, bodily pain (BP) is the interference of pain in everyday activities and general health (GH) is the individual's perception of his or her health (see Table 3.4). These domains carry more weight in the scoring of the physical health status of an individual.

5.6.1.1 Physical health status and physical activity

The physical health status of both groups was found to be comparable, with most participants in both groups having an *average* physical health status (see Table 4.8). The recreational sport participating group scored slightly higher which is consistent with their higher physical activity levels (see Table 4.2 and 4.3).

Increased levels of physical activity are usually associated with increased physical functioning (Pengpid & Peltzer, 2013). Three thousand (3000) to 4000 MET-minutes per week are found to improve cardiovascular health, increase muscular strength and improve joint flexibility (Garber et al., 2011). Furthermore, physical activity decreases bodily pain and causes a decrease in general fatigue, thus improving physical health which in turn improves general health (Garber et al., 2011). On the other hand, excessive physical activity can have adverse effects (see 2.4.3) such as fatigue, muscle stiffness and increased inflammation which can negatively affect physical health (Pedisic et al., 2014).

Even though the physical health status of an individual can be positively influenced by physical activity, other positive lifestyle habits also need to be incorporated to achieve optimal health benefits (Garber et al., 2011). Therefore, physical health is not only influenced by physical activity and it is possible that physically active individuals can have other poor lifestyle habits influencing their physical health.

5.6.1.2 Physical health status and lifestyle habits

In this research study, the majority of the recreational sport participating group presented with moderately healthy lifestyle habits and an *average* physical health status. In the non-recreational sport participating group, the majority of the participants presented with moderate and poor lifestyle habits and an *average* physical health status (see Table 4.10). Commonly, poor lifestyle habits are more likely to be found in those who do not participate in physical activity (Masana et al., 2017), and which are confirmed to some degree by the findings in this study.

5.6.2 Mental health status

In mental health status the domains include vitality (VT), referring to the energy levels and fatigue of an individual, social functioning (SF) is how social activities are influenced by physical or emotional problems, role-emotional (RE) is the influence of emotion on everyday activities and mental health (MH) is the overall influence of psychological well-being (see Table 3.4). These domains carry more weight in the scoring of the mental health status of an individual.

5.6.2.1 Mental health status and physical activity

The mental health status for both groups in this study is comparable with the majority of both groups presenting with an *average* mental health status (see Table 4.9). The recreational sport participating group, however, had a slightly better self-reported mental health status compared to the non-recreational sport participating group. This could be attributed to the positive effects recreational sport participation can have on the mental health of individuals (see 2.7). Increased levels of physical activity, as mentioned previously (see 2.5.1), is found to greatly increase mental health by relieving stress and tension as well as reducing the risk of depression (Parker et al., 2017). It is also reported that club-based sport can have an additional benefit in improving mental health as a result of the social support and the ability to share concerns and worries with team members (Eime et al., 2015). Cricket, as the recreational sport focused on in this study, is also a mentally stimulating sporting activity, involving planning, strategy and mental endurance

(Webster & Travill, 2018), which could have resulted in the slightly higher mental health scores of the recreational sport participating group (see Table 4.7).

Recreational physical activity and specifically cricket may thus be beneficial for improving an individual's general health status (provided they comply with the recommended physical activity guidelines), which can be seen by the mental health status that was found to be better in the sport participating group in this research study. This correlates with a study conducted by Pedisic et al. (2014) who found a significant improvement in mental health with an increase in the total MET-minutes per week (see 2.5).

5.6.2.2 Mental general health status and lifestyle habits

The majority of the recreational sport participating group presented with moderately healthy lifestyle habits and an *average* mental health status whereas an equal percentage in the non-recreational sport participating group presented with moderate and poor lifestyle habits and an *average* mental health score. The mental health status has an influence on lifestyle habit choices (see 5.6.2.1), highlighting the role of physiotherapy as part of the interporofessional healthcare team in supporting healthy lifestyle choices in individuals.

5.6.2.3 Associations between physical activity levels (total METs), MCS, MCS subscales and PCS subscales

During the data analysis to determine relevant associations between physical activity and general health, PCS and the GH subscale were excluded (see 4.5).

The high positive correlation between MCS and MH as well as MCS and RE (see Table 4.11 and 4.5) is in line with previous research reporting on the positive relationship between and individual's mental health status and the ability to regulate emotions in everyday activities (Maruish, 2011). In addition, moderate positive correlations were found between MCS and VT as well as MH and VT (see Table 4.11), where VT refers to the energy levels and fatigue of an individual. Literature further alluded to the added positive influence increased physical activity levels can have on the mental health and/or psychological well-being of an individual (Maruish, 2011), however in contrast to this,

results from the current study indicated a low negative correlation between physical activity levels (total METs) and MH as well as between PF and MCS (see Table 4.11).

A moderate positive statistically significant correlation was found between PF and BP (see Table 4.11), which is noteworthy within the context of physiotherapy as this association refers to the influence bodily pain has on the everyday functional activities of an individual(Maruish, 2011). From these results, the researcher postulates that if bodily pain is present, an increase in physical activity and/or everyday activities can lead to a further increase in pain. In addition, a low negative correlation was found between physical activity levels and BP in this study, which could indicate an increase in physical activity levels can result in a decrease in BP. The contrast of these two findings is interesting and should be considered by physiotherapists in the clinical environment.

5.6.3 The role of physiotherapists in improving general health status

Physiotherapists can play an important role in addressing *Goal 3* of the UN's sustainable developmental goals (see 2.2.2). By means of education and the prescription of physical activity, physiotherapists can encourage behaviour modification and improved lifestyle habit patterns resulting in increased longevity in individuals and ultimately a reduction in the burden of disease (Narain et al., 2016).

Previous studies have found a positive correlation between physiotherapy interventions and general health status (Narain et al., 2016). Jørgensen et al. (2001) found that the physiotherapeutic treatment of musculoskeletal pain can improve physical and mental health status, while in an occupational setting it was found that physiotherapy interventions can improve an individual's work environment which will improve both the long-term physical and mental health status (Pizzari & Davidson, 2013). This highlights the importance of a holistic approach in physiotherapy treatment, rather than only focusing on the physical limitations of patients (Jørgensen et al., 2001), once again emphasising the role of physiotherapy in health promotion and specifically in supporting the sustainable development goals set for 2030 by the UN.

5.7 RECOMMENDATIONS

Based on the results of this study and the discussion of these results in this chapter, recommendations are made for further research, and for physiotherapy clinical practice.

5.7.1 Research recommendations

- Future research studies could include comparable groups of female study participants in order for data to be compared with the baseline data collected in this study.
- Participants could also be recruited from provinces other than the Northern Cape Province in South Africa to get a more generalised picture of the effect of cricket on physical activity and general health status in South Africa. This could provide valuable baseline data to determine the long-term effect of health promotion and physical activity prescription by physiotherapists on the burden of disease and the progress towards the UN's development goals.
- Studies including a broader age range could also be conducted to obtain baseline data across the general population of South Africa.
- It is also recommended that, in future research, an objective test of physical activity be used in conjunction with a self-reported questionnaire. Objective measures such as a pedometer, a physical activity logbook, cell phone applications (i.e. health apps) or wearables (i.e. smart watches) are able to provide a more accurate measurement of physical activity.
- A more detailed breakdown of the accumulation of MET-minutes per week could also be included, clearly indicating the physical activities through which MET-minutes are accumulated, e.g. domestic work or exercise. The long version of the IPAQ provides more domain-specific descriptions which allow researchers to determine the area of physical activity that is lacking, as there are many contributing factors to the accumulation of MET-minutes per week.
- A baseline study on the knowledge of recreational and non-recreational sport participants regarding physical activity guidelines and lifestyle habits.

- Cohort and multi-variant clinical studies could be performed to provide an in-depth understanding of behavioural changes following active health promotion interventions.

5.7.2 Clinical Practice recommendations

The following recommendations are made based on the findings of the current study:

- The recommendation for young males to participate in recreational cricket will be made. This recommendation can be emphasised in the working class and especially sedentary occupations in South Africa and globally as this research study will support the benefits of increased physical activity. The mental and physical benefits of increased physical activity can be affirmed in this research study.
- Recommended physical activity guidelines should be emphasised to achieve optimal health benefits. Although recreational sporting activity is found to only contribute a small portion to the accumulation of MET-minutes, there are additional benefits of recreational physical activity that are not found with other physical activity domains such as occupational physical activity and transportation. Based on everyday activities and occupation, the average amount of MET-minutes per week can be determined. Based on how much is achieved and how much more needs to be achieved, an appropriate recreational sport can be used to reach health benefiting levels of physical activity.
- Physiotherapists should advocate for the participation in physical activities such as cricket, especially on a community level. Despite the UN's sustainable development goals, there is still a high rate of CVD-related mortality and a high level of physical inactivity (Keates et al., 2017). Community members should be educated on the types and benefits of physical activity and recreational sport.
- Physical activity recommendations and education in communities, linked to recreational cricket, can be done at schools, local businesses and government departments.
- At an individual (one-on-one) level, patients should be taught how to monitor their physical activity and how to accumulate MET-minutes during the week. This can

be achieved by using the FITT-principles and guidelines for MET-minutes per week (see Table 2.1).

- Physiotherapists should refer individuals to other members of the interprofessional healthcare team, especially at community levels, to better facilitate overall healthy lifestyle choices. For example, referrals to dieticians can contribute to better dietary habits.
- Interprofessional clinical-based research studies should be performed regarding health promotion and lifestyle habits.

5.8 LIMITATIONS

During the research process, a number of challenges were experienced of which some have already been rep3orted on in Chapter 3 (see Table 3.6). Additional and/or more detailed descriptions of limitations are included below.

5.8.1 Measurement tools

Limitations with regards to the measurement tools used in this study are described below per questionnaire.

Demographic questionnaire

Ethnicity has an influence on the occurrence of hypertension but was not included in the demographic questionnaire used in this study.

5.8.1.2 International Physical Activity Questionnaire

There are certain limitations when using a self-reported measure of physical activity. Sylvia et al. 2014 stated that evaluating physical activity by MET-minutes per week can be an improper measurement as it relies solely on the participant's accuracy of his or her report on physical activity and his or her self-perceived level of physical activity. The MET-minutes also only cover the past seven days. Many who participate in recreational physical activity only do so a few days in a week, whereas physical activity can also

encompass everyday movements such as transportation and occupational physical activity.

5.8.1.2 The Belloc and Breslow seven lifestyle habits questionnaire

Current available research focuses on five lifestyle habits of importance (see 5.4), but, as mentioned, these five lifestyle habits are included in Belloc and Breslow's seven lifestyle habits questionnaire. For future research studies a more recent and frequently used and tested lifestyle questionnaire should be used to evaluate lifestyle habits. At the time of conducting this study, this was the best available lifestyle habits questionnaire and the use of this questionnaire furthermore met the set objectives of the study. Although this questionnaire was found to be valid for the South African context (see 3.5.3.2) specific validity and reliability scores are not available

5.8.1.3 The SF-36v2 health survey

As with the IPAQ, the SF-36v2 also enquires into the participant's perception on his or her mental and physical health and a limitation could be the accuracy of the participant's perception of what his or her health status is at the current time.

5.8.2 Study population

As the study participants were all males and from a single province, similar environmental and social factors as well as the socio-economic environment could have influenced the results. There is furthermore a difference between male and female smoking habits and alcohol consumption (Statistics South Africa, 2016), also within the different provinces in South Africa. Furthermore, the Northern Cape is known for its high prevalence of risky alcohol consumption, the highest in South Africa, which could have skewed the results. For these reasons, the findings of the study cannot be generalised to the broader South African population and it is specific to the Northern Cape's population. This study population was chosen because of its convenience as it is where the researcher resides and works.

As age stratification was used to allow for a better comparison, a single age group was used for this study. The results therefore cannot be generalised to all age groups as age could possibly have had an influence on physical activity levels and lifestyle habits.

Cricketers might have felt obligated to participate in the study as the information session was conducted in a group setting and participation was therefore not entirely anonymous.

5.8.3 Cricket as recreational sport

The choice of cricket as a recreational sport was influenced by the availability of potential study participants as there are more amateur cricket teams than for rugby and soccer in Kimberley, Northern Cape, South Africa (see 3.10). It is possible that within other recreational sports, the physical activity levels can be higher depending on the type of sport. Cricket, in particular, also has mental benefits (see 2.7.2) which could influence all components of general health status which was investigated in this study.

The final conclusions drawn from this study will be presented below.

5.9 ANSWERING THE RESEARCH AIM AND OBJECTIVES

The results of the study answered the aim and objectives set out for this study (see 1.4).

The primary aim of this research study was to investigate the physical activity levels, lifestyle habits and general health status of recreational sport participating and non-recreational sport participating adult males in Kimberley, the capital city of the Northern Cape Province, South Africa. This led to the first research objective, namely to determine and describe the physical activity levels, lifestyle habits and general health status in this population.

Physical activity levels

The recreational sport participating group had an overall higher level of physical activity per week compared with the non-recreational sport participating group, with the non-recreational sport participating group accumulating more sedentary time per week. These results are also in agreement with literature that found that recreational sport participation was a way of increasing physical activity levels and preventing sedentary behaviour which

is often associated with sedentary occupational duties (Owen et al., 2010). Recreational sporting activities such as cricket may also assist in increasing the accumulated MET-minutes per week in order to achieve health benefits.

Lifestyle habits

The majority of recreational sport participating and non-recreational sport participating group presented moderately healthy lifestyle habits. Recreational sport participation is found to be associated with healthy lifestyle habits, however, in this research study the same level of lifestyle habits were found in the sport participating and non-recreational sport participating groups. Both groups had a similar number of participants who smoked but the non-recreational sport participating group consumed more alcohol. This could be as result of the social or environmental influences as well as the socio-economic environment (Keates et al., 2017).

General health status (physical and mental general health)

The self-perceived physical functioning of both groups were comparable whereas the recreational sport participating group presented with slightly more participants with an improved mental health status. Participating in recreational sport increases the overall level of physical activity of an individual which is associated with an improved mental and physical health status (Spivey & Hritz, 2013). Cricket in particular, also requires and improves mental concentration more than being physically exhausting. Improved mental and physical functioning in return leads to improved general health status.

The second research objective was to determine if any association existed between physical activity levels, lifestyle habits and general health status in recreational sport participating and non-recreational sport participating adult males.

Associations between physical activity levels, lifestyle habits and general health status

The recreational sport participating group had positive associations between physical activity and physical and mental emotional health i.e. minimal physical and emotional problems (see Table 4.11). This is in agreement with literature that physical activity in particular recreational sport improves the emotional status of an individual (Eime et al.,

2015). Enhanced sleep quality and duration is one of the many benefits of physical activity (Garber et al., 2011).

The non-recreational sport participating group presented with a negative association between physical functioning ability and emotional problems (see Table 4.11) which implies that limitation in physical activities leads to emotion problems such as frustration or depression.

5.10 CONCLUDING THOUGHTS

Besides answering the research aim and objectives, the study adds value to the current knowledge-base, specifically within the domain of physiotherapy-based promotion of health and well-being in individuals as well as communities. The value of this study is furthermore evident in that it provides baseline information on the physical activity, lifestyle habits and general health2.3.2 status of the chosen population as well as the effect of participation in recreational sport on the above-mentioned aspects. The results of this study highlight the role that participation in recreational sport can play in increasing physical activity levels to achieve health benefits. Based on the results of this study, the role of physiotherapy in improving physical activity levels, healthy lifestyle choices and the general health status of individuals – and more importantly on community level to reach a larger portion of the population – is emphasised. The importance of interprofessional healthcare team collaboration, especially on community level, is also highlighted. Based on physiotherapists' knowledge of exercise prescription and general health status, recreational sport should be promoted by physiotherapists for its mental and physical health benefits, health promotion and for long-term disease prevention.

Physiotherapists thus have an important role to play, as also illustrated through the results of this study, to support the UN's drive towards ensuring "healthy lives and promote well-being for all at all ages".

REFERENCE LIST

Abaraogu, U., Ogaga, M., Odidika, E. & Frantz, J. 2016. ScienceDirect Promotion of healthy nutrition in clinical practice: A cross-sectional survey of practices and barriers among physiotherapists in southeast Nigeria. *Hong Kong Physiotherapy Journal*, 35: 21–29. http://dx.doi.org/10.1016/j.hkpj.2016.05.002.

Acharya, S., Lin, V. & Dhingra, N. 2018. The role of health in achieving the sustainable development goals. *The bulletin of the World Health Organisation*, 96(9):591.

American Collage of Sport Medicine (ACSM). 2017. ACSM guidelines for exercise testing and prescription*. Wolters Kluwer.* 10th edition.

Ainsworth, B.E., Haskell, W.L., Herrmann, S.D., Meckes, N., Bassett, D.R., Tudor-Locke, C., Greer, J.L., Vezina, J., Whitt-Glover, M.C., & Leon, A.S. 2011. 2011 Compendium of Physical Activities: A Second update of codes and MET values. *Medicine & Science in Sports & Exercise*, 43(8):1575-1581.

American Heart Association (AHA). 2017. Viewed 10 January 2018. www.heart.org/en/get-involved/advocate/federal-priorities/physical-activity.

Barrett, M. 2019. If you build it they will stay: the development of public cricket provision as a construction of social citizenship. *Sport in Society*, 0(0): 1–32. https://doi.org/10.1080/17430437.2019.1565390.

Belloc, N. & Breslow, L. 1972. Relationship of physical health status and health practices. *Preventative Medicine*, 1(3): 409–421. http://doi.org/10.1016/0091-7435(72)90014-X.

Bernell, S., & Howard, S. W. 2016. Use Your Words Carefully: What Is a Chronic Disease?. *Frontiers in public health*, *4*, 159. https://doi.org/10.3389/fpubh.2016.00159

Bezner, J.R. 2015. Promoting Health and Wellness: *American Physical Therapy Association*, 95(10): 1433–1444.

Bloemhoff, H.J. 2010. *Gender- and race-related physical activity levels of South African university students*. University of the Free State.

Borgan, S.M., Jassim, G.A., Marhoon, Z.A. & Ibrahim, M.H. 2015. The lifestyle habits and wellbeing of physicians in Bahrain: a cross-sectional study. *BMC Public Health*: 1–7. http://dx.doi.org/10.1186/s12889-015-1969-x.

Bryer, J., Cherkis, F. & Raman, J. 2013. Health-Promotion Behaviours of Undergraduate Nursing Students: A Survey Analysis. *Nursing Education Research*, 1 (December):410–416.

Bunevicius, A. 2017. Reliability and Validity of SF-36 Health survey questionnaire in patients with brain tumors: A cross sectional study. Health quality life outcomes. 15(1):92. doi.10.1186/s12955-017-0665-1.

Capio, C.N., Sit, C.H.P., Abernethy,B. 2014.Physical Well-Being in: Michalos A.C. (eds) Encyclopedia of Quality of Life and Well-Being Research. *Spinger,* Dordrecht.

Carraro, E., Schilir, T., Biorci, F., Romanazzi, V., Degan, R., Buonocore, D., Verri, M., Dossena, M., Id, S.B. & Gilli, G. 2018. Physical Activity, Lifestyle Factors and Oxidative Stress in Middle Age Healthy Subjects. *International journal of environmental research*, 15(1152):2–11.

CDC (Centres for Disease control and Prevention). 2018. Health-related quality of life (HRQOL). Well-being concepts. https://www.cdc.org/hrqol/wellbeing.htm.

CDC (Centres for Disease control and Prevention). 2017. National Health and Nutrition Examination Survey (NHANES). (online). https://wwwn.cdc.gov/nhanes/continuousnhanes/defult.aspx?BeginYear=2017.

Chen, C., Tsai, L., Lin, C., Huang, C., Chang, T., Chen, R. & Lyu, S. 2017. Factors influencing interest in recreational sports participation and its rural-urban disparity. *PLoS ONE*:1–10.

Craig, C.L., Marshall, A.L., Sjöström, M., Bauman, A.E., Booth, M.L., Ainsworth, B.E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J.F. & Oja, P. 2003. International physical activity questionnaire: 12-Country reliability and validity. *Medicine and Science in Sports and Exercise*, 35(8): 1381–1395.

Daya, R., Bayat, Z. & Raal, F.J. 2016. Effects of diabetes mellitus on health-related quality of life at a tertiary hospital in South Africa: A cross-sectional study. *SAMJ Research*, 106(9):918–928.

Delany, C., Fryer, C. & Van Kessel, G. 2015. An ethical approach to health promotion in physiotherapy practice. *Health Promotion Journal of Australia*, 26(3):255–262. http://dx.doi.org/10.1071/HE15052.

Dhurup, M. & Garnett, A. 2011. Self-reported constraints to physical activity participation among university students. *African journal for physical, health education, recreation and dance*, 1(1):86–103.

Dreyer, L. & Merwe, S. Van Der. 2015. The relationships between physical activity, lifestyle and health. *Research Gate*, 33(2):15–18. https://www.researchgate.net/publication/277324601%0AThe.

Durstine, J. & Moore, G.E. 2003. *ACSM's exercise management for persons with chronic diseases and disabilities*. Second edition. United States of America: American Collage of Sport Medicine.

Edwards, M.B. & Rowe, K. 2019. Managing sport for health: An introduction to the special issue. *Sport Management Review*, 22(1):1–4. https://doi.org/10.1016/j.smr.2018.12.006.

Eime, R.M., Charity, M.J., Harvey, J.T. & Payne, W.R. 2015. Participation in sport and physical activity: associations with socio-economic status and geographical remoteness. *BMC Public health*, 15(434):1–12.

Elavsky, S. & McAuley, E. 2007. Physical activity and mental health outcomes during menopause: a randomized controlled trial. *Journal of behavioural medicine*, 33(2):132–142.

Farhud D. D. 2015. Impact of Lifestyle on Health. *Iranian journal of public health*, *44*(11), 1442–1444.

Filbay, S.R., Bishop, F.L., Peirce, Nicholas, Jones, M.E., Arden, N.K. & Peirce, N. 2017. Physical activity in former elite cricketers and strategies for promoting physical activity after retirement from cricket a qualitative study. *BMJ open sport and exercise medicine*, 7(016541):1–11.

Forrester, S. & Arterberry, C. 2006. Student attitudes toward sports and fitness activities after graduation. *Journal of Recreational Sports*, 30(1):87–99.

Freene, N., Cools, S. & Bissett, B. 2017. Are we missing opportunities? Physiotherapy and physical activity promotion: a cross-sectional survey. *BMC Sports Science, Medicine and Rehabilitation*, 9(19): 1–8.

Garber, C., Blissmer, B., Deschenes, M., Franklin, B., Lamonte, M., Lee, I., Nieman, D. & Swain, D. 2011. Quantity and Quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal and neuromotor fitness in apparently healthy adults: Guidance for prescribing exercise. *Medicine and Science in Sports and Exercise*, 43(7): 1334–1359.

Groenewald, A.J. 2012. *Risk-factor profiles for chronic diseases of lifestyle and metabolic syndrome in an urban and rural setting in South Africa*. University of the Free State.

Gray, A., & Vawda Y. Health Legislation and Policy. In: Rispel LC, Padarath A, editors. South African Health Review 2018. Durban: Health Systems Trust; 2018. URL: http://www.hst.org.za/publications/Pages/SAHR2018

Guthold, R., Stevens, G.A., Riley, L.M. & Bull, F.C. 2016. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys

with 1 · 9 million participants. *The Lancet Global Health*, 6(10): e1077–e1086. http://dx.doi.org/10.1016/S2214-109X(18)30357-7.

Holm, I., Tveter, A.T., Moseng, T. & Dagfinrud, H. 2015. Does outpatient physical therapy with the aim of improving health-related physical fitness influence the level of physical activity in patients with long-term musculoskeletal conditions? *Physiotherapy (United Kingdom)*, 101(3):273–278. http://dx.doi.org/10.1016/j.physio.2014.11.005.

Hurd, A.R. & Anderson, D.M. 2011. An excerpt from the book: *Park and Recreation Professional's Handbook. PDF with online resources*. https://us.humankinetics.com/blogs/excerpt/definitions-of-leisure-play-and-recreation

Jørgensen, C., Olesen, F. & Fink, P. 2001. Patients in General Practice in Denmark Referred to Physiotherapists: A Description of Patient Characteristics Based on General Health Status. *Physical Therapy*, 81(3):915–923.

Kaminsky, L.A. & Montoye, A.H.K. 2014. Physical Activity and Health : What Is the Best Dose ? *American Heart Association*, 2014(3): 5–8.

Kaptoge, S., Angelantonio, E.D., Li, Y., Pan, A., Wang, D., Liu, X., Franco, O., Stampfer, M., Willett, W. & Hu, F. 2018. Impact of Healthy Lifestyle Factors on Life Expectancies in the US Population. *American Heart Association*, 10(1161):345–355.

Kastien-hilka, T., Rosenkranz, B., Sinanovic, E. & Bennett, B. 2017. Health-related quality of life in South African patients with pulmonary tuberculosis. *PLoS*, 12(4):1–20.

Keates, A.K., Mocumbi, A.O., Ntsekhe, M., Sliwa, K. & Stewart, S. 2017. Cardiovascular disease in Africa: epidemiological profile and challenges. *Nature Publishing Group*, 19:1–22. http://dx.doi.org/10.1038/nrcardio.2017.19.

Ko, H., Lee, J., Shin, J. & Jo, E. 2015. Health-Related Quality of Life and Cardiovascular Disease Risk in Korean Adults. *Korean Journal of Family Medicine*, 36:349–356.

Koyanagi, A., Stubbs, B. & Vancampfort, D. 2018. Correlates of sedentary behaviour in the general population: A cross-sectional study using nationally representative data from six low- and middle-income countries. PLoS ONE: 1–15.

Kyu, H., Bachman, V., Alexander, L., Mumford, J., Afshin, A., Estep, K., Veerman, L., Delwiche, K., Iannarone, M., Moyer, M., Cercy, K., Vos, T., Murray, C. & Forouzanfar, M. 2016. Physical activity and risk of breast cancer, colon cancer, diabetes, ischemic heart disease, and ischemic stroke events: systematic review and dose-response meta-analysis for the Global Burden of Disease Study 2013. *BMC Public health*, 354(i3857).

Lins, L. & Carvalho, F.M. 2016. SF-36 total score as a single measure of health-related quality of life Scoping review. *SAGE open medicine*, 4(1): 1–12.

Liu, Y., Wheaton, A.G., Croft, J.B., Xu, F., Cunningham, T.J. & Greenlund, K.J. 2018. Relationship between sleep duration and self-reported health-related quality of life among US adults with or without major chronic. *Sleep Health: Journal of the National Sleep Foundation*, 4(3): 265–272. https://doi.org/10.1016/j.sleh.2018.02.002.

Losper, T. 2013. *Physical Activity and lifestyle aspect of female students at a tertiary institution*. University of the Free State.

Low, J., Williams, A.M., Robert, A.P.M.C. & Ford, P.R. 2013. The microstructure of practice activities engaged in by elite and recreational youth cricket players. *Journal of sport sciences,* 31(11): 1242–1250.

Lowe, A., Gee, M., McLean, S., Littlewood, C., Lindsay, C. & Everett, S. 2016. Physical activity promotion in physiotherapy practice: a systematic scoping review of a decade of literature. *British Journal of Sports Medicine*, 0(0): 1–7.

Madans, J.; Webster, K. 2015. Health Survey. International encyclopedia of the social and behavioural sciences (2nd Edition). 725-730. https://doi.org/10.1016/B978-0-08-097086-8.14031-0.

Malan, L. 2019. *Physical Activity and Lifestyle habits in female undergraduate students*. University of the Free State.

Maruish, M. 2011. *User Manual for the SF-36v2 Health Survey (3rd ed.)*. R. Lincoln, ed. QualityMetric Incorporated.

Masana, L., Ros, E., Sudano, I. & Angoulvant, D. 2017. Is there a role for lifestyle changes in cardiovascular prevention? What, when and how? *Atherosclerosis Supplements*, 26(1): 2–15.

Mohammed, A.J. & Ghebreyesus, T.A. 2018. Healthy living, well-being and the sustainable development goals. *Bulletin of the World Health Organization*, 96(9): 18–19.

Moore, S.C., Patel, A. V, Matthews, C.E., Gonzalez, A.B. De, Park, Y., Katki, H.A., Linet, M.S., Weiderpass, E., Visvanathan, K., Helzlsouer, K.J., Thun, M., Gapstur, S.M., Hartge, P. & Lee, I. 2012. Leisure Time Physical Activity of Moderate to Vigorous Intensity and Mortality : A Large Pooled Cohort Analysis. *PLoS Medicine*, 9(11): 1–14.

Mull, R.F., Forrester, S.A. & Barnes, M.L. 2013. *Recreational Sport Programming*. 5th ed. Urbana: Sagamore Publishing LLC.

Narain, S., Mathye, D., Health, S.M., Africa, S. & Narain, S. 2016. Do physiotherapists have a role to play in the Sustainable Development Goals? A qualitative exploration. *South African Journal of Physiotherapy.* 75(1):1–9.

Nel, H. 2016. *The effect of shoulder stability training on upper limb function and quality of life in patients with hemiplegia*. University of Witswatersrand.

Noguchi, Yukari & Ueda, Kimiyo & Fukumoto, Kumiko & Harada, Koichi & Ueda, Atsushi & Wei, Chang-Nian. 2015. Relationship between Perceived Health Status and Health Practices in the General Adult Population in Japan*. Open Journal of Preventive Medicine*. 05. 280-290. 10.4236/ojpm.2015.56031.

Nolan, V.T., Sandada, M. & Surujlal, J. 2011. Perceived benefits and barriers to physical exercise participation of first year university students. *African Journal for physical, health education, recreation and dance*, September (Supplement 1): 56–69.

Noorbhai, M.H. 2013. A public health approach to increase physical activity and health education: The Biokinetic Humanitarian Project. *African Journal for Physical, Health Education, Recreation and Dance*, 19(4): 993–998.

O'Donoghue, G., Cusack, T. & Doody, C. 2012. Contemporary undergraduate physiotherapy education in terms of physical activity and exercise prescription: Practice tutors' knowledge, attitudes and beliefs. *Physiotherapy*, 98(2): 167–173. http://dx.doi.org/10.1016/j.physio.2011.04.348.

Olivier, B., Taljaard, T., Burger, E., Brukner, P., Orchard, J., Gray, J., Botha, N., Stewart, A. & Mckinon, W. 2016. Which Extrinsic and Intrinsic Factors are Associated with Non-Contact Injuries in Adult Cricket Fast Bowlers? *International journal of Sports Medicine*, 13(1): 3–13.

Olson, R., Piercy, K., Troiano, R., Fulton, J. & Pfohl, S. 2018. *Physical Activity Guidelines for Americans*. 2nd ed. Washington, DC: Department of Health and Human Services.

Owen, N., Sparling, P.B., Healy, G.N., Dunstan, D.W. & Matthews, C.E. 2010. Sedentary Behaviour: Emerging Evidence for a New Health Risk. *Mayo Clinic Proceedings*,85(12):1138–1141. http://linkinghub.elsevier.com/retrieve/pii/S0025619611603686.

Pagan, R. 2017. Sleep duration, life satisfaction and disability. *Disability and Health Journal*, 10(2): 334–343. http://dx.doi.org/10.1016/j.dhjo.2016.10.005.

Parker, R., Bergman, E., Mntambo, A., Stubbs, S. & Wills, M. 2017. Levels of Physical Activity in people with chronic pain. *South African Journal of Physiotherapy*, 73(1): 1–7.

Pate, B.R.R., Neill, J.O., Dowda, M., Saunders, R. & Brown, W.H. 2009. *Physical Activity Guidelines for Americans:* US.

Patel, H., Alkhawam, H., Madanieh, R., Shah, N., Kosmas, C. E., & Vittorio, T. J. (2017). Aerobic *vs* anaerobic exercise training effects on the cardiovascular system. *World journal of cardiology*, *9*(2), 134–138. https://doi.org/10.4330/wjc.v9.i2.134

Pedisic, Z., Rakovac, M., Titze, S., Jurakic, D. & Oja, P. 2014. Domain-specific physical activity and health-related quality of life in university students. *European Journal of Sports Science*, 14(5): 492–499.

Pengpid, S. & Peltzer, K. 2013. Physical inactivity and associated factors among university student in South Africa. *African Journal for physical, health education, recreation and dance*, 19(1): 143–153.

Phillips, E.M. & Kennedy, M.A. 2012. Theme Issue: Exercise and Sports The Exercise Prescription: A Tool to Improve Physical Activity. *PMRJ*, 4(11): 818–825. http://dx.doi.org/10.1016/j.pmrj.2012.09.582.

Pizzari, T. & Davidson, M. 2013. Health Outcomes can be improved by implementing an Occupational Physiotherapy Provider Programme. *Wiley Online Library*, 18: 47–54.

Qu, B., Guo, M., Liu, J., Zhang, Y. & Sun, G. 2010. Reliability and Validity Testing of the SF-36 Questionnaire for the Evaluation of the Quality of Life of Chinese Urban Construction Workers. *The Journal of international medical research*, 37(4): 1184–1190.

Riebe, D., Ehrman, J., Liguori, G., & Magar, M. 2018. *ACSM guidelines for exercise testing and prescription*. Philadelphia: Wolters Kluwer.

Romé, Å, Persson, U., Ekdahl, C. & Gard, G. 2009. Physical activity on prescription (PAP): Costs and consequences of a randomized, controlled trial in primary healthcare. *Scandinavian Journal of Primary Health Care*, 27(4): 216–222. http://www.tandfonline.com/doi/full/10.3109/02813430903438734.

Ruf, V., Stewart, S., Pretorious, S., Kubheka, M., Lautenschlager, C., Presek, P. & Sliwa, K. 2010. Medication adherence, self-care behaviour and knowledge on heart failure in

urban South African: The Heart of Soweto Study. *Cardiovascular journal of Africa*, 21(2): 86–92.

Rumsfeld, J.S. 2002. Health Status and Clinical Practice. *Circulation*, 106(1):5-7.

Santha, B., Hongal, S., Saxena, V., Jain, M. & Singh, A. 2018. The Association of Lifestyle with the Physical Activity and Diet of Adolescents in Bhopal City. *Journal of Health and Research*. 5(1): 23–27.

Sezgin, E. 2019. The Effects of a Physically Active Lifestyle on the. *Sports*, 7(75): 1–13.

Spence, C. 2017. Breakfast: The most important meal of the day? *International journal of Gastromony and Food Science*, 8(January): 1–6.

Statistics South Africa. 2016. *South Africa Demographic and health survey*. https://dhsprogram.com/pubs/pdf/FR337/FR337.pdf

Sylvia, L. G., Bernstein, E. E., Hubbard, J. L., Keating, L., & Anderson, E. J. 2014. Practical guide to measuring physical activity. *Journal of the Academy of Nutrition and Dietetics*, *114*(2), 199–208. https://doi.org/10.1016/j.jand.2013.09.018

Takashi, W., Yasutaka, H., Takanobu, O. & Hideyuki, B. 2013. Of the Three Classifications of Healthy Lifestyle Habits, Which One is the Most Closely Associated with the Prevention of High Blood Pressure? *HEP*. 40(4): 7–13.

The Heart and Stroke foundation South Africa. 2016. *Heart and Stroke Foundation South Africa Cardiovascular Disease Statistics*. South Africa

The IPAQ Group. International Physical Activity Questionnaire. Viewed 10 January 2018, http://www.ipaq.ki.se.

Trovato, G.M. 2012. Behaviour, nutrition and lifestyle in a comprehensive health and disease paradigm: skills and knowledge for a predictive, preventive and personalized medicine. *The EPMA journal*, 3(8): 1–15.

UN (United Nations). 2015. Transforming our world: the 2030 agenda for sustainable development. https://sustainabledevelopment.un.org/?menu=1300.

Van Aartsen, J. & Van Aswegen, H., 2018, 'Changes in biopsychosocial outcomes for a mixed cohort of ICU survivors', *South African Journal of Physiotherapy* 74(1), a427. https://doi.org/10.4102/sajp.v74i1.427

Van Rooyen, A., Viviers, C. & Becker, P. 2010. A Daily Physical Activity and Diet Intervention for Individuals with Type 2 Diabetes Mellitus: A Randomized Controlled Trial. *South African journal of physiotherapy*, 61(2): 9–16.

Vancampfort, D., Stubbs, B., Probst, M. & Mugisha, J. 2018. Physiotherapy for people with mental health problems in Sub-Saharan African countries : a systematic review. : 1–8.

Walkeden, S. & Walker, K.M. 2015. Perceptions of physiotherapists about their role in health promotion at an acute hospital: A qualitative study. *Physiotherapy (United Kingdom)*, 101(2): 226–231. http://dx.doi.org/10.1016/j.physio.2014.06.005.

Warner, S. 2019. Sport as medicine: How F3 is building healthier men and communities. *Sport Management Review*, 22(1): 38–52. https://doi.org/10.1016/j.smr.2018.06.006.

Webster, Z. 2017. *An assessment of the physical fitness demands of one- day cricket using global positioning system tracking software*. University of the Western Cape.

Webster, Z., & Travill, A.L. 2018. Comparison of the physical demands of a one-day cricket game and the training sessions of provincial cricket players using Global Positioning System tracking software. *South African Journal of Sports Medicine*, 30(1):1-6.

World Confederation of Physical Therapy. n.d. How to measure Physical Activity. (online). https://www.wcpt.org/sites/wcpt.org/files/files/wptday/17/infographics/measuringPhysicalActivity-infographic_A3_FINAL.pdf.

Wilding, J.P.H. 2010. Pathophysiology and aetiology of obesity. *Journal of Medicine*, 39(1): 6–10. http://dx.doi.org/10.1016/j.mpmed.2010.10.002.

WHO (World Health Organisation). 2020a. Basic documents. 49:1-245. apps.who.int/gb/bd/pdf_files/BD_49th-en.pdf#page=7.

WHO (World Health Organisation). 2020b. Global strategy on diet, physical activity and health. (online). https://www.who.int/dietphysicalactivity/pa/en.

WHO (World Health Organisation). 2020c. Developing new guidelines on physical activity and sedentary behaviour. (online). http://www.who.int/activities.developing-new-guidelines-on-physical-activity-and-sedenatary-behaviour-for-youth-adults-and-sub-population.

WHO (World Health Organisation). 2020d. Mental Health. (online). http://www.who.int/mental_health/en/

Xu, J., Qiu, J., Chen, J., Zou, L., Feng, L., Lu, Y., Wei, Q. & Zhang, J. 2012. Lifestyle and health-related quality of life : A cross-sectional study among civil servants in China. *BMC Public Health*, 12(330): 1471–2458.

Zhang, Y., Zhou, Zhongliang, Gao, J., Wang, D., Zhang, Q., Zhou, Zhiying, Su, M. & Li, D. 2016. Health-related quality of life and its influencing factors for patients with hypertension: evidence from the urban and rural areas of Shaanxi Province, China. *BMC Health Services Research*, 16(277): 1–9. http://dx.doi.org/10.1186/s12913-016-1536-x.

Zuhlke, L. 2017. The future of cardiovascular disease in South Africa and the role of the South African Heart Association. *South Africa Heart Association*, 15(3): 174–177.

APPENDICES

Appendix A: Health Sciences Research Ethics Committee approval letter

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA

UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

IRB nr 00006240
REC Reference nr 230408-011
IORG0005187
FWA00012784

15 September 2017

MISS SHABNAM JOHNSON
DEPT. OF PHYSIOTHERAPY
FACULTY OF HEALTH SCIENCES
UFS

Dear Miss Shabnam Johnson

HSREC 91/2017 (UFS-HSD2017/0914)
PRINCIPAL INVESTIGATOR: MISS SHABNAM JOHNSON
SUPERVISOR: ROBYN SMITH
PROJECT TITLE: PHYSICAL ACTIVITY, LIFESTYLE HABITS AND HEALTH-RELATED QUALITY OF LIFE OF AMATEUR CRICKETERS IN KIMBERLEY, NORTHERN CAPE

APPROVED

1. You are hereby kindly informed that the Health Sciences Research Ethics Committee (HSREC) approved this project after all conditions were met. This decision will be ratified at the next meeting to be held on 26 September 2017.

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

3. Any amendment, extension or other modifications to the protocol must be submitted to the HSREC for approval.

4. A progress report should be submitted within one year of approval and annually for long term studies.

5. A final report should be submitted at the completion of the study.

6. Kindly use the **HSREC NR** as reference in correspondence to the HSREC Secretariat.

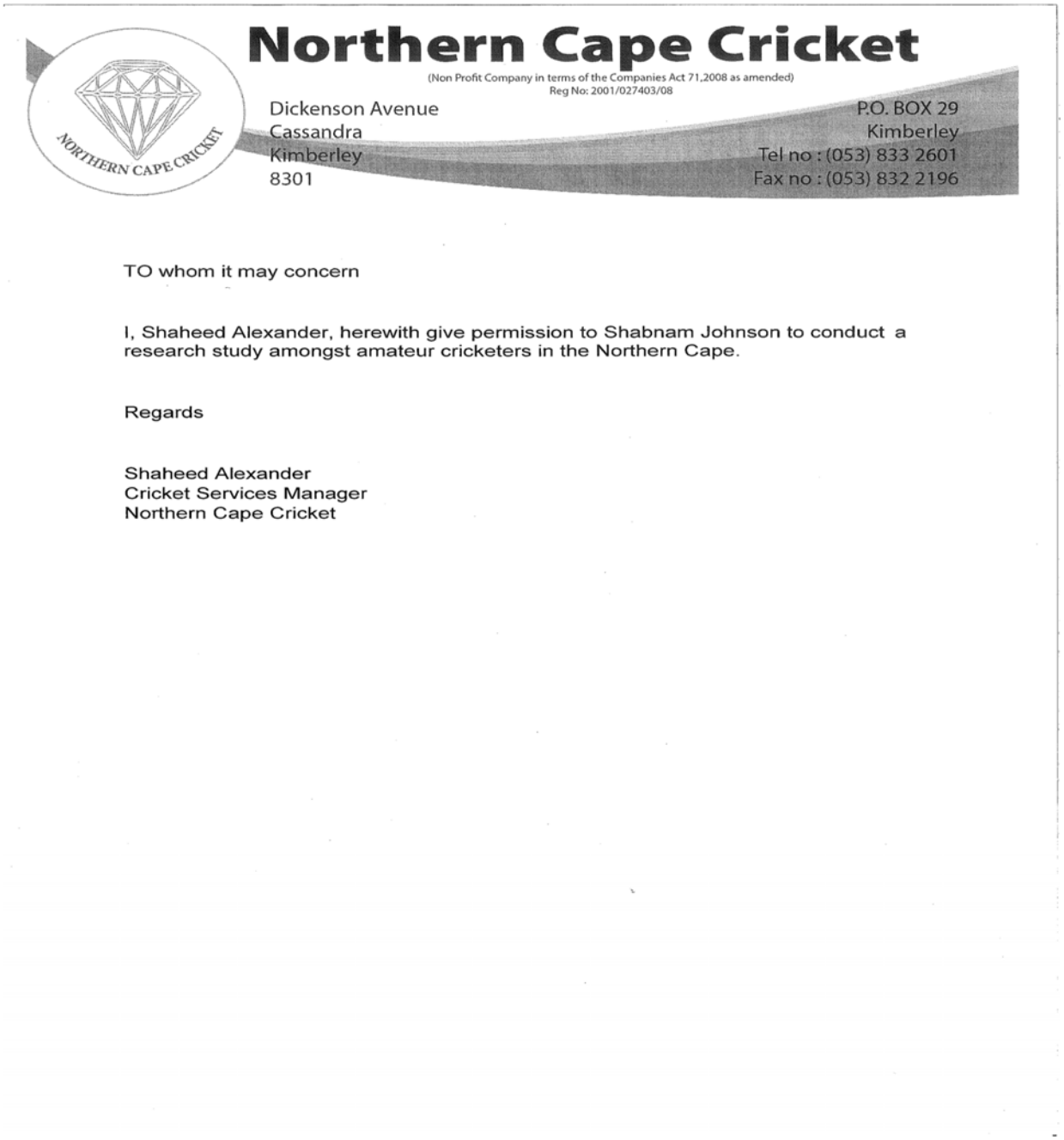
7. The HSREC functions in compliance with, but not limited to, the following documents and guidelines: The SA National Health Act. No. 61 of 2003; Ethics in Health Research: Principles, Structures and Processes (2015); SA GCP(2006); Declaration of Helsinki; The Belmont Report; The US Office of Human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

Yours faithfully

MS MGE MARAIS
HEAD: HEALTH SCIENCES RESEARCH ETHICS COMMITTEE ADMINISTRATION

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

Appendix B: Northern Cape Cricket Board permission letter



Northern Cape Cricket

(Non Profit Company in terms of the Companies Act 71,2008 as amended)
Reg No: 2001/027403/08

Dickenson Avenue
Cassandra
Kimberley
8301

P.O. BOX 29
Kimberley
Tel no : (053) 833 2601
Fax no : (053) 832 2196

TO whom it may concern

I, Shaheed Alexander, herewith give permission to Shabnam Johnson to conduct a research study amongst amateur cricketers in the Northern Cape.

Regards

Shaheed Alexander
Cricket Services Manager
Northern Cape Cricket

Appendix C: Department of Health permission letter

DEPARTMENT OF HEALTH
LEFAPHA LA BOITEKANELO
ISEBE LEZEMPILO
DEPARTEMENT VAN GESONDHEID

Department of Health
Private Bag X5049
KIMBERLEY
8301

Enquiries : Dr. Eshetu Worku
Reference : 053 830 2134

Date : 23 November 2017

Dear Ms. S Johnson

PROJECT TITLE: *Physical Activity, Lifestyle Habits and Health-Related Quality of Life of Amateur Cricketers in Kimberley, Northern Cape*

The Provincial Health Research and Ethics Committee (PHREC) has received and reviewed the above-mentioned research proposal for gate-keeping permission.

Approval is granted to conduct your research study in Kimberley as indicated in the research proposal.

Your Provincial Ethics Reference Number is ***NC_2017_RP_05,*** kindly use that reference number in correspondence with the PHREC administration.

Please note the following:

1) This approval is valid for a period of one from the date of approval

Please note the conditions below:

1) This project must be conducted at ***no cost*** to the Northern Cape Department of Health
2) This approval is limited to the research proposal as submitted in the application
3) No variation or modification on the research project

We are committed to achieving our vision through a decentralized, accountable, accessible and constantly improving health care system within available resources. Our caring, multi-skilled, effective personnel will use evidence-based, informative health care and maturing partnerships for the benefit of our clients and patients.

Appendix D: Department of Education permission letter

I.K Nkoane Education House
156 Barkly Road
Homestead
Kimberley 8301

Private Bag X5029
Kimberley 8300
Republic of South Africa

Tel: 053 839 6500
Fax: 053 839 6580/1
Web:ncdoe.ncpg.gov.za

DEPARTMENT OF EDUCATION

Enquiries: Mr H. Esau
Reference:
Date: 1 November 2017

Ms S. Johnson
MSc in Clinical Sports Physiotherapy
University of the Free-State
Bloemfontein
9300

Dear Madam

Request for permission to conduct Research – Physical activity, Lifestyle habits & Health-related quality of life amongst amateur cricketers in Kimberley, Northern Cape

Permission is hereby granted for you to conduct research on Physical activity, Lifestyle habits & Health-related quality of life amongst amateur cricketers in Kimberley, Northern Cape

This approval is granted with the proviso that the normal working hours is not compromised in any way, and that the research results will be shared with the Northern Cape Department of Education after completion and publication.

Attached please find a copy of list of males within the department.

Kind Regards

p.p.

MR GT PHARASI
SUPERINTENDENT-GENERAL

Appendix E: Department of Agriculture, Land Reform and Rural Development permission letter

agriculture, land reform
& rural development

Department:
agriculture, land reform & rural development
NORTHERN CAPE PROVINCE
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE HEAD OF DEPARTMENT

162 George Street, Kimberley, Northern Cape, South Africa, 8300
Tel: (053) 838 9118, Fax: (053) 831 3635 E-mail: fortunec@ncpg.gov.za, web: www.agrinc.gov.za

Our Reference: H2.8.2.2

Your Reference:

Enquiries: C. Fortune

Date: 08 November 2017

Ms S. Johnson
1 Zuyder Street
New Park
KIMBERLEY
8301

Dear Ms Johnson

LETTER OF AUTHORIZATION TO CONDUCT A RESEARCH STUDY IN GOVERNMENT DEPARTMENTS IN THE NORTHERN CAPE

This letter will serve as authorization for Ms Shabnam Johnson to conduct a research project titled, "physical activity, lifestyle habits and health-related quality of life of amateur cricketers" at the Department of Agriculture, Land Reform and Rural Development.

The research will entail circulation of a questionnaire to twenty males between the ages of 20 – 25.

You may liaise directly with Ms N. Ndzilili on telephone 053 – 838 9128 to commence your research.

Yours faithfully,

Mr WVD Mothibi
HEAD OF DEPARTMENT

Appendix F: Department of Roads and Public works permission letter

OFFICE OF THE PREMIER

DIRECTOR GENERAL

JW Sauer Building
Cnr Roper & Quinn Str
Private Bag X5016
KIMBERLEY 8300

Kgetsanaposo X5016
KIMBERLEY 8300

Tel: (053) 838 2731 Fax: (053) 8328403

E-mail: lmakadu@ncpg.gov.za

Enquiries : L. Makadu
Dipatlisiso :
Imibuzo :
Navrae :
Tshupelo : H2.8.2.2
Isalathiso :
Verwysing

Date : 25 October 2017
Leshupelo :
Umhla :
Datum :

Mr. K.S Nogwili
The Head of Department
Department of Roads and Public Works
Kimberley
8300

Dear Mr. Nogwili

REQUEST FOR PERMISSION TO CONDUCT A RESEARCH STUDY AT THE DEPARTMENTS OF ROADS AND PUBLIC WORKS:

Mr Shabman Johnson is Pursuing Masters in Clinical Sports Medicine and is requesting approval to circulate questionnaires to males between the ages of 20-25 in pursuance of the study.

Appended herewith, the letter from the University granting him permission to undertake the research and a letter outlining the scope of the study in the Department.

I hereby request the Accounting officer to consider this request and directly liaise with Mr Shabman Johnson on the following number: **078 206 4625**

Kind Regards

JUSTICE BEKEBEKE
DIRECTOR GENERAL
Date: 20171026

Appendix G: Department of Social Development permission letter

social development

Department:
Social Development
NORTHERN CAPE

OFFICE OF THE HEAD OF DEPARTMENT

Mimosa complex, Homestead road, Kimberley, Northern Cape, South Africa, 8301

Tel: (053) 844 9100, E-mail: tbooysen@ncpg.gov..za, web:http:// socdev.ncpg.gov.za/

Our Reference: Enquires: T Booysen

Your Reference: Date: 10 November 2018

Ms S Johnson

1 Zuyder Street

New Park

Kimberley

8301

Dear Ms S Johnson

LETTER OF AUTHORISATION TO CONDUCT A RESEARCH STUDY AT THE DEPARTMENT OF SOCIAL DEVELOPMENT IN THE NORTHERN CAPE

This letter will serves as authorisation for Ms Shabnam Johnson to conduct a research project titled: "Physical activity, lifestyle habits and health –related quality of life of amateur cricketers" at the department of Social Development.

The research will entail circulation of a questionnaire to twenty males between the ages of 20 – 35.

Yours faithfully

Ms H Samson

HEAD OF DEPARTMENT

Appendix H: Demographic questionnaire

SECTION A: SOCIO- DEMOGRAPHIC QUESTIONNAIRE				FOR OFFICE USE	
The following questionnaire allows the researcher to gain background knowledge on the population participating in the study					
Participant number					1-3
Group A/ B					4
		Date that the questionaries' is complete (dd/mm/yy):			
					5-10
		d d m m y y			
		INSTRUCTIONS			
1		Please indicate your age in the space provided below:			
			years old		11-12
2		Please indicate your occupation. Choose from the options below			13-14
	1		Medical professional		
	2		Finance		
	3		Construction		
	4		Education		
	5		Driver		
	6		Mine worker		
	7		Trained craftsman		
	8		Police service		
	9		South African defence force		
	10		Student		
	11		Admin Clerk		
	12		Other		
	If other, please indicate your occupation in the space provided below:				
	13		Unemployed		
3		What is your home language?			
	1		Afrikaans		15-16
	2		English		
	3		Tswana		

4		Please indicate if you suffer from any the co morbidities (Illnesses) listed below:				
	1		High Blood Pressure			
	2		High Cholesterol			
	3		Type 2 Diabetes Mellitus			
	4		Obesity			
	5		Hypothyroidism (underactive thyroid)			
	6		Congestive cardiac failure			
	7		Depression			
	8		Arthritis			
	9		Cardiac Arrhythmia (Irregular heart rhythm)			17-18

THANK YOU FOR COMPLETING THIS SECTION, PLEASE CONTINUE TO SECTION B - PHYSICAL ACTIVITY QUESTIONNIARE

Appendix I: International Physical Activity Questionnaire

SECTION B: INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE					FOR OFFICE USE ONLY
We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.					
Think about all the vigorous activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did at least 10 minutes at a time.					
1	During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling? (Mark appropriately with an "X" if no physical activities occurred)				
		days per week		If no, skip to: QUESTION 3	
		No vigorous physical activities	□o		
2	How much time did you usually spend doing vigorous physical activities on one of those days? (Mark with an "X" in the appropriate box if you are not sure)				19
		hours per day			
		minutes per day			
		Don't know/Not sure			
Think about all the moderate activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.					20
3	During the last 7 days, on how many did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking. (Mark appropriately with an "X" if no physical activities occurred)				
		days per week		Skip to: QUESTION 5	
		No moderate physical activities	□o		
4	How much time did you usually spend doing moderate physical activities on one of those days? (Mark with an "X" in the appropriate box if you are not sure)				21
		hours per day			

		minutes per day			
		Don’t know/Not sure			22
Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.					
5	During the last 7 days, on how many days did you walk for at least 10 minutes at a time? (Mark appropriately with an "X" if no physical activities occurred)				
		days per week		Skip to: QUESTION 7	
		No walking			
6	How much time did you usually spend walking on one of those days? (Mark with an "X" in the appropriate box if you are not sure)				23
		hours per day			
		minutes per day			
		Don’t know/Not sure			
The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.					24
7	During the last 7 days, how much time did you spend sitting on a week day? (Mark with an "X" in the appropriate box if you are not sure)				
		hours per day			
		minutes per day			
		Don't know/Not sure			
THANK YOU FOR COMPLETING THIS SECTION, PLEASE CONTINUE TO SECTION C - BELLOC & BRESLOW SEVEN LIFESTYLE HABITS					25

Appendix J: Belloc & Breslow seven lifestyle habits questionnaire

SECTION C: BELLOC & BRESLOW SEVEN LIFESTYLE HABITS QUESTIONNAIRE				FOR OFFICE USE ONLY	
For each of the following statements mark the applicable space with an "X" (Yes or No) that indicates your current lifestyle habits.					
		YES	NO		
1	Do you each three meals a day at regular times with no snacks in between?				26
2	Do you eat breakfast every day?				27
3	Do you participate in moderate exercises two or three times a week?				28
4	Do you get 7 to 9 hours sleep a night?				29
5	Are you a non-smoker?				30
6	Do you maintain a healthy body weight? (According to your BMI)				31
7	Do you consume little or no alcohol?				32
	*Coffee or tea with a rusk and/or toast is, for the purpose of the study, not accepted as a breakfast				
	THANK YOU FOR COMPLETING THIS SECTION, PLEASE CONTINUE TO SECTION D - STANDARD HEALTH & WELL BEING SUVERY				

Appendix K: SF-36v2 Health Survey

Your Health and Well-Being

This questionnaire asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. Thank you for completing this survey!

For each of the following questions, please mark an ☒ in the one box that best describes your answer.

1. In general, would you say your health is:

Excellent	Very good	Good	Fair	Poor
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

2. Compared to one year ago, how would you rate your health in general now?

Much better now than one year ago	Somewhat better now than one year ago	About the same as one year ago	Somewhat worse now than one year ago	Much worse now than one year ago
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

3 The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

		Yes, limited a lot	Yes, limited a little	No, not limited at all
		☐	☐	☐
a	Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	☐ 1	☐ 2	☐ 3
b	Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐ 1	☐ 2	☐ 3
c	Lifting or carrying groceries	☐ 1	☐ 2	☐ 3
d	Climbing several flights of stairs	☐ 1	☐ 2	☐ 3
e	Climbing one flight of stairs	☐ 1	☐ 2	☐ 3
f	Bending, kneeling, or stooping	☐ 1	☐ 2	☐ 3
g	Walking more than a kilometre	☐ 1	☐ 2	☐ 3
h	Walking several hundred metres	☐ 1	☐ 2	☐ 3
i	Walking one hundred metres	☐ 1	☐ 2	☐ 3
j	Bathing or dressing yourself	☐ 1	☐ 2	☐ 3

4. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
	□	□	□	□	□
a Cut down on the amount of time you spent on work or other activities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b Accomplished less than you would like	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c Were limited in the kind of work or other activities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d Had difficulty performing the work or other activities (for example, it took extra effort)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

5. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
	□	□	□	□	□
a Cut down on the amount of time you spent on work or other activities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b Accomplished less than you would like	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c Did work or other activities less carefully than usual	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups?

Not at all	Slightly	Moderately	Quite a bit	Extremely
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

7. How much bodily pain have you had during the past 4 weeks?

None	Very mild	Mild	Moderate	Severe	Very severe
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all	A little bit	Moderately	Quite a bit	Extremely
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

9. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks…

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a Have you felt full of life?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b Have you been very nervous?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c Have you felt so down in the dumps that nothing could cheer you up?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

d	Have you felt calm and peaceful?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e	Have you had a lot of energy?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
f	Have you felt downhearted and depressed?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
g	Have you felt worn out?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
h	Have you been happy?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
i	Have you felt tired?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

All of the time	Most of the time	Some of the time	A little of the time	None of the time
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

11. How TRUE or FALSE is each of the following statements for you?

		Definitely true	Mostly true	Don't know	Mostly false	Definitely false
a	I seem to get sick a little easier than other people	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b	I am as healthy as anybody I know	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c	I expect my health to get worse	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d	My health is excellent	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Thank you for completing these questions!

Appendix L: Participant information document

Date:

Study Title: Relationship of Physical Activity and Health-related quality of life amongst amateur cricketers in Kimberley, Northern Cape

To: Whom it may concern

RE: Request for permission to conduct a research study amongst amateur cricketers in the Northern Cape

INTRODUCTION

I, Shabnam Johnson am currently a MSc. Clinical sports physiotherapy student at the University of the Free State. I am conducting this research in partial fulfilment of my degree. Research is a systemic method of investigation guided by theory to solve a particular phenomenon.

REASON FOR THE RESEARCH STUDY

I will be doing a research study to determine the level of physical activity, lifestyle habits and health-related quality of life in amateur cricketers in Kimberley. Physical activity is found to have positive benefits for the mind and body. Regular physical activity reduces the chance of developing chronic lifestyle disease such as high blood pressure, non-insulin diabetes mellitus and cardiovascular conditions. Health-related quality of life (HRQOL) is a detailed concept which consists of everyday domains such as mobility, physical functioning, and mental health. Amateur cricket is a type of physical activity which will lead to an improve HRQOL. Physical activity is therefore a key factor to improving quality of life.

ADVANTAGES OF THE STUDY

By allowing permission to perform the research study, you will allow the researcher to improve the body of research knowledge on health-related quality of life and amateur cricket

RISKS

There will be no risks involved in participating in this study.

PROCEDURE

Participants will be requested to complete a questionnaire, which is composed of a socio-demographic section, a physical activity section (international physical activity questionnaire),

a lifestyle habits section (Belloc & Breslows seven habits questionnaire) and a health-related quality of life section (Standard health & well-being survey). The research study will be carried out either before or after a training session. The questionnaire will take 20 – 30 minutes to complete and you will be allowed to leave thereafter.

Participation for all is voluntary and participants have the right to decline participation or with draw from the study at any time with no risk of penalties. If the participant signs the consent form if is an agreement to participate in this research study.

All information will be kept confidential. The outcomes of the study will be made available to the Griqualand West cricket board, coaches, physiotherapists, biokinetictis and fitness trainers involved in the training and the recovery of the amateur cricketers. The information will also be available to those who participated in the study. The results will be published in an accredited journal and presented at a conference.

I would request your kind consideration of this request for permission to conduct this research. Should your decision be favourable, I would request that you communicate your permission to conduct the above -mentioned research study by signing the provided consent form. Should you have any questions regarding the study please feel free to contact me via email or at the number(s) listed below would request your kind consideration of this request for permission to conduct this research.

Thanking you in anticipation.

Shabnam Johnson

Researcher

Cell: 078 206 4625

E-mail: shibby.johnson@gmail.com

Should you have an ethical concerns please feel free to contact the secretariat of the Health Sciences Research Ethics Committee:

Mrs MGE Marais

University of the Free State

051 401 7796

EthicsFHS@ufs.ac.za

Appendix M: Participant consent form

Date:

Study title: Relationship between Physical activity and Health-related quality of life amongst amateur cricketers in Kimberley, Northern Cape.

Name of researcher: Shabnam Johnson

The information presented above described the process of the study. Below is the consent form for the above information.

CONSENT FORM

I _____ (name of participant), agree to participate to the following study: Physical activity, Lifestyle habits & Health-related quality of life amongst amateur cricketers in Kimberley, Northern Cape.

I understand the following:

- That my participation is voluntary.
- I have the right to withdraw from the study at any point of time without reason.
- That my identity will stay confidential.
- The study is aimed not to cause any harm or hold any danger.
- The study would not influence any of my other therapy/treatment negatively.
- The results will be anonymously presented in the study report and/or scientific article.
- No remuneration will be provided for my participation.
- I may contact the researcher for any additional information.
- Results may be requested after the completion of the study.
- Results will be used for compiling research report in fulfilment of M.Sc. degree at the University of Free State
- Results may be used for a scientific publication in an accredited journal.

Participant

_____ (Sign)_____ (full name)

at _____ (place) _____ (date).

Witness

_____ (Sign)_____ (full name)

at _____ (place) _____ (date).

Appendix N: Declaration of Language editor

I, Johan Frederick Barnard, hereby declare that I have been appointed by Ms Shabnam Johnson (hereinafter “the Candidate”) to attend to the linguistic aspects of Chapters 1 to 5 as well as the Summary of the dissertation that is hereby submitted (excluding front matter not specified, references and appendices). To the best of my knowledge, all suggestions and recommendations made by me in this regard have been attended to by the above-mentioned candidate.

Title of dissertation: *Physical activity, lifestyle habits and general health status of recreational sport participating and non-sport participating males in Kimberley, Northern Cape*

Qualification: MSc in Physiotherapy with specialisation in Sports Physiotherapy

Tertiary institution: University of the Free State

Date: 25 January 2020

Signed: JF Barnard

BIur (UOFS) LLB (UFS) BA (Languages and Literature)(UNISA) BAHons (Linguistics)(UNISA)(cum laude)
Member of South African Translators' Institute (1001190)
Member of Professional Editors' Guild (BAR014)
Advocate of the High Court of South Africa

JF Barnard
Language Services

PO Box 32950, Fichardt Park, Bloemfontein, 9317

mrowe@vitalitybroadband.co.za

071 034 0293 / 051 522 0238 (W)

Appendix O: Turn-it-in report