DURBAN UNIVERSITY OF TECHNOLOGY

# PROFILES OF EXERCISE PARTICIPATION BY SOUTH AFRICAN INDIANS RESIDING IN KWAZULU-NATAL, SOUTH AFRICA.

NUSRAT KADER

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# PROFILES OF EXERCISE PARTICIPATION BY SOUTH AFRICAN INDIANS RESIDING IN KWAZULU-NATAL, SOUTH AFRICA.

**NUSRAT KADER**

**Dissertation submitted in partial fulfilment of the requirements for the Degree in Masters of Technology in Chiropractic in the Faculty of Health Sciences at the Durban University of Technology**

**Supervisor: Prof T. Puckree**

**Co-supervisor: Dr F. Haffejee**

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# Declaration

This is to certify that the work is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Duran University of Technology or to any other institution for assessment or for any other purpose.

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Student Date

Nusrat Kader

**Approved for Final Submission**

_____ _____

Supervisor Date

Professor T. Puckree

PhD

_____ _____

Co-Supervisor Date

Dr F. Haffejee

PhD

# Dedication

“If you are seeking, seek us with joy

For we live in the kingdom of joy.

Do not give your heart to anything else

But to the love of those who are clear joy,

Do not stray into the neighbourhood of despair.

For there are hopes: they are real, they exist –

Do not go in the direction of darkness –

I tell you: suns exist.”

(Moulana Jalalludin Rumi)

I therefore dedicate this dissertation to the mentors of inner light, guidance and wisdom: my parents, Nurran Bibi and Mohammed Rafick.

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I begin in the name of my Lord (ALLAH), Who has gifted me with the knowledge that I possess. All Praises and Gratitude unto Him and salutations upon His Beloved, the ultimate role model, Prophet Muhammad (P.B.U.H.).

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# ABSTRACT

**Introduction:**

Evidence suggests that Indians are at a greater risk of developing chronic diseases due to their unhealthy diet and sedentary lifestyle. The increased emphasis placed on exercise and diet in preventative regimens is altering related mortality and morbidity. Physical activity plays a role in the prevention of coronary heart disease and other chronic diseases which occur at a higher rate in inactive people. Despite the need for exercise to improve health, no study has examined the exercise profile of Indians in KwaZulu-Natal, South Africa, their exercise patterns and motivations regarding exercise.

**Aim:**

This study determined the patterns of exercise participation by Indians residing in KwaZulu- Natal (KZN).

**Methodology:**

A quantitative, descriptive, cross sectional survey was used in this study. The study was conducted at the Durban North Beach on selected weekends during August and September 2015. The target population was South African Indians. A convenience sample was used, that is, potential participants, who were at North Beach on the data collection days were approached with a request to participate in the study. Following the signing of an informed consent form, data was collected by means of a self-administered questionnaire. A total of 450 self-administered questionnaires were handed out and 411 completed questionnaires were received.

Descriptive statistics in the form of frequencies, means and standard deviations were calculated. Relationships between two variables were determined using chi-squared tests, Fisher's Exact test, Pearson's correlation test, as appropriate. Odds ratios were calculated where relevant. A p value less than 0.05 was considered statistically significant.

**Results:**

The mean age of respondents was 37.7 ± 13.7 years. The majority (70.1%) participants reported that they currently exercise. However, only 42.9% of the respondents were found to meet the international requirement of 150 minutes of physical activity per week. When unstructured physical activity, such as household and yard chores were added, the latter frequency increased to 45.3%. Physical activity levels were similar across all age groups, likewise, similar proportions of males and females exercised.

The most common exercises performed included walking (45.5%) and jogging (25.3%). Gymnasiums (33.5%), public grounds (25.3%) and the beachfront (21.4%) were the most commonly used locations for physical activity. One third of these respondents reported their health conditions as their main reason for exercising and most were aware about the value of exercise. Respondents who did not exercise regularly cited time management for their lack of exercise.

**Conclusion:**

The prevalence of exercise among South African Indians is low, with less than half of the population being physically active. Interventions are required to make people aware of the benefits of physical activity in order to increase the prevalence of exercise in this population.

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# List of Abbreviations

**AHA:** American Heart Association

**BMI:** body mass index

**CHD:** coronary heart disease

**DUT:** Durban University of Technology

**FFA:** free fatty acids

**GPAQ:** Global Physical Activity Questionnaire

**HDL:** high-density lipoprotein

**HPA axis:** hypothalamic-pituitary-adrenal axis

**IDL:** intermediate-density lipoprotein

**IHD:** ischaemic heart disease

**IPAQ:** International Physical Activity Questionnaire

**Kg:** kilograms

**KZN:** KwaZulu- Natal

**LDL:** low-density lipoprotein

**METs:** metabolic equivalents

**MmHg:** millimetres of mercury

**Mmol/l:** millimole per litre

**OR:** Odds Ratio

**PTH1-34:** teriparatide

**SERMS:** selective oestrogen receptor modulators

**SNS:** sensory nervous system

**VLDL:** very low-density lipoprotein

**WHO:** World Health Organization

# Definitions

Physical activity is defined as bodily movements that are produced by skeletal muscles, which result in energy expenditure (Caspersen *et al*., 1985).

Exercise is a category of physical activity and is a planned repetition of bodily movements that maintains or improves physical fitness (Caspersen *et al*., 1985).

Physical fitness is an individual's ability to perform daily tasks without fatigue and thereafter to still have the ability to enjoy leisure activities and deal with unforeseen circumstances (Caspersen *et al*., 1985).

Intensity of physical activity is defined as the magnitude of effort an individual expresses when performing a type of physical activity (WHO, 2015).

Post exercise recovery is the body's adaption after any physical activity (Calder, 1990).

Fatigue after physical activity is defined as the failure to maintain exercise intensity through the duration of the exercise (Meeuson *et al*., 2006).

Aerobic refers to the use of oxygen that increases the heart and breathing rate and aids in sustaining moderate intensity physical activity (Zupan *et al.,* 2009).

Anaerobic activity refers to when individuals exert themselves to perform activities which result in breathlessness after less than 90 seconds (Zupan *et al.,* 2009).

Structured physical activity is performed in a formal manner with the aim of achieving health benefits through the physical activity, it occurs on a regular basis and includes various types of sport (competitive and non-competitive), gym exercises and fitness classes (Bognadis, 2012).

Unstructured or informal physical activity refers to occupational duties, walking to and from transport means, household/garden chores and stair usage that is performed on a regular basis (Appleton *et al*., 2013).

Coronary heart disease (CHD), also known as Ischaemic Heart Disease (IHD), is defined as insufficient oxygen and blood supply to and from the heart (Kumar *et al.,* 2007).

Diabetes mellitus is a broad term used to describe disorders that cause increased blood glucose levels (hyperglycaemia), namely, type I and II diabetes (Kumar *et al.,* 2007).

Hypertension refers to a raised blood pressure where the systolic pressure is equal to or greater than 140 mmHg and diastolic pressure is equal to or greater than 90 mmHg (Naicker *et al.,* 2015).

Cholesterol is a fat-like substance that is produced by the liver from the ingestion of saturated fats (WHO, 2002).

Hypercholesterolemia also known as hyperlipidaemia, refers to excess lipids in the bloodstream (Kelly, 2010).

Obesity is defined as an increase in fat stores, particularly in the abdominal cavity, where the ratio of weight to height squared / body mass index (BMI) is greater than 30 (Ibrahim *et al.,* 2013).

Chronic diseases are defined as diseases that have a slow onset but prolonged and continuous course (Booth *et al.,* 2012).

Pain is defined as a physical discomfort that is felt due to noxious stimulation that acts on free nerve endings (Booth *et al.,* 2012).

Low back refers to pain between the lower margin of the twelfth ribs and the lower gluteal folds, with or without pain referral to the lower limbs (Hoy *et al.,* 2014).

Neck pain is pain that is experienced between the occiput and the third thoracic vertebrae (Muchna, 2011).

Osteoarthritis is defined as “wear and tear” or degeneration of cartilage and underlying bone within a joint and is part of the aging process (Booth *et al.,* 2012).

Osteoporosis is explained as the deterioration of bone tissue, decreased bone mass and reduced bone density which leads to enlargement of bone spaces that produces porosity and brittleness (Hough *et al*., 2012).

A cross-sectional survey is an observational study that assesses the prevalence of attributes (e.g. exercise) in a particular population at a particular time (Kanchanaraksa, 2008).

# CHAPTER ONE

# INTRODUCTION

## 1.1. Background

Physical activity is defined as bodily movements that are produced by skeletal muscles, which result in energy expenditure (Caspersen *et al.,* 1985). Regular exercise throughout life is important in preventing coronary heart disease (CHD) which occurs at a higher rate in inactive people (Paguntalan and Gregoski, 2015). A sedentary lifestyle has been identified as a risk factor for many diseases, such as CHD, diabetes mellitus, obesity and low back pain (Vardhan, 2006). In addition, it has also been observed that South African Indians lead a sedentary lifestyle (Vardhan, 2006; Seedat, 2005). However, this research was conducted almost ten years ago and it is unknown whether this lifestyle has changed in the recent years. In view of this it will be important to determine the level of physical activity amongst Indians and the reasons for the lack of activity in those individuals that are inactive.

It has previously been shown that barriers to physical activity exist within specific communities (Lambert and Kolbe-Alexander, 2005). However, such data is not available for the South African Indian community. Once these are ascertained, steps can then be taken to educate the community about the importance of exercise and an attempt can also be made to reduce these barriers. According to Arvidsson *et al.* (2008), research related to the health-promoting factors is needed worldwide, specifically with regards to physical activity.

South African researchers and policy makers outlined research that is required in specific communities (Seedat, 2005). These included the determination of types and levels of physical activity in particular communities, the reasons for exercising and whether it was beneficial (Lambert and Kolbe-Alexander, 2005). There is also a need to determine the reasons for exercise participation in those individuals who are physically active and to ascertain whether this has had any changes in their health (Lambert and Kolbe-Alexander, 2005).

The most efficient measure of physical activity levels which provide reliable and valid information includes information on the type, intensity, duration, frequency and timing

of physical activity (Dishman *et al.,* 2012). The most reliable means of measuring the effectiveness of physical activity is by the use of descriptive epidemiology that includes the assessment of physical activity in populations. (Dishman *et al.,* 2012).

Since physical inactivity causes obesity, low back pain, osteoporosis and joint pain (Woolf and Pfleger, 2003), this may impact on visits to chiropractors, other health care professionals and the health care budget. This study is therefore important in that it addresses factors that may impact on the burden of disease attended to by chiropractors and other health care professionals.

## 1.2. Aims and Objectives

### 1.2.1. Aim

To determine the exercise profile of South African Indians residing in KwaZulu-Natal.

### 1.2.2. Objectives

1. To determine the frequency of participation in exercise by Indians residing in, KZN.

2. To determine the types of exercise performed by this population.

3. To determine the reasons for exercising by those that are physically active.

4. To determine the different areas/facilities used for exercising by Indians in KZN.

5. To determine reasons for inactivity in those that do not exercise.

6. To determine the barriers that prevent Indians residing in KZN from exercising.

7. To compare the above amongst different ages, gender and religious backgrounds.

## 1.3. Flow of the thesis

Chapter two provides details on the literature on various physical activities including their benefits and requirements, prevalence of chronic diseases and the relationship between physical activity/inactivity and chronic diseases in the Indian population.

Chapter three addresses the methodology that was undertaken to conduct the research study. Ethical considerations from all respective authorities are highlighted.

The chapter also outlines the statistical tests that were used in obtaining the study's results.

Chapter four describes the results of the study. These are presented in the form of graphs, figures, tables and written information.

Chapter five is a critical discussion of the results obtained in the study.

Chapter six provides a summary of the study and also outlines recommendations for future studies. .

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1. Introduction

This chapter presents a detailed review of the literature related to the prevalence and patterns of physical activity within the Indian population in general. It also includes an insight into the prevalence and pathophysiology of prominent chronic diseases seen in the same population. Explanations on the various types of exercises and their physiological benefits are included.

The literature review was conducted by using the following search engines: Google scholar, PubMed, Durban University of technology (DUT) research summons, Medscape and Ebscohost. The keywords used in the search engines were as follows: 'physical activity,' 'physical activity in the Indian population,' 'physical activity in South Africa,' 'physical activity in KwaZulu Natal, South Africa,' 'perceptions and physical activity,' 'exercise and Indians,' 'prevalence of exercise,' 'benefits of exercise,' 'structured and unstructured exercise,' 'exercise physiology,' 'exercise and chronic diseases,' 'coronary heart disease and Indians,' 'chronic diseases and Indians,' 'chronic pain and exercise,' 'types of exercise,' 'recovery and exercise,' 'fatigue and exercise,' 'stairs and exercise,' 'manual work and exercise,' 'recreational activity and exercise,' 'chores and exercise' and ' exercise recommendations.'

## 2.2. Overview

Physical activity is defined as bodily movements that are produced by skeletal muscles, which result in energy expenditure (Caspersen *et al.,* 1985). Regular exercise throughout life is important in preventing coronary heart disease (CHD) which occurs at a higher rate in inactive people (Paguntalan and Gregoski, 2015). A sedentary lifestyle has also been identified as a risk factor for many diseases, such as CHD, diabetes, obesity, osteoporosis, low back pain, and joint pain (Woolf and Pfleger, 2003; Vardhan, 2006). An association between the South African Indian population and a sedentary lifestyle has previously been established (Vardhan, 2006). However, this research was conducted almost ten years ago and it is unknown whether this lifestyle has changed in recent years. In view of this it will be

important to establish the level of physical activity in the Indian community and to determine the reasons for the lack of activity in those individuals that are inactive. It has previously been shown that barriers to physical activity exist within specific communities and these may provide reasons for physical inactivity (Lambert and Kolbe-Alexander, 2005). Such data is not available for the South African Indian community.

Physical inactivity is associated with the diseases mentioned above, it may impact on visits to chiropractors, other health care professionals and the health care budget. This study is thus important in that it addresses factors that may impact on the burden of disease attended to by chiropractors and other health care professionals.

## 2.3. The Indian diet

An ideal Indian staple diet consists mainly of meat, rice, legumes, and sweet foods which are consumed either as starters, main course, desserts or snacks (Agrawal *et al*., 2008). Furthermore there is a decreased consumption of fruit, vegetables and fibre, however, South African Indians consume a variety of vegetables that are often added to a meat dish which masks their actual vegetable intake (Naicker *et al.,* 2015). The low dietary intake of fibre, fruit and vegetables and higher intake of carbohydrates, proteins, free sugar and added fat in the form of oil or *ghee* (clarified butter) used in the cooking procedure is also associated with the Indian diet and predisposes the Indian population to chronic diseases such as hypercholesterolemia, ischaemic stroke, diabetes mellitus (type II), CHD, hypertension, and obesity (Naicker *et al.,* 2015).

According to the American Heart Association, the recommended calorie intake is between 1,500-2,000 calories/day. An unhealthy diet and sedentary lifestyle are modifiable risk factors in the onset of chronic diseases (Paguntalan and Gregoski, 2015). Currently, South Africa is faced with a challenge in producing a healthy diet guideline and recommendation for its diverse population (Schonfeldt *et al*., 2013).

## 2.4. Physical activity

### 2.4.1. Definitions

Physical activity, exercise and physical fitness are commonly misused as synonyms (Caspersen *et al.,* 1985). Physical activity refers to occupational activities, desired modes of transport such as walking or cycling, domestic chores and leisure time physical activities (WHO, 2002). Exercise is a category of physical activity and is a planned repetition of bodily movements that maintains or improves physical fitness (Caspersen *et al.,* 1985). Physical fitness is an individual's ability to perform daily tasks without fatigue and thereafter to still have the ability to enjoy leisure activities and deal with unforeseen circumstances (Caspersen *et al.,* 1985).

## 2.5. Prevalence of physical activity

### 2.5.1. South Africans and physical activity

Physical activity levels are low world-wide, with 60% of the global population not performing adequate physical activity (WHO, 2015). The South African population has a 43-49% prevalence of physical inactivity (Micklesfield *et al*. 2014).

### 2.5.2. Indians and physical activity

In a study comparing lifestyles between the Indian, African and White population of the United Kingdom, Indians were the least active (Abate and Chandalia, 2001). Previously, the people of India were considered physically active due to their manual occupational duties but since industrial development and economic growth, only 3-15% of the population perform leisure time activities and are currently physically active (Naicker *et al.,* 2015). The results of the above study showed that of those who did exercise, majority did not perform the adequate amount of exercise to be regarded as physically active (Naicker *et al.,* 2015).

Similarly, the Indian population in the Netherlands are also more inactive compared to other ethnic groups in that country (Dhawan and Bray, 1997). An association between South African Indians and a sedentary lifestyle has also previously been established (Seedat, 2005; Vardhan, 2006, Naicker *et al.,* 2015).

## 2.6. Intensity of physical activity

Physical activity can be performed at various intensities (WHO, 2015). Intensity is defined as the magnitude of effort an individual expresses when performing a type of physical activity and is measured in metabolic equivalents (METs), which is the ratio between the metabolic rate at rest and during physical activity (WHO, 2015). Moderate and vigorous intensities of physical activity are the two categories used to describe the intensity levels of physical activity (Dishman *et al.,* 2012).

### 2.6.1. Moderate intensity physical activity

Moderate intensity exercises include: brisk walking, dancing, garden / household chores, sport / active games with children/pets, building tasks (e.g., painting) and carrying loads that are less than 20 kg (WHO, 2015). It is also stated that moderate intensity physical activities require moderate amount of effort and minimally increase the heart rate (WHO, 2015). To determine if a moderate intensity is being achieved, the 'talk test' can be performed (WHO, 2015). If there is no difficulty in speaking, moderate intensity activity has been achieved. However, if there is difficulty in maintaining the conversation, the activity is of vigorous intensity (WHO, 2015). Moderate intensity activities result in an energy expenditure of three-six metabolic equivalents (Gunn *et al.,* 2004).

Caloric reduction due to exercise depends on the type and intensity of exercise performed (WHO, 2015). A duration of 150 minutes of moderate exercise on five or more days per week has been prescribed as a manageable level of physical activity with resultant health benefits (Elley *et al.,* 2007). The caloric reduction for some moderate intensity exercise performed for 30 minutes is: brisk walking: 140 kcal, gardening and light household chores: 165 kcal, golf: 165 kcal, hiking: 185kcal, light weight lifting: 110kcal and stretching: 90kcal (WHO, 2015).

### 2.6.2. Vigorous intensity physical activity

Vigorous intensity exercises include: running, fast swimming, walking/climbing uphill, fast cycling, aerobics, competitive sport, heavy digging and carrying loads that weigh more than 20 kg (WHO, 2015). These activities require a maximum amount of effort and substantially increase the heart rate (WHO, 2015).

Vigorous activity for 60 minutes per week in 20 minute bouts can be sufficient to ensure health benefits (Anjana *et al.,* 2015). Vigorous intensity exercise for a duration of 30 minutes causes a calorie reduction between 220 and 295 (WHO, 2015).

## 2.7. Barriers of physical activity

There are psychological, social, emotional and environmental factors that will impact on an individual's decision to participate in physical activity (McArthur *et al.,* 2014). An Iranian study has shown that certain demographic and environmental factors may prevent people from participating in physical activity (Booth *et al.,* 2012; King, 2001). The demographic factors included being female, old age, low level of education, low income, increased weight, low self-efficacy and lack of support from family and friends (Booth *et al.,* 2012; King, 2001).

Environmental factors of concern included lack of safe sidewalks, a high crime rate, bad neighbourhoods and air pollution (Booth *et al.,* 2012; King, 2001). From a cultural context, many ethnic groups still have traditional ideologies about gender and occupational/domestic responsibilities which affect the level of physical activity (Codina *et al.,* 2013). These factors together with laziness, depression, exhaustion, lack of leisure time, decreased motivation, no company and not being able to exercise in front of the opposite gender were all regarded as "barriers" to physical activity within the Iranian population (Salehi *et al.,* 2010). The more barriers an individual faces, the lower the levels of physical activity (McArthur *et al.,* 2014).

## 2.8. Benefits of physical activity

Benefits of physical activity outweigh any possible barriers. It has been suggested that if people are educated on the benefits of physical activity, the levels of physical activity will increase (Salehi *et al.,* 2010). However, recent research indicates that the benefits of physical activity have been well promoted world-wide, but this has not resulted in increased levels of physical activity (Anjana *et al.,* 2015).

Regular physical activity aids in weight loss, reducing blood pressure and the prevention of cardiovascular diseases and type II diabetes mellitus (Bassuk and Manson, 2010). Other benefits of increased physical activity has also been shown to

improve moods and anxiety disorders, some forms of cancer, osteoporosis and sarcopenia (Dunn and Jewell, 2010). Increased physical activity improves personal characteristics such as confidence, popularity, responsibility, maturity and happiness. Therefore physical activity serves as a platform to improve health and interpersonal dynamics (Kanarek *et al.,* 2012). Individuals who participated in physical activity reported many benefits (Salehi *et al.,* 2010). These benefits included increased social time, enjoyment, weight-loss, decreased stress levels, peaceful sleep, increased self-fitness, positivity and improvement in flexibility (Salehi *et al.,* 2010).

Physical activity can be improved if family, friends and colleagues all participate (Sparling *et al.,* 2000). Further improvement will occur if health care professionals and the government promote physical activity (Sparling *et al.,* 2000). To this end, the South African Department of Health released national health guidelines that included physical activity followed by promoting an annual National Wellness Day (Sparling *et al.,* 2000). The above initiatives failed to be implemented due to a lack of financial and local community support (Sparling *et al.,* 2000). In addition, the Sports Science Institute of South Africa in association with Old Mutual targeted smaller disadvantaged communities of all races and hosted exercise lessons for all age groups under the supervision of sports scientists, allied health professionals and physical education specialists (Sparling *et al.,* 2000). However, this project was only implemented in communities that specifically requested help (Sparling *et al.,* 2000). The project resulted in an improvement in functional ability within the elderly, increased levels of physical activity and lower blood pressure (Sparling *et al.,* 2000).

## 2.9. The physical and psychological effects of physical activity

During physical activity, muscle work output and in turn oxygen consumption increase. This causes blood vessel dilation in muscles which increases venous return and cardiac output resulting in a more efficient cardiovascular system (Guyton and Hall, 2011). Endurance physical activity are reliant on the cardiovascular and respiratory systems to efficiently use and relay oxygen to the muscles. This ultimately aids in lowering of the resting heart rate and blood pressure further increasing the efficiency of the cardiovascular system. This allows for better exercise performance and better cardiovascular health (Guyton and Hall, 2011).

Regular physical activity causes an increase in blood flow to the brain and activates the hypothalamic-pituitary-adrenal (HPA) axis causing a physiologic reaction to stress (Wittink *et al*., 2011). This process is mediated by the communication between the HPA axis, limbic system of the brain, amygdala and the hippocampus which are areas of the brain responsible for mood and motivation (Tsatsoulis and Fountoulakis, 2006). The communication between these brain areas and the HPA axis results in low cortisol and catecholamine levels which in turn, decreases cardiovascular and sensory nervous system (SNS) responses to stressful stimuli (Tsatsoulis and Fountoulakis, 2006).

In addition, any state of exhilaration, most commonly: exercise, excitement or orgasm allow for the secretion of endorphins which are produced in the pituitary gland (at the base of the brain) and hypothalamus (linking the nervous system and endocrine system) (Tsatsoulis and Fountoulakis, 2006). These endorphins are endogenous opioid polypeptide compounds that produce a state of euphoria and aid in analgesia and mood improvement (Wittink *et al*., 2011). Therefore, physical activity has beneficial effects on improving mood, anxiety, self-efficacy, self-esteem and memory. By doing so, it provides neuroprotection (Wittink *et al*., 2011).

## 2.10. Post exercise recovery and fatigue

Post exercise recovery is defined as the body's adaption after any physical activity (Calder, 1990). It allows for a decrease in heart rate and the removal of metabolic waste products, lactate and hydrogen ions, which allows for muscle recovery (Martinmäki and Rusko, 2008; Mike and Kravitz, 2009). Recovery from exercise determines an individual's overall performance and can enhance performance as shorter recovery periods occur (Mike and Kravitz, 2009). Immediate recovery occurs during exercises such as brisk walking, where energy regeneration in the lower limbs occurs between strides (Mike and Kravitz, 2009). Short term recovery occurs more commonly in training and refers to recovery between sets of an exercise or between intervals of exercise bouts (Mike and Kravitz, 2009).

Fatigue after physical activity is defined as the failure to maintain exercise intensity throughout the duration of the exercise (Meeuson *et al*., 2006). It can occur due to muscle glycogen depletion or the brain signalling for exercise cessation as a

protective mechanism to prevent damage to the muscles (Jentjens and Jeukendrup, 2003; Bishop *et al*., 2008). Fatigue could result in muscle soreness, muscle weakness, poor exercise performance which may prevent immediate recovery and further performance or optimal training for that session (Gleeson, 2002).

## 2.11. Types of physical activity

Physical activity consists of occupational duties, walking to desired mode of transport, domestic work and leisure activities (Dishman *et al.,* 2012). Although these can render an individual physically active, it is the amount, intensity, duration and frequency of the activity that is important in causing health benefits (Kokkinos, 2012). Physical activity is dependant on the intensity of the performed activity and occurs in two forms, namely, aerobic/endurance and anaerobic activity (Bognadis, 2012). Aerobic physical activity refers to the use of oxygen which increases the heart and breathing rate and aids in sustaining moderate intensity physical activity (Zupan *et al.,* 2009). Aerobic physical activity assists in decreasing the risk of chronic diseases (Bognadis, 2012). Anaerobic activity refers to when individuals exert themselves to perform activities which result in breathlessness after less than 90 seconds (Zupan *et al.,* 2009).

Physical activity can be further divided into two types: structured and unstructured. Structured physical activity is performed in a formal manner with the aim of achieving health benefits through the physical activity, it occurs on a regular basis and includes various types of sport (competitive and non-competitive), gym exercises and fitness classes (Bognadis, 2012). Unstructured or informal physical activity includes occupational duties, walking to and from transport means, household/garden chores and stair usage that is performed on a regular basis (Appleton *et al*., 2013).

### 2.11.1. Structured physical activity

#### 2.11.1.1. Brisk walking

Walking, jogging and running involve a rhythmic forward movement of the lower limbs that activate the lower limb muscles, namely: iliopsoas, gluteus maximus, quadriceps and hamstrings. Those are aided by the gastrocnemius and anterior tibialis muscles (Moore and Dalley, 2014). The hip abductors made up of the gluteus

medius and minimus, hip adductors consisting of adductor longus, brevis and pectineus muscles allow for hip stabilization during these rhythmic movements (Moore and Dalley, 2014). The thorax and abdominal muscles are also activated to keep the torso in an erect position whilst the hands swing adjacent to the body (Milburn, 1981). The thorax muscles include pectoralis major and minor muscles whilst the abdominal muscles consist of the following: external oblique, internal oblique and transverse abdominal (Moore and Dalley, 2014).

Walking is reported as the most ideal form of aerobic activity due to it having a low risk for injury owing to low impact activity and it can be easily achieved (Connor *et al*., 2015). Hence walking is the first recommendation to begin an active lifestyle in those that are sedentary (Connor *et al*., 2015).

Brisk walking consists of the act of a fast-paced walk that noticeably increases the heart rate whilst still being able to uphold a conversation without becoming breathless (Haskell *et al.,* 2007). Brisk walking is considered a moderate-intensity aerobic activity that is recommended for 30 minutes a day, five times a week (Haskell *et al.,* 2007). Brisk walking expends calories and reduces cardiovascular diseases (Milburn, 1981; Connor *et al*., 2015; Haskell *et al.,* 2007). Jogging and running are defined as vigorous aerobic activities which involve quick forward leap movements of the lower limb (Milburn, 1981). They are high intensity exercises that expend energy more rapidly than walking (Milburn, 1981; Schnohr *et al*., 2015).

#### 2.11.1.2. Zumba

Dancing has been a form of social activity for many decades and recently been shown to have health benefits (Vahabi *et al*., 2012). It is mostly used for its roles in improvement of cardiac functioning and loss of weight (Vahabi *et al*., 2012). The most utilized form of dancing beside cultural specific dance is Zumba (Micallef, 2014). Zumba is a Latin-based fitness dance that allows for the loss of 378-817 kilocalories per workout (Micallef, 2014). It consists of one hour sessions that begin and end with five to ten minutes of stretching (Micallef, 2014). Zumba consists mainly of moderate intensity movements with bouts of vigorous activity that add up to the recommended 75 minutes of vigorous activity per week (Micallef, 2014). Dancing provides immediate results such as a better physical well-being, improvement in mental health, a sense of enjoyment, enhanced functional ability in arthritic patients

and increased social well-being (Vahabi *et al*., 2012; Robinson *et al.,* 2003; Eyigor *et al.,* 2009). Cultural specific dancing has been shown to reduce the risk for heart diseases, obesity, depression and arthritis (Vahabi *et al*., 2012).

#### 2.11.1.3. Swimming

Swimming refers to rhythmic self-propelling through water and is considered an aerobic physical activity (Tanaka, 2009). Due to water being the main medium for swimming, it does not involve bearing of body weight and allows for less compressive load on joints (Tanaka, 2009). This indicates that musculoskeletal injuries are less likely to occur in swimming (Tanaka, 2009). Swimming has been shown to improve aerobic capacity in asthmatic individuals, especially in children (Matsumoto *et al.,*1999). Regular swimming results in insulin sensitivity, blood pressure regulation and improvement in mental health (Tanaka, 2009). More research is required to determine the health benefits of swimming on coronary heart disease (CHD) and weight loss (Tanaka, 2009). Swimming develops and strengthens the core muscles of the abdomen (transverse abdominal muscle) and the trunk muscles preventing postural abnormalities (Bielec *et al*., 2013). Hence, swimming plays a role in the treatment of spinal curvature disorders such as scoliosis (Bielec *et al*., 2013).

Swimming is considered a moderate intensity activity whilst competitive swimming is considered a vigorous intensity activity (Bielec *et al*., 2013). The American Heart Association has recommended 30 minutes for all moderate intensity exercises, including swimming on five days of the week.

Swimming, water aerobics and water jogging are collectively termed water exercises, which have been shown to be beneficial in improvement of diabetes, arthritis and obesity (Bielec *et al*., 2013).

#### 2.11.1.4. Cycling

Cycling is an aerobic activity mainly performed with moderate intensity in combination with bouts of vigorous activity (de Hartog *et al.,* 2010). Leisure cycling also includes cycling to work and needs to be performed at 15 km/hr in order for it to characterize as a moderate activity (Ainsworth *et al.,* 2000). It has been reported that

regular cycling has a resultant loss of 1000 kcal/ per week for women and 1500 kcal per week for men (Oja *et al*., 2011).

Cycling specifically targets the cardiac, respiratory and metabolic systems resulting in the decrease of cardiovascular diseases, stroke, type II diabetes, hypertension, hypercholesterolemia, metabolic syndrome, colon cancer, breast cancer and obesity (de Geus *et al.,* 2009). Regular cycling is beneficial in increasing cardiorespiratory functions, improving muscular fitness, reducing depressed moods and enhancing cognitive functioning (Oja *et al*., 2011). Cycling in the elderly has demonstrated to increase balance, hence decreasing the prevalence of falls (Oja *et al*., 2011).

#### 2.11.1.5. Weight lifting

Lifting weights, as it is informally called, refers to strength training or progressive resistance training (Seguin and Nelson, 2003). Strength training can also be defined as dynamic muscle movement against resistance and with time the resistance is slowly increased to intensify the training session (Seguin and Nelson, 2003). This resistance is provided by the use of body weight, exercise bands, machine weights, free weights (i.e. dumbbells and adjustable ankle weights), or a combination of all of the above (Seguin and Nelson, 2003). It has been shown that body weight exercises and free weights cause a greater improvement in muscle strength and physical function than elastic bands (Seguin and Nelson, 2003).

Strength training also helps to reduce arthritis, sleep disorders, heart disease, type II diabetes, osteoporosis and depression (Roubenoff and Hughes, 2000). It is known to increase muscle mass, muscle strength, bone mass, flexibility, dynamic balance, self-confidence and self-esteem (Roubenoff and Hughes, 2000). The above benefits are vital for the elderly as strength training reduces the risk for falls, prevents frailty and increase functional ability (Roubenoff and Hughes, 2000; Foldvari *et al.,* 2000).Strength training is recommended twice or thrice a week (Nelson *et al*., 2014).

Strength training performed in isolation is considered a moderate-intensity exercise and allows for the loss of five kilocalories per minute (Ainsworth *et al.,* 1993). When it is combined with circuit or cardio training, it is considered to be of a vigorous intensity and allows for the reduction of seven kilocalories per minute (Ainsworth *et al.,* 1993).

#### 2.11.1.6. Racket sport

Racket sport is a collective name given to all sport that requires each participant to use a hand-held racket to propel in most cases, balls of varying sizes (Lees, 2003). These sport include: badminton, table tennis, tennis and squash (Lees, 2003). Racket sports are played on a specific size court within which the ball has to be contained (Lees, 2003). The purpose of these sports is to propel the ball in directions that the counter player cannot return the propelled ball successfully (Lees, 2003). They are considered to be aerobic physical activity of vigorous intensity (Barry and Scott, 2012) and have an average duration of 20-90 minutes (Lees, 2003).

Racket sports require perception and action; hence participation in these sports improves motor and functioning skills (Chen *et al.,* 2015). Tennis players specifically, have better cardiorespiratory fitness, lower body weight and higher bone density than sedentary individuals (Barber-Westin *et al*., 2015).

#### 2.11.1.7. Team sport

Team sports occur over the duration of 60-120 minutes and include soccer, cricket, basketball, netball, volleyball, baseball, hockey, rugby, softball, handball, water polo and lacrosse (Billaut *et al*., 2012). Most team sports comprise of short and high-intensity efforts such as jumping, tackling and dribbling (Billaut *et al*., 2012) but the key feature is the repeated short bouts of sprinting that occurs during a match (Buchheit, 2012). Due to team sports having a combination of vigorous activity with short bouts of high-intensity efforts, there is a resultant high energy expenditure which causes extra loss in calories (Billaut *et al*., 2012).

Team sports have psychological and social health benefits that include an increase in social circle, improved self-confidence, life satisfaction, improvement in mood and reduction in feelings of hopelessness and suicide (Eima *et al.,* 2013). Individuals that engage in team sport have also been shown to have cardiorespiratory fitness, lower body weight and higher bone density than sedentary individuals (Barber-Westin *et al*., 2015).

#### 2.11.1.8. Pilates

Pilate's exercises are series of muscle contraction exercises that allow for the maintenance of a neutral spinal posture and train an individual to strengthen the core and trunk muscles in co-ordination with respiration in order to achieve dynamic body flexibility (Segal *et al*., 2004). The core muscle refers to transverse abdominus muscle and trunk muscles which are the back extensor muscles that consist of iliocostalis, longissimus and spinalis, collectively known as the erector spinae muscles (Moore and Dalley, 2014). Pilates decreases musculoskeletal and joint pain owing to the compressive and decompressive forces on joints and cartilage (Segal *et al*., 2004). It also increases strength, balance, coordination and posture in athletes and increase flexibility in patients with rheumatoid arthritis (Segal *et al*., 2004).

#### 2.11.1.9. Yoga

Yoga is the Sanskrit term for "union" and is defined as a physical and mental treatment that utilizes deep relaxation breathing, meditation and stationary postures to create specific body alignment (Oken *et al.,* 2006; Chaoul and Cohen, 2010). It allows for stretching of all muscles groups resulting in increased flexibility, strength and balance (Oken *et al.,* 2006). Furthermore, it decreases anxiety (Nelson *et al*., 2014).

### 2.11.2. Unstructured physical activity

#### 2.11.2.1. Stair usage

Small amounts of daily physical activity, such as climbing stairs, can be accumulated to an acceptable amount of energy expenditure (Pillay *et al.,* 2009). Stair climbing is a vigorous aerobic physical activity with resultant benefits in fitness, strength, weight loss, better lipid profiles and decreased risk of osteoporosis (Boreham *et al*., 2000). It is particularly successful in an occupational setting where stairs can be used on multiple occasions (Pillay *et al.,* 2009). If stair climbing is performed with a vigorous intensity on a daily basis, seven kilocalories per minute can be lost (Ainsworth *et al.,* 1993).

#### 2.11.2.2. Load carrying

Previous studies have shown that carrying 20 kg of any type of load approximately six or eight times a day results in moderate-intensity strength training (Tshabangu and Coopoo, 2001). This results in reduction of risks for heart disease, type II diabetes, osteoporosis and depression (Roubenoff and Hughes, 2000). Load lifting is similar to weight lifting and is known to increase muscle mass, muscle strength, bone mass, flexibility and improve dynamic muscular movement (Roubenoff and Hughes, 2000).

#### 2.11.2.3. Household chores

Household chores such as domestic and yard chores are moderate intensity activities and can be a major source of energy expenditure with resultant health benefits (Phongsavan *et al.,* 2004; Kingsley *et al*., 2009).

Sweeping, window cleaning, vacuuming and lawn mowing can be considered vigorous activities, whilst washing up, weeding and pruning are moderate activities (Gunn *et al.,* 2004). Vacuuming is considered vigorous intensity due to lifting of carpets and moving of furniture (Gunn *et al.,* 2004). Sweeping the yard is considered a vigorous activity due to the rough ground as compared to sweeping tiled and smooth surface of a home (Gunn *et al.,* 2004). Lawn mowing and window cleaning are the most intense household chores but are performed at a less frequency and hence minimally contribute to the recommended 150 minutes of moderate intensity activity per week (Withers *et al.,* 2006).

Sweeping, window cleaning, vacuuming and lawn mowing for at least 30 minutes per day have been associated with health benefits and can be used as an alternative to cycling or walking (Withers *et al.,* 2006; Brooks *et al.,* 2004). However, household activities such as dusting and tiding up that are performed for less than ten minutes a day are not considered a contribution to physical activity (Gunn *et al.,* 2004).

#### 2.11.2.4. Active leisure time with children

Actively playing with children can increase an adult's fitness with the added benefit of having regular family time (Fredricks and Eccles, 2005). It may include a combination of moderate and vigorous activity and if performed daily, it can be

regarded as physical activity (Anderson *et al*., 2009). Playing active games such as hopscotch or tag increases the heart rate and could burn up to 200 calories (Anderson *et al*., 2009).The health benefits include cardiorespiratory fitness, weight loss, for both the adult and the child (Bassuk and Manson, 2010). In addition, the active time spent with children increases their academic, psychological and social well-being (Fredricks and Eccles, 2005). Furthermore it inculcates a healthy lifestyle from an early age (Fredricks and Eccles, 2005).

## 2.12. The relationship between sedentary lifestyle and chronic diseases

A sedentary lifestyle refers to physical inactivity and can lead to the development of chronic diseases (Seedat, 2005). Some of these chronic disease are: coronary heart disease (CHD), ischaemic stroke, type II diabetes mellitus , hypertension, deep vein thrombosis, osteoarthritis, colon cancer, breast cancer, obesity, osteoporosis, bone fractures, cognitive dysfunction, depression, anxiety and low back pain syndrome (Woolf and Pfleger, 2003; Booth *et al.,* 2012; Micklesfield *et al.,* 2014). It was reported that 40-49% of the South African population have adopted a sedentary lifestyle (Kunene and Taukobong, 2015). It has been established that both genetic predisposition and a sedentary lifestyle are risk factors for CHD and type II diabetes mellitus (Seedat, 2005; Vardhan, 2006). The highest prevalence of these diseases were found in the South African Indian population, compared to other ethnic groups in the country (Seedat, 2005; Vardhan, 2006).

## 2.13. Chronic diseases and physical activity

### 2.13.1. Coronary heart disease (CHD)

Coronary heart disease (CHD), also known as Ischaemic Heart Disease (IHD), occurs when there is insufficient oxygen and blood supply to and from the heart (Kumar *et al.,* 2007). The myocardium, which is the main muscle of the heart, needs sufficient blood supply to ensure proper contraction. This is ensured by the coronary arteries that transport oxygen and blood to the myocardium (Vardhan, 2006). When a coronary artery becomes blocked through atherosclerotic disease, the area of the myocardium that it supplies becomes injured, ischaemic and/or infarcted. This

results in angina pectoris, myocardial infarction and congestive heart failure, all of which are collectively called CHD (Vardhan, 2006).

Atherosclerotic disease refers to atherosclerosis which is the hardening of blood vessels by plaque (Kumar *et al.,* 2007). Plaque is a form of excess cholesterol and cholesterol esters that harden and protrude into the vascular lumina which weakens the blood vessel and blocks blood flow to the heart resulting in CHD (Kumar *et al.,* 2007). The artherosclerotic plaques can rupture leading to thrombosis and sudden death (Kumar *et al.,* 2007). In South Africa, 4.8 million people presented with hypercholesterolemia and 31 million with increased levels of low-density lipoprotein cholesterol levels, which are risk factors for CHD (WHO, 2002). Indians have the highest prevalence of CHD in South Africa (Seedat, 2005).

Physical activity prevents the accumulation of the atherosclerotic plaques in the artery supplying the heart, thus preventing CHD and resulting in efficient cardiac function (Vardhan, 2006). The American Heart Association (AHA) recommends 30-60 minutes of moderate physical activity in bouts of 10-15 minutes four or five times a week, specifically for individuals with CHD (Vardhan, 2006).

### 2.13.2. Diabetes mellitus

Diabetes mellitus is a broad term used to describe disorders that cause increased blood glucose levels (hyperglycaemia), namely, type I and II diabetes (Kumar *et al.,* 2007). The normal blood glucose level is less than or equal to 5.5 mmol/l (Padoa, 2011). An individual is diabetic when the fasting glucose concentration is more than 6.1 mmol/l or when the random/non-fasting concentration is 11.1 mmol/l or more (Kumar *et al.,* 2007). In 2012, three and a half million people in South Africa suffered from type II diabetes (Otterman, 2012).

Genetic and environmental factors such as an unhealthy diet and a sedentary lifestyle cause a decreased ability of peripheral tissues (striated muscle) to respond to insulin. This process is known as insulin resistance which is associated with physical inactivity (Seedat, 2005). Due to insulin resistance, the pancreatic β-cells become dysfunctional leading to decreased insulin secretion and glucose intolerance which occurs in type II diabetes (Kumar *et al.,* 2007).

Insulin resistance is also linked to obesity (Hassapidou *et al.,* 2013). Normally, adipose cells release free fatty acid (FFA) and an insulin-sensitive cytokine called adiponectin into striated muscle to regulate insulin levels (Kumar *et al.,* 2007). However, when environmental factors cause a decreased response of the striated muscle to insulin, FFA levels increase whilst adiponectin levels decrease which results in insulin resistance and glucose intolerance (Coldberg *et al.,* 2010). Another insulin-sensitive hormone called leptin, which controls energy homeostasis in the hypothalamus becomes deficient (Kumar *et al.,* 2007). This results in decreased insulin secretion, increased food intake and decreased energy expenditure, which are also the hallmark features of obesity (Kumar *et al.,* 2007). Most individuals who are diabetic are obese and it is well established that obesity is a risk factor for diabetes (Maritz, 2005).

Physical activity stimulates striated muscles to absorb glucose from the bloodstream via the GLUT-4 transporter improving insulin sensitivity (Kokkinos, 2012). Skeletal muscles release irisin which is a hormone that transforms white adipose cells to brown adipose cells and through physical activity, protects an individual from metabolic diseases (Coldberg *et al.,* 2010). The hypothalamic-pituitary-adrenal (HPA) axis and the sensory nervous system (SNS) respond to physical activity as stressful stimuli (Tsatsoulis and Fountoulakis, 2006). This results in decreased cortisol secretion which creates a balance between protein degradation, protein synthesis and glucose utilization in muscles, as well as decreased free fatty acids in the bloodstream, collectively, resulting in proper glucose usage and decreased insulin resistance (Djurhuus *et al.,* 2002; Tsatsoulis and Fountoulakis, 2006).

Moderate intensity physical activity of minimum 30 minutes on five days of the week with 90 minutes of vigorous activity per week is recommended for type II diabetes (Coldberg *et al.,* 2010).

### 2.13.3. Hypertension

The normal average blood pressure is 120/80 mmHg (Naicker *et al.,* 2015). Hypertension refers to a raised blood pressure where the systolic pressure is equal to or greater than 140 mmHg and diastolic pressure is equal to or greater than 90 mmHg (Naicker *et al.,* 2015). In South Africa, 21% of the population is hypertensive (WHO, 2002) of those, 55% are Indians. (Connor *et al.,* 2005).

Hypertension is a risk factor for CHD, renal disease and blindness (Steyn, 2005). Factors such as obesity, physical inactivity, stress, high salt diet, smoking and genetic factors predispose an individual to hypertension and cause the following:

- Damage to the kidneys, particularly the adrenal cortex, resulting in decreased sodium secretion which leads to salt and water retention. This causes a reflex increase in plasma volume and extracellular fluid resulting in increased cardiac output which leads to hypertension (Kumar *et al.,* 2007).

- Vascular changes that can cause functional vasoconstriction can result in permanent thickening of blood vessel with increased peripheral resistance. This then results in hypertension (Kumar *et al.,* 2007).

- Changes to the vasculature of smooth muscle that results in vascular wall thickening which in turn leads to increased peripheral resistance and hence hypertension (Kumar *et al.,* 2007).

Physical activity aids in improving normal vascular tone of blood vessels to allow for appropriate vasoconstriction and vasodilation thereby preventing peripheral resistance (Tsatsoulis and Fountoulakis, 2006). This is achieved by restoring sufficient vasodilation through the bioavailability of nitric oxide in the vascular wall (Tsatsoulis and Fountoulakis, 2006). When there is increased stress to the body, the sympathetic division of the autonomic nervous system activates allowing the adrenal medulla to release hormones called adrenaline and noradrenaline which increase blood pressure and the heart rate (Tortora and Derrickson, 2007). In an already hypertensive patient, this could be life threatening and regular physical activity reduces this sympathetic response to stress preventing life threatening consequences (Tsatsoulis and Fountoulakis, 2006).

### 2.13.4. Hypercholesterolemia

Cholesterol is a fat-like substance, produced by the liver from the ingestion of saturated fats (WHO, 2002). Cholesterol is found in the bloodstream, nerve fibres and organs and is the main constituent in arthrosclerosis (Vardhan, 2006). Hypercholesterolemia also known as hyperlipidaemia refers to excess lipids in the bloodstream (Kelly, 2010). These lipids are cholesterol, cholesterol esters, phospholipids and triglycerides (Maritz, 2005). These lipids are transported in the

blood as lipoproteins which are divided into five classes: chylomicrons, very low-density lipoproteins (VLDL), intermediate-density lipoproteins (IDL), low-density lipoproteins (LDL) and high-density lipoproteins (HDL) (Kelly, 2010). Triglycerides are transported in chylomicrons and cholesterol in HDL and LDL (Kelly, 2010). LDL cholesterol delivers cholesterol to the peripheral tissues and aids in lesion (artheroma) development and HDL cholesterol removes cholesterol from developing lesions (atheroma) and transports them to the liver to be excreted as bile (Maritz, 2005).

The risk factors for hypercholesterolemia include a diet with excess saturated fats (e.g. animal fat, egg yolk and butter) and trans unsaturated fats (margarine and baked potatoes), a genetic predisposition, smoking and a sedentary lifestyle (WHO, 2002). These risk factors increase LDL levels resulting in atheroma development in blood vessels (Seedat, 2005). As a result, cholesterol is a major risk factor of CHD, stroke and other vascular diseases (WHO, 2002).

An individual is diagnosed with hypercholesterolemia when blood cholesterol is greater than 5.2mmol/L (WHO, 2002). Over five million South Africans have high cholesterol levels with the Durban, Indian population having the highest levels (Maritz, 2005).

Physical inactivity induces lipid accumulation in blood vessels through high serum LDL cholesterol levels which makes an individual at high risk for CHD, stroke, obesity and diabetes (Kelly, 2010). On the contrary, moderate physical activity of at least 120 minutes per week increases HDL cholesterol and decreases LDL cholesterol (Kelly, 2010). The reduction in LDL levels results in decreased lipid accumulation in blood vessels and through the increase of HDL levels there is removal of cholesterol from blood vessels. This would result in a decrease in development of atheromas which decrease the risk of chronic diseases (Kelly, 2010).

### 2.13.5. Obesity

The prevalence of obesity in South Africans aged 10 to 20 years old is between 15 and 20% with 48% of Indian women and 54% Indian men being obese (Micklesfiled *et al*., 2014). Obesity is defined as an increase in fat stores, particularly in the abdominal cavity, where the ratio of weight / height squared, also known as the body

mass index (BMI) is greater than 30 (Ibrahim *et al.,* 2013). Individuals with normal BMI generally have high levels of physical activity, but these levels decrease with an increase in BMI (Salehi *et al.,* 2010). In obesity, the energy expenditure is less than the energy intake (Kokkinos, 2012).

Regulation between energy intake and expenditure is vital in obtaining a stable weight (Kumar *et al.,* 2007). Lipostat, a neuro receptor, senses the amount of fat/adipose stores and regulates energy intake and expenditure accordingly (Kumar *et al.,* 2007). The adipose cells release a hormone called leptin that binds to neuroreceptors in the hypothalamus to control food intake and enhance energy expenditure creating an energy homeostasis (Kokkinos, 2012). In obesity, leptin secretion is diminished with the resultant increase in food intake resulting in an energy imbalance (Kokkinos, 2012).

Whilst genetic predisposition is a predictor of obesity, individuals also become obese with an unhealthy diet and sedentary lifestyle (Hassapidau *et al.,* 2013). Obesity with physical inactivity is a risk for diseases such as CHD, hypertension, type II diabetes mellitus, dyslipidaemia and cancer (Hassapidau *et al.,* 2013).

Insulin is one of the energy regulating mechanisms along with leptin (Kumar *et al.,* 2007). Obesity is associated hyperinsulinemia and insulin resistance which occur in type II diabetes mellitus (Kumar *et al.,* 2007). The excess plasma insulin levels leads to retention of sodium, increased norepinephrine, increased blood volume and smooth muscle proliferation which are associated with hypertension (Kumar *et al.,* 2007). Obesity, in association with insulin resistance, hypertriglyceridemia and hypertension, leads to metabolic syndrome which further predisposes an individual to cardiovascular diseases and type II diabetes mellitus (Kumar *et al.,* 2007).

Physical activity decreases the amount of accumulated adipose stores allowing for the stimulation of leptin which will restore the energy balance between food intake and expelled energy (Tortora and Derrickson, 2007). Physical activity also prevents excess plasma insulin levels and hypertriglyceridemia, decreasing the risk for CHD, hypertension, type II diabetes mellitus, dyslipidaemia and cancer (Tortora and Derrickson, 2007; Kumar *et al.,* 2007).

The American Heart Association recommends that obese individuals should participate in moderate aerobic exercises five to seven times a week for 30 minutes in addition to professional assistance in altering their eating habits (Micklesfiled *et al*., 2014).

### 2.13.6. Chronic low back pain

Chronic diseases are defined as diseases that have a slow onset but prolonged and continuous course (Booth *et al.,* 2012). Pain is defined as a physical discomfort that is felt due to noxious stimulation that acts on free nerve endings (Booth *et al.,* 2012). Low back refers to pain between the lower margin of the twelfth ribs and the lower gluteal folds with or without pain referral to the lower limbs (Hoy *et al.,* 2014).

Low back pain is ranked sixth in the Global Burden of Disease (Hoy *et al*., 2014). In South Africa low back pain has a prevalence of 12% in children and 33% in adults (Louw *et al*., 2007). Indians residing in the greater Durban area have a low back pain prevalence of 45% (Docrat, 1999). Low back pain is more prevalent amongst those with prolonged sitting, standing, lifting heavy loads and using power tools (Bindra *et al.,* 2015).

Moderate physical activity five to six times a week facilitates an individual's functional ability and relieves pain (Wang *et al.,* 2012). A positive association has been established between physical activity and chronic low back pain (Arvidsson, 2008).

Chronic low back pain adversely affects the spinal stability system which consists of muscles, tendons, bone, ligaments, joints and the nervous system (Punjabi, 1992; Wang *et al.,* 2012). Spinal stability is achieved by the contraction of the deeper trunk muscles, namely the transverse abdominus muscle (Punjabi, 1992). Once the individual is efficiently able to sustain the contraction, they are required to subconsciously learn to perform this contraction prior to daily activities (e.g. contracting the deeper trunk muscles prior to bending) (Wang *et al.,* 2012).The next level of contraction is the local trunk muscle contraction or contraction of superficial trunk muscles (Wang *et al.,* 2012). The contraction of both the deeper and superficial muscle groups can be achieved through Pilates, yoga and tai-chi exercises (Wang *et al.,* 2012). These core exercises have been shown to achieve spinal stability and hence prevent and treat low back pain (Wang *et al.,* 2012).

### 2.13.7. Chronic neck pain

Neck pain is pain that is experienced between the occiput and the third thoracic vertebrae (Muchna, 2011). Neck pain is common in individuals that lift heavy objects, work in air-conditioned rooms and sit without arm support and/or back support (Muchna, 2011). Treatment of neck pain entails patient education about posture, the use of analgesic medication, cryotherapy, heat therapy, electro therapy, chiropractic manipulation and specific neck motion and strengthening exercises (Muchna, 2011).

#### 2.13.7.1. Chronic low back and neck pain in the physically inactive

A sedentary lifestyle causes muscle weakness (Booth *et al.,* 2012). During inactivity, muscle fibres become partially filled with fat which weakens the muscle and causes the muscle fibre to lose its contractile efficiency which results in easy fatigue whilst doing simple activities (Kumar *et al.,* 2007). This can be reversed with moderate physical activity performed for ten minutes, three times a day on a daily basis or alternatively, 120 minutes of moderate physical activity per week (Wang *et al.,* 2012).

### 2.13.8. Osteoarthritis

Osteoarthritis is defined as “wear and tear” or degeneration of cartilage and underlying bone within a joint and is part of the aging process (Booth *et al.,* 2012). Osteoarthritis affects mainly the knees, hip and hands and is more common in obese people as well as those that are inactive (Lee *et al.,* 2013). Disability is one of the most common consequences of osteoarthritis (Lee *et al.,* 2013).

Chondrocytes produce proteoglycans and type II collagen that gives cartilage its tensile strength in order for the cartilage to continuously undergo matrix degradation and replacement. Therefore a disruption to this process can lead to osteoarthritis (Kumar *et al.,* 2007). These disruptions are caused by genetic predisposition, trauma, increased bone density and high oestrogen levels. It is mostly caused by repetitive injury to a joint caused by some sports/activities (Booth *et al.,* 2012). These factors cause collagen decrease, increased water, less cartilage proteoglycan, which result in disorganization and cracking of the matrix which exposes the subchondral bone (Kumar *et al.,* 2007). As the condition progresses, cancellous bone becomes exposed and thickened causing bony protuberances on the articular surface referred to as osteophytes (Kumar *et al.,* 2007). The degenerated cartilage decreases

synovial fluid, shock absorption and load distribution within joints which causes friction between exposed cancellous bones during movement (Kumar *et al.,* 2007). Synovial fluid is forced into the gaps created by the dislodged fragments in the subchondral bone and is referred to as subchondral cysts (Kumar *et al.,* 2007). Osteophytes, loose bodies and subchondral cysts are hallmark features for osteoarthritis that are seen on x-rays (Kumar *et al.,* 2007). Osteophytes and loose bodies decrease the joint space causing restricted movement, decreased flexibility and pain (Lee *et al.,* 2013).

Moderate to vigorous physical activity of 30–60 minute duration, thrice a week, has health benefits specific to individuals with osteoarthritis (Booth *et al.,* 2012; Lee *et al.,* 2013). These benefits include increased flexibility, decreased pain, improvement of physical disability and increased fitness caused by osteoarthritis (Lee *et al.,* 2013). Regular physical activity increases lubrication within joints, preventing stiffness and pain which results in friction-free movements causing less bone loss and swelling (Lee *et al.,* 2013). It also strengthens the muscles around the affected joints and prevents muscle weakening (Lee *et al.,* 2013). Regular physical activity also aids in decreasing weight loss which is strongly associated with osteoarthritis (Booth *et al.,* 2012). Physical activity in arthritis helps to restore the range of motion of the affected joint, increases muscle strength, increases aerobic capacity and increases the ability to perform recreational/leisure activities (Lee *et al.,* 2013).

### 2.13.9. Osteoporosis

Osteoporosis causes deterioration of bone tissue; a decrease in bone mass and reduces bone density. This leads to enlargement of bone spaces that produces porosity and brittleness (Hough *et al*., 2012). An estimated 1, 4 million women and 0.6 million men, over the age of 50 in South Africa are suffering from osteoporosis, with the white and Indian communities having the highest prevalence (Hough *et al*., 2012). The most common risk factor for osteoporosis is muscle weakness, also termed sarcopenia, which causes alterations to balance and gait (Booth *et al.,* 2012). Physical inactivity is the main cause of bone loss in weight-bearing bones (Hough *et al*., 2012). It was shown that a bone loss of approximately one percent per year occurred in the lumbar spine and femoral neck of sedentary women (Booth *et al.,*

2012). Physical inactivity results in decreased muscle contraction as well as decreased bone formation (Booth *et al.,* 2012).

Calcitonin, bisphosphonates, selective oestrogen receptor modulators (SERMS), hormone therapy, anabolic agents, teriparatide (PTH1-34), strontium ranelate, calcium and vitamin D supplements are medications that can aid in osteoporosis (Hough *et al*., 2012). However, a diet rich in dairy products accompanied by moderate intensity physical exercise of 30 minutes thrice a week has been recommended as a better alternative treatment for osteoporosis (Booth *et al.,* 2012). Weight-bearing exercise and physical activity reduce bone loss at the hip denoting the importance of activity early in life (Booth *et al.,* 2012). Although weight-bearing exercises may not increase all bone mass and strength, bones subject to loading will become stronger. This prevents high fracture rates that are common in later life (Booth *et al.,* 2012).

## 2.14. Conclusion

Regular physical activity has been shown to decrease the risk of coronary heart disease, obesity, some forms of cancer and musculoskeletal pain (Bassuk and Manson, 2010; Coldberg *et al*., 2010; Wang *et al*., 2012; Kokkinos, 2012). Physical activity has also been shown to improve stress levels, self-confidence, moods and anxiety disorders (Dunn and Jewell, 2010; Salehi *et al*., 2010; Kanarek *et al*., 2012).

Less than half of the global population (40%) perform adequate physical activity (WHO, 2015). Earlier research studies have reported that Indians in the United Kingdom, Netherlands and India have the highest level of inactivity (Dhawan and Bray, 1997; Abate and Chandalia, 2001; Naicker *et al*., 2015). The South African population has a 43-49% prevalence of physical inactivity (Micklesfield *et al*. 2014). An association between South African Indians and a sedentary lifestyle has been established (Seedat, 2005; Vardhan, 2006). However, this research was conducted over a decade ago. It will, therefore, be important to establish whether this lifestyle has changed in South African Indians in the recent years. There is also currently an absence of data available in South Africa to show whether any barriers to physical activity exist within the Indian population (Lambert and Kolbe-Alexander, 2005), which will provide reasons for physical inactivity. The South African researchers and

Policy makers outlined research that is required in specific communities (Seedat, 2005). These include the determination of types and levels of physical activity in particular communities, the reasons for exercising and whether it was beneficial (Lambert and Kolbe-Alexander, 2005). To date, there is a paucity of data regarding exercise patterns within the Indian community.

# CHAPTER 3

# METHODOLOGY

## 3.1. Introduction

This chapter presents the methodology used in this study. The methods will be described using the subheadings: research design, ethical considerations, population, instrument, procedure for data collection and data analysis.

## 3.2. Research design

A quantitative, descriptive, cross sectional survey was used in this study. A cross-sectional survey is an observational study that assesses the prevalence of attributes (e.g. exercise) in a particular population at a particular time (Kanchanaraksa, 2008). The most reliable means of measuring the effectiveness of physical activity is by the use of descriptive epidemiology that includes the assessment of physical activity in populations with different demographic characteristics such as age, gender, ethnicity, health status and geographical location (Dishman *et al.,* 2012). This allows researchers to determine trends and effectiveness of physical activity interventions within different populations (Dishman *et al.,* 2012).

### 3.2.1. Setting

The study was conducted at the Durban North Beach on selected weekends during August and September 2015. The site was chosen because it is a popular recreational site for both people who exercise and those that do not exercise. People regardless of age, gender, race, or socioeconomic status relax on the beachfront.

## 3.3. Ethical considerations

Ethical approval to conduct the study was obtained from the Durban University of Technology (DUT) Ethics Committee (IREC 063/15; Appendix I). Permission to conduct the study at the North Beach on the Durban beach front was obtained from the Head of the Skills Development Unit and the Head of Parks, Recreation and Culture at the eThekwini Municipality (Appendix II). All participants were provided with written information about the study prior to enrolment. No personal identifying

information was collected and signed consent forms were collected separately from the questionnaire.

## 3.4. Population

The population consisted of all Indians who were at the Durban North Beach on three Sundays during August and September 2015 between 7h00 and 17h00. A total of 411 Indians who met the inclusion and exclusion criteria participated in the study. For eligibility in the study, the following inclusion and exclusion criteria were set:

### 3.4.1. Inclusion criteria

- People of Indian origin
- English speakers over the age of 18
- Residents of KwaZulu-Natal (KZN)

### 3.4.2. Exclusion criteria

- Those who participated in the focus group or pilot study

### 3.4.3. Sampling

The sample size was calculated by the statistician. Using the total population size of 756,991 Indians residing in KZN (Census, 2011), a confidence level of 95% and a confidence interval of 0.5, a minimum sample size of 384 was calculated. As a response rate of approximately 80% was anticipated, a total of 450 questionnaires were printed. A convenience sample was used, that is, potential participants, who were at North Beach on the data collection days were approached with a request to participate in the study.

## 3.5. Instrument

A self-administered questionnaire (Appendix III) was designed by the researcher using relevant questions from the global physical activity questionnaire (GPAQ) and international physical activity questionnaire (IPAQ) (WHO, 2002). The questions were closed ended.

The questionnaire consisted of the following eight sections:

- Section A: Demographics
- Section B: Health and exercise
- Section C: Exercise History
- Section D: Current Activity
- Section E: Household/ yard/ garden chores
- Section F: Unstructured Exercise
- Section G: Sports Events
- Section H: Monitoring Health

### 3.5.1. Validity of the instrument

A focus group assists in the research process by enhancing the face and content validity of the questionnaire and improving its relevance in the research study (Salant and Dillman, 1994; Mouton, 1996; Dyer, 1997; Bernard, 2000).The original questionnaire (Appendix IV) was validated using an expert focus group which comprised of nine individuals who consisted of five academics, three senior chiropractic students and one junior library and information sciences student. The focus group interrogated the questionnaire for relevance, clarity, simplicity and ambiguity. In the original questionnaire all the questions were open ended. The focus group recommended that these be changed to close ended questions with specific categories. Furthermore, items that did not adequately meet the above criteria were removed or adjusted. This resulted in the post-focus group questionnaire (Appendix V). The exact changes from the original questionnaire to the post focus group questionnaire are shown in Appendix VI.

### 3.5.2. Reliability of the instrument

The post-focus group questionnaire (Appendix V) was then piloted for reliability using six individuals who met the inclusion criteria for the main study. The pilot study recommendations are indicated in Appendix VII and consisted of the addition of a

table for exercise history, questions on exercise preference, post-exercise recovery and the impact of continuously changing information on exercise regimens. After the amendments were made, the final questionnaire was used in the study (Appendix III).

## 3.6. Procedure for data collection

### 3.6.1. Research Assistants

Two research assistants (a male and female) who were health science students from the Durban University of Technology (DUT), helped with the collection of data. A letter of instruction and informed consent was given to the research assistants (Appendix VIII). The study procedure was also verbally explained at length to them. The research assistants were asked to run a mock interview with the researcher prior to data collection. This was to ensure standardisation of the procedure and to make certain that even though assistants were used, the data would be reliable.

### 3.6.2. Data Collection

Potential participants were approached by either the researcher or two assistants. They were verbally informed of the study those wishing to participate were given a written letter of information and informed consent form (Appendix IX). Following the signing of the consent form, data was collected by means of a self-administered questionnaire (Appendix III). The participants sat on the seating area provided next to the walk way and answered the questionnaire without any interference from any other person. Participants were allowed to ask questions if required. Approximately 10-15 minutes were required to complete the questionnaire. Completed questionnaires, were collected in a sealed ballot box, separate from the signed informed consent form to ensure anonymity. At the end of the appointed data collection day, the assistants presented the sealed boxes to the researcher which was used for data capturing during the week and thereafter re-sealed and safely stored in a locked cupboard.

## 3.7. Data analysis

### 3.7.1. Calculations

The level of physical activity was calculated by multiplying the time spent on structured exercise per day by the number of days exercised per week. Similarly, the time spent on unstructured exercise e.g. sweeping, vacuuming, gardening and lawn mowing was calculated. The total amount of physical activity was calculated by adding the times spent on structured and unstructured exercise.

The body mass index (BMI) was calculated by dividing the participant's mass (in kg) by the square of the height (in metres) i.e.:

$BMI = weight/height^2$

The following BMI classifications were used: individuals who weighed less than 18.5 $kg/m^2$ were considered underweight, those between 18.5-24.99 $kg/m^2$ were classified as normal weight, respondents between 25-29 $kg/m^2$ were overweight and those greater than 30 $kg/m^2$ were categorised as obese (Ibrahim *et al.,* 2013).

### 3.7.2. Statistical Analysis

The data was coded and captured on SPSS (Version 23) for statistical analysis. Descriptive statistics in the form of frequencies, means and standard deviations were calculated. To determine whether relationships existed between two variables, chi-squared tests and Fisher's Exact test were used, as appropriate. Odds ratios were calculated where relevant. Pearson's correlation test was used to determine relationships between variables. A p value less than 0.05 was considered statistically significant.

# CHAPTER FOUR

# RESULTS

## 4.1. Introduction

This chapter presents the results of the study. Tables and graphs have been used where appropriate.

## 4.2. The Sample

A total of 450 questionnaires were distributed and 411 completed questionnaires were received. This gave a response rate of 91.13%.

## 4.3. Demographics

This section presents the biographical characteristics of the respondents.

### 4.3.1. Age

The mean age of respondents was 37.7 ± 13.7 years. Figure 4.1 indicates that most of the respondents were from the age group 21-31 years (31.4%, *n* = 129), followed by age group 31-41 and 41-51 years.

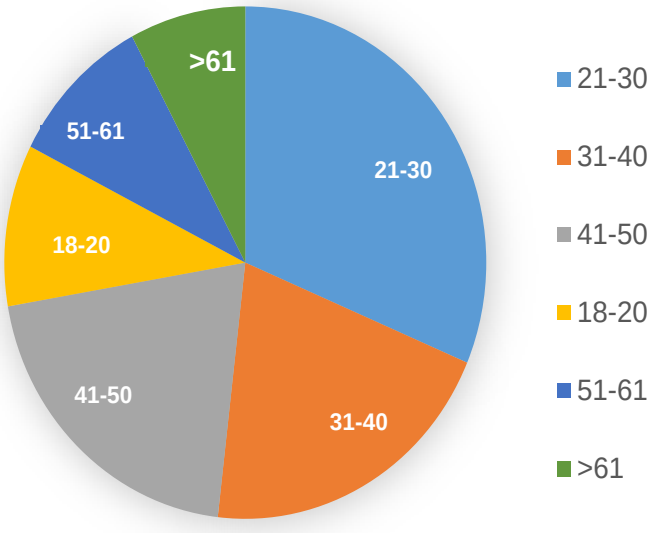


Figure 4.1. Distribution of participants in the different age groups

### 4.3.2. Gender

The gender distribution was almost the same with males comprising 51% (*n* = 209) and females 49% (*n* = 201), of the study population (*p* = 0.7).

### 4.3.3. Religion

Figure 4.2 shows that the majority of the respondents practiced Islam (66.6%, *n* = 273). Numbers of participants in each religious category was significantly different (*p* < 0.001).

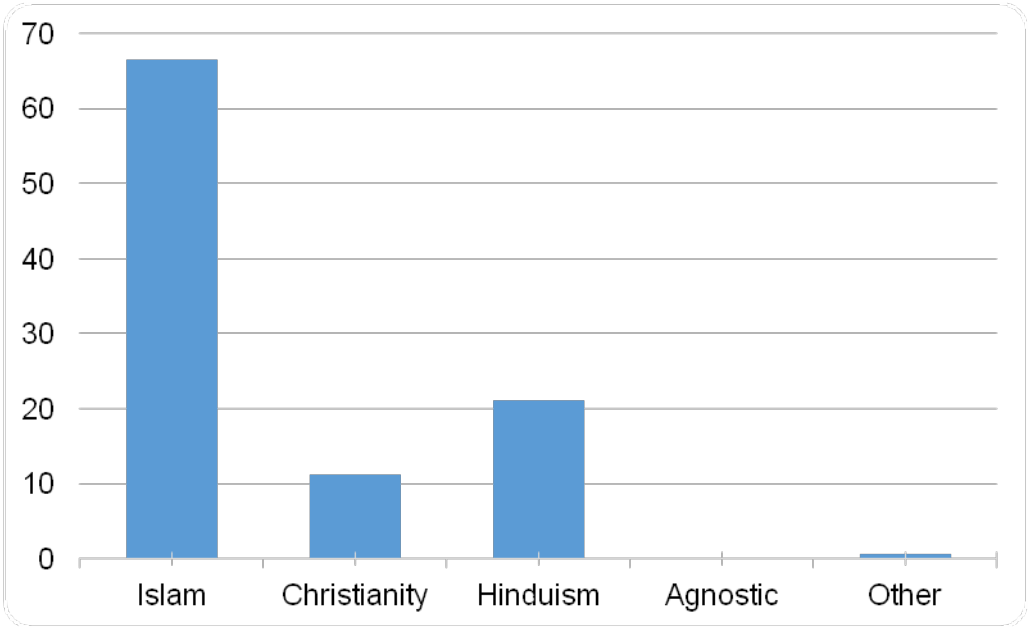


Figure 4.2. Religion of the respondents

### 4.3.4. Language

Table 4.1 shows the proportion of respondents who spoke each of the different languages. The majority spoke English (98.8%, *n* = 405) as their first language. Only a minority of the respondents used their home language as their primary spoken language:

Table 4.1. Mother tongue of the respondents

| Language of respondents | Number of respondents % (n) |
|---|---|
| Urdu | 42.3 (167) |
| Gujarati | 19.2 (76) |
| Hindi | 12.2 (48) |
| Tamil | 10.6 (42) |
| English | 8.4 (33) |
| Telegu | 2.8 (11) |
| Memon | 2.3 (9) |
| Punjabi | 0.5 (2) |
| Kokni | 0.3 (1) |
| Other | 1.5 (6) |

### 4.3.5. Body mass index (BMI)

Figure 4.3 illustrates the distribution of the respondents' in each BMI category. Over a third of the respondents had a normal BMI (37%, *n* = 138). One third of the respondents were overweight (33%, *n* = 120) and a quarter were obese (25%, *n* = 92).

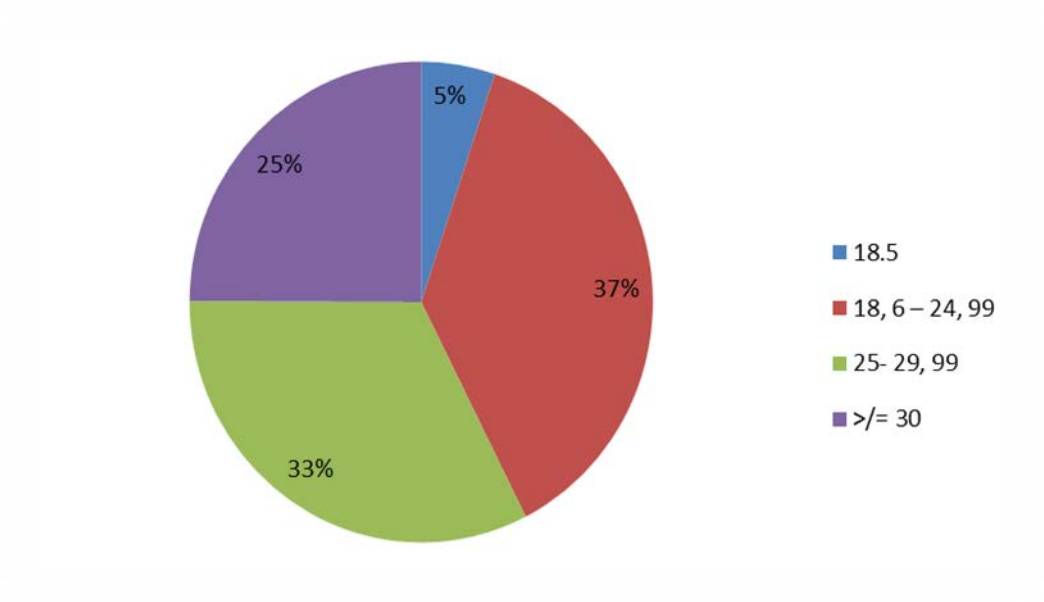


Figure 4.3. Proportion of respondents' in each Body mass index (BMI) category

### 4.3.6. Occupation

The largest proportion of respondents were administrative personnel (15.6%, *n* = 64), finance workers (14.8%, *n* = 53) and students (12.9%, *n* = 49). Other respondents' occupations are shown in Table 4.2.

Table 4.2. Occupation of the respondents

| **Occupation** | **Number of respondents** |
|---|---|
| | **% (n)** |
| Administrative personnel | 15.6 (64) |
| Finance | 14.8 (53) |
| Students | 12.2 (49) |
| Businessman | 11.9 (48) |
| Housewife | 10.9 (44) |
| Academics | 7.3 (30) |
| Health Professionals | 5.1 (22) |
| Sales Personnel | 4.7 (19) |
| Retired | 3.9 (16) |
| Engineers | 3.8 (16) |
| Technicians | 2.5 (10) |
| Law Enforcement | 1.6 (7) |
| Unemployed | 1.7 (7) |
| Designers | 1.3 (6) |
| Beauty stylists | 0.9 (4) |
| Domestic workers | 0.7 (3) |
| Architects | 0.6 (3) |
| Chef | 0.5 (2) |

## 4.4. Diet

Over half of the respondents stated that they did not control their diet (56.8%, *n* = 231). Of those that controlled their diet, many indicated that they ate in moderation (36.8%, *n* = 49), consumed less carbohydrates (22.5%, *n* = 30) and increased vegetable intake (17.3%, *n* = 23).

## 4.5. Exercise History

Most respondents began exercising when they were younger than 20 years old (69%, *n* = 227). Housewives, businessman and students were more likely to exercise every day ($p<0.001$). The main forms of exercises comprised of walking (61.3%, *n* = 252), jogging (46.7%, *n* = 192), swimming (38.4%, *n* = 158) and soccer (35.3%, *n* = 145). The different types of exercises performed by the participants in the past are shown in Table 4.3.

Table 4.3. Types of exercise performed by respondents

| **Type of exercise** | **Number of respondents % (n)** |
|---|---|
| Walking | 61.3 (252) |
| Jogging | 46.7 (192) |
| Swimming | 38.4 (158) |
| Soccer | 35.3 (145) |
| Running | 31.4 (129) |
| Cycling | 29.7 (122) |
| Treadmill | 27.0 (111) |
| Cricket | 27.5 (113) |
| Free weights | 25.8 (106) |
| Stationary cycling | 18.5 (76) |
| Machine weights | 17.5 (72) |
| Squash | 17.3 (71) |
| Tennis | 16.1 (66) |
| Netball | 15.1 (62) |
| Aerobics | 10.7 (44) |
| Yoga | 9.7 (40) |
| Zumba | 7.8 (32) |
| Taebo | 6.8 (28) |
| Pilates | 4.9 (20) |
| Hockey | 3.4 (14) |
| Rugby | 3.4 (14) |
| Volleyball | 1.0 (4) |
| Martial arts | 0.5 (2) |
| Kickboxing | 0.2 (1) |
| Hiking | 0.2 (1) |

With regards to their exercise history, less than half of the respondents (38.3%, *n* = 144) stated that they used to exercise twice a week. Some (25%, *n* = 94) previously

exercised every day, others three to five times a week (23.1%, *n* = 87) and a few only once a week (3.6%, *n* = 51). Some reported (10%, *n* = 41) that they did not exercise in the past. Previously, respondents exercised at gymnasiums (33.5%, *n* = 138), local public grounds (25.3%, *n* = 104), the beachfront (21.4%, *n* = 88), at home (20.4%, *n* = 84), on the road (17%, *n* = 70), at school facilities (4.6%, *n* = 19) and indoor stadiums (1%, *n* = 4).

A large proportion of the respondents stopped participating in their initial exercise or sport. Most respondents stopped their original exercise more than 10 years ago (36.7%, *n* = 110). The main sports that were stopped were netball (80.6%, *n* = 50), volleyball (75%, *n* = 3), hockey (71.4%, *n* = 10), rugby (71.4%, *n* = 10) and tennis (69.7%, *n* = 46). These percentages do not total to 100% as some of them used to play more than one sport. Most indicated that they did not have time to continue with the exercise or sport. Many cited a lack of self-discipline and disinterest as reasons for stopping the activity.

## 4.6. Exercise Prevalence

The majority of respondents (70.1%, *n* = 284) reported that they currently exercise. However, only 42.9% (*n* = 177) of the respondents met the international requirement of 150 minutes of physical activity per week. When unstructured exercise such as household and yard chores were added, the frequency increased to 45.3% (*n* = 188).

### 4.6.1. Sport

Most respondents (68.4%, *n* = 281) considered sport as a physical activity while some did not (31.6%, *n* = 130). A minority of respondents (17%, *n* = 68) reported that they participated in formal or competitive sports events. Some (10.4%, *n* = 41) participated in marathons and few competed in cricket or soccer tournaments (6.1%, *n* = 25).

### 4.6.2. Types of Exercise

Almost half of the respondents walked (45.5%, *n* = 187) and a quarter jogged (25.3%, *n* = 104). Other physical activities that they participated in are shown in Table 4.4.

Table 4.4. Types of exercise currently performed by study respondents

| Type of current exercise | Number of respondents % (n) |
|---|---|
| Walking | 45.5 (187) |
| Jogging | 25.3 (104) |
| Treadmill | 18.5 (76) |
| Free weights | 17.0 (70) |
| Swimming | 16.3 (67) |
| Cycling | 16.1 (66) |
| Machine weights | 13.4 (55) |
| Soccer | 13.1 (54) |
| Running | 12.4 (51) |
| Stationary cycling | 10.0 (41) |
| Cricket | 9.0 (37) |
| Yoga | 6.3 (26) |
| Squash | 5.4 (22) |
| Aerobics | 5.4 (22) |
| Zumba | 4.1 (17) |
| Tennis | 3.6 (15) |
| Pilates | 3.2 (13) |
| Netball | 1.5 (6) |
| Hockey | 0.5 (2) |
| Volleyball | 0.5 (2) |
| Taebo | 0.2 (1) |
| Martial arts | 0.2 (1) |
| Boxing | 0.2 (1) |
| Other | 0.2 (1) |

Note: Percentages do not add to 100 as some respondents performed more than one activity.

#### 4.6.2.1. Age differences

There was a significantly higher number of younger respondents who jogged than older respondents ($p = 0.02$). The largest proportion of joggers were aged between 21-31 years old (39.4%, *n* = 41). A very small proportion of respondents aged 51-61 (6.7%, *n* = 7) and over 61 (3.8%, *n* = 4) jogged.

Most respondents who cycled were 21-31 years old (27.3%, *n* = 18, *p*<0.001). However, this was closely followed by respondents aged 31-41 years (24.2%, *n* = 16) and 41-51 years (25.8%, *n* = 17). Very few over the age of 51 years cycled (6.1%; n = 4).

There was a significant relationship between age and those who swam (*p* = 0.03). Respondents aged 18-31 years (52.3%, *n* = 35) and 41-51 years (26.9%, *n* = 13) swam more than those who were 31-41 years (19.4%, *n* = 13) and more than 51 years of age (1.5%, *n* = 1). There were no respondents aged 41-51 years who swam. Most respondents who swam were of a normal weight (Pearson: *p* = 0.01).

Majority of the younger respondents between 21-31 years used free weights (52.9%, *n* = 37, *p*<0.001) and machine weights (54.5%, *n* = 30, *p* = 0.002). Similarly, most respondents between the ages of 21-31 played soccer (40.7%, *n* = 22, *p* = 0.002), cricket (45.9%, *n* = 17, *p*<0.004) and squash (50%, *n* = 11, *p* = 0.02). Details of all the other exercises performed by the various age groups are provided in Table 4.5.

Table 4.5. Frequencies of various exercises performed by the different age groups of the respondents.

| | **Frequency of different exercises % (n) Age** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Type of exercise** | **18-21** | **21-31** | **31-41** | **41-51** | **51-61** | **>61** | **p-value** |
| Jogging | 16.3 (17) | 39.4 (41) | 16.3 (17) | 17.3 (18) | 6.7 (7) | 3.8(4) | 0.02 |
| Swimming | 25.4 (17) | 26.9 (18) | 19.4 (13) | 26.9 (18) | 0.0 (0) | 1.5 (1) | <0.001 |
| Cycling | 16.7 (11) | 27.3 (18) | 24.2 (16) | 25.8 (17) | 6.1 (4) | 0.0 (0) | 0.03 |
| Treadmill | 18.4 (14) | 35.5 (27) | 21.1 (16) | 22.4 (17) | 1.3 (1) | 1.3 (1) | 0.002 |
| Walking | 12.3 (23) | 27.3 (51) | 16.6(31) | 23.0 (43) | 11.8 (22) | 9.1 (17) | 0.11 |
| Yoga | 11.5 (3) | 30.8 (8) | 11.5 (3) | 26.9 (7) | 11.5 (3) | 7.7(2) | 0.89 |
| Pilates | 7.7 (1) | 23.1 (3) | 23.1(3) | 23.1 (3) | 15.4 (2) | 7.7 (1) | 0.97 |
| Zumba | 11.8 (2) | 23.5 (4) | 29.4 (5) | 23.5 (4) | 11.8 (2) | 0.0 (0) | 0.78 |
| Stationary cycling | 7.3 (3) | 48.8 (20) | 19.5 (8) | 19.5 (8) | 2.4 (1) | 2.4 (1) | 0.11 |
| Machine weights | 9.1 (5) | 54.5 (30) | 16.4 (9) | 16.4 (9) | 3.6 (2) | 0.0 (0) | 0.002 |
| Free weights | 11.4 (8) | 52.9 (37) | 20.0 (14) | 11.4 (8) | 2.9 (2) | 1.4 (1) | <0.001 |
| Tennis | 33.3 (5) | 20.0 (3) | 26.7 (4) | 13.3 (2) | 6.7 (1) | 0.0 (0) | 0.05 |
| Soccer | 22.2 (12) | 40.7 (22) | 18.5 (10) | 14.8 (8) | 3.7 (2) | 0.0 (0) | 0.002 |
| Cricket | 24.3 (9) | 45.9 (17) | 10.8 (4) | 13.5 (5) | 5.4 (2) | 0.0 (0) | 0.004 |
| Squash | 22.7(5) | 50.0 (11) | 4.5 (1) | 22.7 (5) | 0.0 (0) | 0.0 (0) | 0.02 |
| Aerobics | 13.6 (3) | 13.6 (3) | 36.4 (8) | 31.8 (7) | 4.5 (1) | 0.0 (0) | 0.09 |
| Running | 15.7 (8) | 49.0 (25) | 19.6 (10) | 11.8 (6) | 3.9 (2) | 0.0 (0) | 0.006 |

#### 4.6.2.2. Gender differences

There was no significant relationship between gender and those who were physically active. Most of the runners were male compared to female (68.6%, $n$ = 35, $p$ = 0.005). Of those that performed yoga, 80.8% ($n$ = 21, $p$ = 0.89) were females. Likewise, participants who practised Pilates were 92.3% female ($n$ = 12, $p$<0.001). Females were the majority of those who performed aerobics (95.5%, $n$ = 25, $p$<0.001) and Zumba (94.1%, $n$ = 16, $p$ = 0.78). Respondents who were a normal weight were significantly more likely to participate in yoga (Pearson: $p$ = 0.04). There was no relationship found between BMI, running, aerobics and Zumba.

More males used machine weights (67.3%, $n$ = 37, $p$ = 0.01) and free weights (64.3%, $n$ = 45, $p$ = 0.01). Likewise, more males played tennis (73.7%, $n$ = 11, $p$ = 0.05). Table 4.6 indicates the gender differences for the performance of exercise.

Table 4.6. Frequencies of various exercises performed by the different genders of the respondents.

| | **Frequencies of different exercises % (n)** | | |
|---|---|---|---|
| **Type of exercise** | **Gender** | | **p-value** |
| | **Male** | **Female** | |
| Jogging | 62.5 (65) | 37.5 (39) | 0.004 |
| Swimming | 56.7 (38) | 43.3. (29) | 0.19 |
| Cycling | 60.6 (40) | 39.4 (26) | 0.06 |
| Treadmill | 44.7 (34) | 55.3 (42) | 0.14 |
| Walking | 50.3 (94) | 40.9 (93) | 0.44 |
| Yoga | 19.2 (5) | 80.8 (21) | 0.001 |
| Pilates | 7.7 (1) | 92.3 (12) | <0.001 |
| Zumba | 5.9 (1) | 94.1 (16) | <0.001 |
| Stationary cycling | 41.5 (17) | 58.5 (24) | 0.13 |
| Machine weights | 67.3 (37) | 32. (18) | 0.007 |
| Free weights | 64.3 (45) | 35.7 (25) | 0.01 |
| Tennis | 73.3 (11) | 26.7 (4) | 0.07 |
| Soccer | 92.6 (50) | 7.4 (4) | <0.001 |
| Cricket | 94.6 (35) | 5.4 (2) | <0.001 |
| Squash | 81.8 (18) | 18.2 (4) | 0.002 |
| Aerobics | 4.5(1) | 95.5 (21) | <0.001 |
| Running | 68.6 (35) | 31.4 (16) | 0.005 |

## 4.7. Exercise behaviour

There were variations in the times at which different respondents performed exercise. Some exercised in the mornings (30.4%, *n* = 125), others (22.6%, *n* = 93) in the afternoon or at any time of the day (19%, *n* = 78). A minority of respondents exercised at midday (4.1%, *n* = 17).

Almost half of the respondents (49.5%, *n* = 141) reported currently exercising for 60 minutes daily. Some (22.1%, *n* = 63) exercised for 30 minutes a day and others for 90 minutes per day (15.8%, *n* = 45). Fewer respondents (9.1%, *n* = 26) exercised for 120 minutes a day, 150 minutes a day (1.4%, *n* = 4) and 180 minutes (2.1%, *n* = 6) a day. Most of the overweight respondents reported to have exercised for 60 minutes a day (62.6%, *n* = 77, *p* = 0.002). More respondents in the weight category of 56-65 kg (20.8%, *n* = 28) exercised everyday (*p*<0.001). However, there was no significant relationship between BMI and the approximate duration exercised per week.

There was a significant relationship between age groups and the approximate duration exercised per week (*p*<0.001). This comprised of those aged between 21-31 years (*p* = 0.02). More females exercised for 60 minutes a day (58.7%, *n* = 37) compared to the males (41.3%, *n* = 26, *p* = 0.01).

Many respondents (30.9%, *n* = 88) indicated that they currently exercised twice a week. Some (29.8%, *n* = 85) exercised every day, others three to six times a week (29.2%, *n* = 83) and a few only once a week (10.2%, *n* = 29).

### 4.7.1. Exercise preferences

Half of the respondents that exercised, did so on their own (50.4%, *n* = 142) whereas others preferred a group setting (46.8%, *n* = 132). Some (2.8%, *n* = 8) had no preference to exercise in a group or alone. Those that preferred exercising on their own mentioned that it allowed for more concentration, privacy, better personal achievements or a self-manageable pace. On the other hand, increased motivation and socialising were important to those that preferred group activities.

Majority of the younger respondents between the ages of 21-31 (38%, *n* = 30) used a private gym compared to the older respondents (5.1%, *n* = 4, *p* = 0.01).Conversely,

most of the older respondents (50.1%, *n* = 44) exercised at the beachfront compared to the younger respondents (34.1%, *n* = 27, *p* = 0.03).

A majority of respondents (82.1%, *n* = 229) indicated that the continuous change in exercise trends and knowledge did not impact on their exercise. They did however mention, that the latest information assisted in technique improvement (38.9%, *n* =14) and catered for a larger variety of exercises (36.1%, *n* = 13). A few respondents reported that the changes provided motivation to perform more exercise (11.1%, *n* = 4).

## 4.8. Post exercise recovery

Just over half of respondents (52.3%, *n* = 148) reported having recovered 15 minutes after exercise compared to other respondents who recovered in 30 minutes (24.4%, *n* = 69, *p*<0.001). Some respondents reported not experiencing a post exercise recovery period whereas a few (9.9%, *n* = 28) had a post exercise recovery period of 60 minutes or more. Post exercise recovery periods were significantly different across all respondents (*p* < 0.001). The post exercise recovery time did not impact on the willingness of respondents to continue with consistent exercise (84.3%, *n* = 237). Others (41.1%, *n* = 15) stated the recovery period led to exhaustion and shortness of breath. Over half of the respondents (55.9%, *n* = 19) indicated that the recovery time encouraged them to perform more exercise.

## 4.9. Unstructured exercise

More than half of the respondents (56.5%, *n* = 225) climbed stairs at work. The number of flights climbed daily varied as follows: more than three (30.3%, *n* = 66), three (20.6%, *n* = 45), two (30.7%, *n* = 67) or one (18.3%, *n* = 40). Less than half of the respondents climbed stairs more than three times a day (41.2%, *n* = 91), some thrice a day (19%, *n* = 42), others twice a day (26.2%, *n* = 58) and a minority once a day (10.9%, *n* = 24). Correlation analysis revealed that there was a relationship between  those that exercised and climbing stairs at work , with over three quarter of the respondents who exercised, climbing stairs at work (74.7%, *n* = 165, *p* = 0.002). Most of those that exercised reported to have climbed more than three flights of

stairs (86.4%, *n* = 57, *p* = 0.05). The odds of climbing stairs was higher in those who exercised (OR = 1.65).

Majority of the respondents (67.1%, *n* = 269) stated that they played with children. Most respondents (44.7%, *n* = 117) indicated that they played with children for one to four hours per day and some between one to four hours per week (18.7%, *n* = 49). Only 15.6% (*n* = 41) of respondents played with children for 30 minutes a day. Majority of the respondents who played with children were significantly more likely to have exercised (75.6%, *n* = 201, *p*<0.001). The odds of those who played with their children was higher in those who exercised (OR = 2.06).

### 4.9.1. Household and garden chores performed by study respondents

More than half of the respondents (64.1%, *n* = 250) reported that they performed household chores. The most commonly performed chores included making beds (53.3%, *n* = 219), washing dishes (48.4%, *n* = 199) and sweeping (40.6%, *n* = 167). These common chores were performed for more than 15 minutes a week by 40.3% of the sample population (*n* = 25). Significantly more females (82.9%, *n* = 160) performed household chores (*p*<0.001). Those who performed household chores were significantly more likely to have exercised (Pearson, *p*<0.001). The odds of those who performed household chores were higher in those who exercised (OR = 2.05).

Some respondents (27.2%, *n* = 108) performed yard chores. The most commonly performed yard chores were: raking (11.7%, *n* = 48), digging (9%, *n* = 37) and weeding (11.4%, *n* = 47). These common chores were mostly performed for 15-30 minutes a week (43.8%, *n* = 14). Only 8.8% (n = 36) performed manual labour which lasted less than 30 minutes a day. In contrast to the house chores, more males (33.3%, *n* = 67) performed yard chores (*p*<0.001). There was a significant relationship between those who exercised and performed yard chores (*p*<0.001). The odds of those who performed yard chores were higher in those who exercised (OR = 1.82).

### 4.9.2. Transport

Figure 4.4 indicates that most respondents (91.3%, *n* = 368) used a car as a main mode of transport, some used the bus (5.5%, *n* = 22) and others walked (1.7%, *n* = 7). A minority of respondents used a bicycle (0.7%, *n* = 3), motor bike (0.5%, *n* = 2) or other modes of transport (0.2%, *n* = 1). Few (19%, *n* = 76) reported walking for more than ten minutes to and from their transport. Most of the respondents that used a personal vehicle parked closer to entrances (64.5%, *n* = 243), others parked further from the entrance (18%, *n* = 68) and some parked wherever parking was available (17.5%, *n* = 66). There was no significant relationship between those who exercised and the type of transport they used. However, of those who exercised and used a private car, majority parked closer to entrances (Pearson: *p* = 0.002).

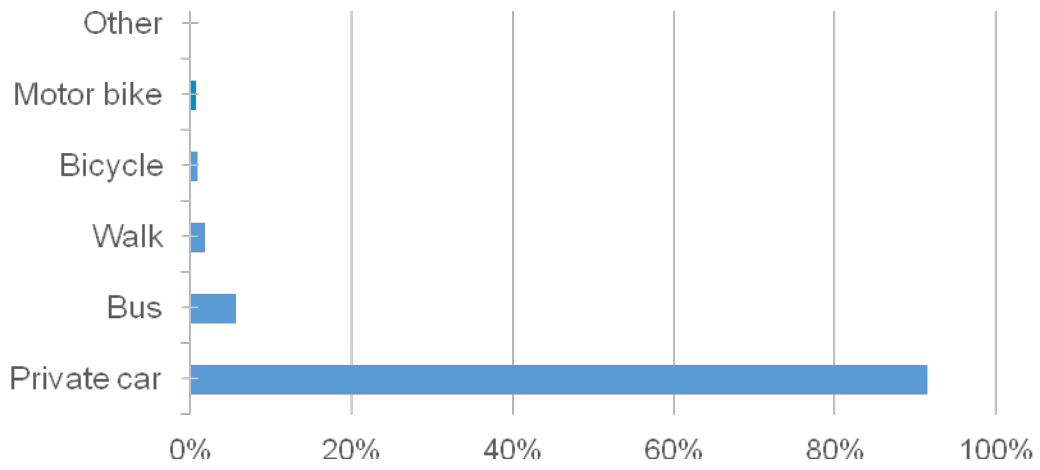


Figure 4.4. Modes of travel used by the study participants

## 4.10. Health and exercise

The majority of respondents (26.2%, *n* = 107) stated that they were diagnosed with a health condition. The more common conditions were diabetes (10%, *n* = 41), hypertension (7.5%, *n* = 31), hypercholesterolemia (2.7%, *n* = 11) and myocardial infarction (2.4%, *n* = 10). The diagnosed health conditions of the respondents are shown in Table 4.7. It must be noted that some participants reported that they were diagnosed with more than one health condition. Some (5.1 %, *n* = 21) reported they may possibly have diabetes or osteoarthritis but had not consulted a medical practitioner to confirm this.

There was a high risk between sedentary individuals and diabetes (OR = 1.29), hypertension (OR = 1.25), hypercholesterolemia (OR = 1.23) and myocardial infarction (OR = 1.73). The odds of having diabetes (OR = 1.06), hypertension (OR = 1.07) and hypercholesterolemia (OR = 1.65) was higher in overweight respondents. Likewise, there was a high risk between overweight respondents and myocardial infarction (OR = 1.03), as well as polycystic ovarian syndrome (OR = 1.02).

Some of the respondents consumed less carbohydrates (22.5%, *n* = 30) in order to control diseases such as CHD and diabetes. The odds of those who controlled their diet was higher in those who exercised (OR = 1.48).

Table 4.7. Frequency of diagnosed health conditions of the respondents

| **Health condition** | **Number of respondents % (n)** |
|---|---|
| Diabetes | 10 (41) |
| Hypertension | 7.5 (31) |
| Hypercholesterolemia | 2.7 (11) |
| Myocardial infarction | 2.4 (10) |
| Asthma | 1.7 (7) |
| Polycystic ovarian syndrome | 1.5 (6) |
| Irritable Bowel Syndrome | 1.4 (6) |
| Cancer | 0.7 (3) |
| Hyperthyroidism | 0.7 (3) |
| Anaemia | 0.7 (3) |
| Osteoporosis | 0.5 (2) |
| Hypotension | 0.5 (2) |
| Immune disorders | 0.4 (2) |
| Skin disorders | 0.4 (2) |
| Inflammatory arthritides | 0.4 (2) |
| Migraines | 0.2 (1) |
| Angina | 0.2 (1) |
| HIV/AIDS | 0.2 (1) |
| Fibromyalgia | 0.2 (1) |
| Hernia | 0.2 (1) |
| Anxiety | 0.2 (1) |

## 4.11. Perceptions of physical activity

Only a third (33.4%, *n* = 132) reported that some factors prevented them from exercising. These included lack of time (19%, *n* = 78) and physical ailments (3.9%, *n* = 16). It must be noted that some participants reported more than one factor that prevented them from exercising. Table 4.8 indicates all the reasons cited for the lack of exercise.

Table 4.8. Reasons for prevention of exercise within the study population

| **Reason** | **Number of respondents % (n)** |
|---|---|
| No time | 19.0 (78) |
| Physical ailments | 3.9 (16) |
| Lack of family time | 3.4 (14) |
| Musculoskeletal pain | 3.2 (13) |
| Laziness | 1.9 (18) |
| Personal reservations | 0.5 (2) |
| No self-discipline | 0.5 (2) |
| No facilities | 0.2 (1) |
| Transport problems | 0.2 (1) |
| Old age | 0.2 (1) |

Increased fitness (38.7%, *n* = 159) and good health (31.6%, *n* = 130) were cited as important advantages of physical activity. It must be noted that some participants reported more than one advantage of physical activity. Table 4.9 indicates all the advantages of exercise reported by the respondents.

Table 4.9. Advantages of physical activity

| **Advantages** | **Number of respondents % (n)** |
|---|---|
| Fit | 38.7 (159) |
| Healthy | 31.6 (130) |
| Mental health | 23.1 (95) |
| Weight loss | 18.5 (76) |
| Energetic | 14.8 (61) |
| Good physique | 8.8 (36) |
| Socialise | 2.9 (12) |

Some of the respondents (24.9%, *n* = 43) reported that, post exercise, pain is a disadvantage of physical activity. Other disadvantages were that exercise is time consuming (16.8%, *n* = 29) and caused dizziness (16.8%, *n* = 29). It must be noted that some participants reported more than one disadvantage of physical activity. Table 4.10 provides a list of all the disadvantages reported by the study respondents.

4.10. Disadvantages of physical activity

| **Disadvantages** | **Number of respondents % (n)** |
|---|---|
| Pain experienced after exercise | 24.9 (43) |
| Exercise is time consuming | 16.8 (29) |
| Dizziness | 16.8 (29) |
| Fatigue | 15.6 (27) |
| Injuries | 11.6 (20) |
| Costly | 2.9 (5) |
| Shortness of breath | 2.3 (4) |
| Lack of family time | 1.7 (3) |
| Lack of safety | 1.7 (3) |
| Don’t see immediate results | 1.2 (2) |
| No disadvantages | 1.2 (2) |
| Increased appetite | 1.2 (2) |
| Lack of facilities | 0.6 (1) |
| Too overweight to exercise | 0.6 (1) |
| Lack of motivation | 0.6 (1) |
| Lack of muscle spams | 0.6 (1) |

## 4.12. Monitoring Health

A minority of the respondents (15.3%, *n* = 60) reported that they record their heart rate. Most of these respondents recorded their heart rate at any time of the day (35.1%, *n* = 20). In contrast, only 8.8% (*n* = 5) of the respondents recorded their heart rate before exercise while some did so after exercise (15.8%, *n* = 9). Others recorded both at rest and during exercise (10.5%, *n* = 6). A minority recorded their heart rate both before and after exercise (5.3%, *n* = 3).

Only a few respondents recorded their blood pressure (20.2%, *n* = 80). Some of these respondents recorded their heart rate at any time of the day (46.3%, *n* = 37),

others before exercise (7.5%, *n* = 6) or after exercise (10%, *n* = 8). A minority recorded their blood pressure at rest (5%, *n* = 4). Only 1.3% (*n* = 1) of respondents recorded their heart rate before exercise as well as during exercise.

Some respondents mentioned that they were not currently exercising but that they needed to do so (7.6%, *n* = 21). Other comments included: “walking is the best form of exercise”, “physical activity is a lifestyle choice that results in fitness and exercise prevents physical ailments”, “BMI values do not indicate that an individual is healthy”, “health conscious parents will raise healthy children”, “dancing and housework are forms of exercise”, “exercise should be performed daily”, “most people only exercise after they are diagnosed with physical illnesses”, “exercise is hard work with good results and more time should be set aside for exercise.” A few requested for extra public awareness on exercise (5.8%, *n* = 16).

# CHAPTER FIVE

# DISCUSSION

## 5.1. Introduction

This chapter provides a detailed interpretation and discussion of the study's results.

## 5.2. Prevalence of physical activity

This study showed that more than half of the Indian population in KwaZulu Natal (KZN) sampled in this study, exercised (70.1%). However, only 42.9% of the respondents met the international minimum requirement of 150 minutes of physical activity per week (WHO, 2015). When unstructured exercise such as household and yard chores were added, the prevalence of required physical activity increased to 45.3%. Therefore, less than half of the study population met the international requirements of sufficient physical activity for the reduction of heart disease, stroke, hypertension, type II diabetes, osteoporosis and obesity (WHO, 2015). This supports previous studies that reported very low levels of physical activity in the South African Indian population (Seedat, 2005; Vardhan, 2006). However, a limitation of the previous studies are that they did not report the exact percentages of the population that was physically active and thus the prevalence data cannot be effectively compared. However, the results of the present study indicate much higher levels of physical activity compared to the population of India, where only 3-15% of the population were reported to be physically active (Naicker *et al.,* 2015). Therefore South African Indians living in KwaZulu Natal are more physically active than their counterparts on the Indian sub-continent.

Some of study population (17%) participated in formal sport events such as marathons, soccer and cricket tournaments. This is a very small proportion compared to reports of 61% of the Indian population living in Europe who engaged in formal sport activities (Van Tuyckom and Scheerder, 2010). Although participation in formal sports are not the only opportunities for physical activity, it does, however, form a platform through which individuals can easily become physically active (Van Tuyckom and Scheerder, 2010). This would be easy to maintain due to the positive

psychological effects of group activities and the competitive nature of sports. Hence, there is a need to encourage participation in these sports in the South African Indian population.

A salient finding in this study was that physical activity levels were similar across all age groups. This is in contradiction to previous studies that reported higher exercise levels in the younger population (Kunene and Taukobong, 2015; Anjana *et al*., 2015). The finding of the present study thus indicates a changing trend where older people are no longer sedentary. This is encouraging as it shows a positive change towards leading a healthier lifestyle, particularly since the study was conducted in a population that is vulnerable to lifestyle diseases such as CHD, hypertension and diabetes mellitus (Seedat, 2005). More importantly, the current finding is contradictory to previous studies that have reported that although most societies are aware of the health benefits associated with regular physical activity, many still lead a sedentary lifestyle (Van Tuyckom and Scheerder, 2010). Indeed, the most common reasons provided for exercising were to improve fitness, good mental and physical health as well as weight loss. Similar findings were reported in studies conducted in other parts of the world, such as the United States of America, Germany, Iran, Spain and India (Bassuk and Manson, 2010; Dunn and Jewell, 2010; Salehi *et al.,* 2010; Kanarek *et al.,* 2012; Codina *et al.,* 2013; Anjana *et al*., 2015)..

This awareness is in contrast to previous reports where only 50% of the population were aware of the benefits of physical activity and exercise (Vaz and Bharathi, 2000). The present awareness of the benefits of physical activity could be due to reporting in both the print and social media and shows the importance of education through these means. Further investigation is however required to support this. Moreover, participants mentioned that the latest available information allowed for technique improvement and also catered for a larger variety of exercises. Study participants also reported that socialising was an important reason for exercising. Having a friend to exercise with provided company while exercising, someone to talk to and could also alleviate the fear of being alone particularly if one is walking or jogging on the street or even along the beachfront. As previously reported, the fear of crime could prevent people, particularly women, from exercising on their own

(Salehi *et al.,* 2010). Exercising in groups could also provide opportunities to increase a person's social network.

While most respondents reported to have started exercising at an age younger than 20 years old, the findings also indicate that the exercise and sport performed at this young age were discontinued by most of the respondents. Further exploration showed that these sports, which included soccer, hockey and netball, are commonly played at secondary school. In addition, our findings demonstrated that most of the respondents stopped participating in these exercises, usually more than ten years ago, most likely after they completed their schooling. Reasons provided for cessation of these exercises were lack of time, ill health, laziness and insufficient family time. Similar reasons were provided by a previous study conducted in Iran (Salehi *et al.,* 2010). In South Africa, secondary schools offer these sports as part of the extra-curricular activities that young people participate in. However, once they leave school, work or family commitments probably require more time and thus the sporting activities that these young people participated in at school are neglected. Since they also cited laziness as a factor, the motivation for exercising or participating in sports is lost. If they can once again be motivated to continue with the sport, appropriate time management would make it possible.

This study shows that in the Indian population of KZN, similar proportions of males and females exercised. This is in contrast to previous studies which showed that males are generally more physically active than the females (Salehi *et al*., 2010; Codina *et al.,* 2013; Micklesfield *et al.,* 2014). In Iran this was attributed to reservations of females exercising in the presence of males (Salehi *et al.,* 2010). In Spain and South African rural areas, women may be restricted by cultural and traditional norms which expect them to be domesticated (Codina *et al*., 2013; Micklesfield *et al*., 2014). The current report thus also shows a change in trend towards the role of females and that there is no longer a requirement for them to remain in their homes.

Nevertheless, the types of exercises performed by males differed from that of females. The latter participated more in treadmill, yoga, netball, Zumba, aerobics, Pilates and stationary cycling whilst males participated in jogging, swimming, cycling, running, weight lifting, cricket, soccer and squash. Walking was performed equally

by both genders. This is in agreement with earlier exercise studies conducted in the United Kingdom, Australia, India and South Africa (Lees, 2003; Billaut *et al*., 2012; Appleton *et al*., 2013; Anjana *et al.,* 2015; Schnohr *et al.,* 2015; Çonnor *et al.,* 2015). Possible reasons for the gender difference in exercises could be that females opted for convenient exercises that enable them to exercise within the household without compromising on family time and household responsibilities. Other reasons could include the monthly cost of formal exercise memberships, hence the use of home friendly equipment such as the treadmill, stationary cycle and exercise videos. However, further investigation is required to determine the reasons for exercise preferences between the different genders.

## 5.3. Exercise patterns

There was no preference to performing physical activity at any particular time of day, possibly due to Durban not experiencing large fluctuations in temperature during the course of a day. On the contrary, in an Iranian study, most participants reported exercising in the afternoons (Salehi *et al.,* 2010), possibly due to its location in the Mediterranean region where the mornings may be very hot and thus not conducive to exercising. It must be noted that a shortcoming of the current study is that information about changes in exercise patterns during winter and summer was not requested. It was also noted that housewives, students and businessmen exercised more than other professionals. This could be due to these people having more time for exercise.

It is encouraging that the post recovery time is not a deterrent in continuing with any particular exercise. Indeed some respondents mentioned that it encouraged them to increase their exercise performance. This is reassuring as this will help to decrease the post recovery time in the future and consequently improve heart function (Mike and Kravitz, 2009; Gleeson, 2002). Equally important, the continuous change in exercise knowledge and trends did not negatively affect exercise performance.

## 5.4. Areas/facilities used for exercise

Public grounds, the beachfront and gymnasiums were the most commonly used locations for exercise. The findings in this study regarding the use of public grounds

and gymnasiums for exercise was in agreement with previous studies (Anjana *et al.,* 2015; Schnohr *et al.,* 2015). To our knowledge, this is the first study to investigate the use of the beachfront as an exercise location. The Durban beachfront was revamped in 2010 with extensive walkways created between Ushaka Marine World in the South and the Blue Lagoon in the North. This area has since been used by many people, both for walking as well as cycling. The study population did not report any concerns about safety in the area. Many engaged in group exercise, which alleviated safety concerns and was also advantageous as they socialized simultaneously.

## 5.5. Health and exercise

The present study revealed that just more than half of the study's population did not control their diet (56.8%). This data is in agreement with previous studies that stated that South African Indians' have an unhealthy diet (Seedat, 2005; Vardhan, 2006; Gupta *et al*., 2013; Naicker *et al*., 2015). However, the remaining 43.2%, that controlled their diet, consumed less carbohydrates and ate more vegetables. This corroborates with the finding of a study in India which reported the consumption of less carbohydrates and free sugar in order to control blood glucose levels and weight (Anjana *et al.,* 2015). It is noteworthy that those respondents who controlled their diet performed exercise as well. This finding is also supported by a previous study (Anjana *et al*., 2015).

The majority of the study's participants were diagnosed with chronic conditions, most commonly diabetes, hypertension, hypercholesterolemia and myocardial infarction. This is in agreement with previous studies that established the links between the South African Indian population, CHD and myocardial infarction (Seedat, 2005; Vardhan, 2006). However, it must be noted that a third of the respondents reported their health conditions as their main reason for exercising and most them were over the age of 40. This indicates that even though many of the older participants may have initially exercised while at school and subsequently stopped their exercise, they then resumed it after diagnosis of the health condition. This indicates that health care professionals may have emphasized and promoted the importance of the role of regular physical activity in the management of health conditions. However, this requires further investigation. Nevertheless, it is unfortunate that many people only

adopt a healthy lifestyle that includes physical activity after being diagnosed with adverse health conditions. Measures need to be put into place to educate people about the importance of exercise before they become ill. It has also been noted that a minority of the respondents monitor their blood pressure and heart rate readings. The importance of regular monitoring and health care appointments needs to be emphasized, particularly in the Indian community where CHD and hypertension are rife.

## 5.6. Unstructured exercise

This study shows that there was very little physical activity achieved through walking instead of using other means of transport, particularly by those who did not exercise. The majority of the study's respondents travelled by car and parked closer to mall entrances and very few walked for more than ten minutes to and from their transport. This corroborates previous findings which reported that due to urbanization, most individuals do not walk to work but rather travel by easily accessible vehicles (Anjana *et al*., 2015). Brisk walking for 30 minutes daily can be considered as adequate physical activity (Haskell *et al*., 2007). Climbing stairs is also a beneficial way of compensating for leisure time physical activity. Many of the study participants climbed up to 3 flights of stairs daily. However, this was particularly so, for those that exercised. On the other hand, participants that did not exercise, play sport or participate in other leisure time physical activities, did not climb stairs and thus climbing stairs did not compensate for the lack of physical activity.

Most of the respondents performed household chores which comprised of making beds, washing dishes and sweeping for more than fifteen minutes per day. However, only those who swept floors performed the adequate amount of physical activity, achieved through household tasks. Chores such as making beds and washing dishes are not of a sufficient intensity to be regarded as a moderate physical activity (Park and Shoemaker, 2008). Thirty minutes of daily vigorous household/yard activities such as sweeping or digging have been shown to decrease the risk of cardiovascular diseases (Kingsley *et al*., 2009). A previous study reported that elderly women performed vigorous household and garden chores such as sweeping, cleaning windows, vacuuming and mowing lawns at an adequate intensity that contributed to the 30 minutes of physical activity required per day (Withers *et al*.,

2006). There is thus a change in the amount of time spent doing household or yard chores since previous years. It must however be noted that more females perform household tasks while males engage in yard chores. This is similar to findings of other studies in different populations (Withers *et al*., 2006; Salehi *et al*., 2010; Codina *et al*., 2013; Micklesfield *et al*., 2014). The current study indicated that a minority of the respondents performed manual work which lasted for less than 30 minutes a day. This is possibly due to jobs becoming less labour intensive in recent times (Anjana *et al*., 2015).

Most respondents who played with their children, did so for up to four hours per day. However, a limitation of this study was that active playing with children was not quantified and therefore cannot be reported as to whether it contributed to leisure time physical activity. In order to attain physical activity through playing with children, emphasis should be on active games such as tag or hopscotch.

# CHAPTER SIX

# CONCLUSION AND RECOMMENDATIONS

## 6.1. Conclusion

The aim for the current study was to determine the profile of South African Indians in KwaZulu- Natal (KZN) who exercised and the factors affecting this.

The results indicated that 70.1% of the Indian population in KwaZulu Natal (KZN), exercised. However, only 42.9% of the respondents met with the international minimum requirement of 150 minutes of physical activity per week (WHO, 2015). When unstructured exercise such as household and yard chores were added, the prevalence of required physical activity increased to 45.3%. Interventions to increase physical activity in this population are therefore required. People need to be made aware of the importance of physical activity not only for it's health benefits but also for general well-being. Whilst it is encouraging that those with lifestyle diseases such as CHD and diabetes mellitus are being physically active, it is important to target the healthy population so that they can be persuaded to become physically active prior to the onset of disease. Furthermore, those people that are physically active but are not meeting the international requirement of 150 hours of weekly physical activity need to be encouraged to boost their activity levels to meet the minimum criteria. Since many reported a lack of time as a reason for not participating in exercise programmes, teaching of time management skills would also be useful in this population.

Physical activity levels were similar across all age groups and gender. Women worldwide are well-known to be restricted by cultural and traditional norms which expect them to be domestically inclined. The finding of similar activity levels between both genders shows that unlike in other countries such as Iran, South African Indian women are able to exercise freely without many restrictions. Although the activities performed by the females differed from those of males, this may be due to preference.

## 6.2. Limitations

Although majority of the respondents exercised at any time of the day, it was not determined if a change in weather had affected their preferred exercise schedule. A change in season could possibly have altered their exercise pattern and this requires further investigation. Although stair climbing was cited as a form of exercise, the pace and duration of this activity were not determined. Similarly, playing with children was not quantified. Another limitation of the study is that it was conducted at the Beach Front which may have introduced bias, therefore the study cannot be generalized to the Indian population of KwaZulu- Natal. This is possibly why some of the findings are contrary to other studies that cite that males are generally more physically active as compared to females. Despite the limitations, the results of this study has shown increased levels of physical activity and awareness within the Indian community in KZN. This is in contrast to many previous local and international studies which stated that Indians lead a sedentary lifestyle.

## 6.3. Recommendations

This study determined the exercise profile of South African Indians. This need to be extended to include all race groups in South Africa to determine similarities and/or differences.

Future studies can identify the types of injuries that cause individuals' to discontinue exercising. This could also be useful particularly in the elderly who may be afraid to exercise due to fear of getting injured. Such a study can be used to educate that portion of the population on activities that are safe for them. It will also create an awareness of the possible physiological and mental processes that prevent one from being active after sustaining an injury.

A further recommendation is to determine the levels of unstructured exercise that occurs through the activities of daily living. This can be combined with the measurement of fitness parameters using the Fitbit device.

To conclude, although the current study showed that there are increased levels of exercise within the Indian community in KZN, a minority exercised for the required minimum amount of exercise. Therefore, an intensive effort at a government,

community and personal level is needed to develop ways and means that will assist in the participation of the required amount of regular exercise that is needed in order to see health benefits.

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## APPENDIX I: Letter of approval from DUT

## IREC

DUT
DURBAN UNIVERSITY OF TECHNOLOGY

**Institutional Research Ethics Committee**
Faculty of Health Sciences
Room MS 49, Mansfield School Site
Gate 8, Ritson Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2900
Fax: 031 373 2407
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

**www.dut.ac.za**

15 July 2015

IREC Reference Number: **REC 61/15**

Ms N Kader
37 Mallinson Road
Maluti Heights
Flat 39
Sydenham
4091

Dear Ms Kader

**Profiles of exercise participation by South African Indians residing in KwaZulu-Natal, South Africa**

I am pleased to inform you that Provisional Approval has been granted to your proposal REC 61/15 subject to:

- Piloting of the data collection tool

Full approval is subject to meeting the above condition.

The Proposal has been allocated the following Ethical Clearance number **IREC 063/15**. Please use this number in all communication with this office.

Approval has been granted for a period of two years, before the expiry of which you are required to apply for safety monitoring and annual recertification. Please use the Safety Monitoring and Annual Recertification Report form which can be found in the Standard Operating Procedures [SOP's] of the IREC. This form must be submitted to the IREC at least 3 months before the ethics approval for the study expires.

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

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

**Please note that you may continue with validity testing and piloting of the data collection tool. Research on the proposed project may not proceed until IREC reviews and approves the final document. If there are no changes to the data collection tool, kindly notify the IREC in writing.**

Yours Sincerely

[redacted]

Professor M N Sibiya
Deputy Chairperson: IREC

DUT DURBAN UNIVERSITY OF TECHNOLOGY

2015 -07- 15

INSITUTUTIONAL RESEARCH ETHICS COMMITTEE
P O BOX 1334 DURBAN 4000 SOUTH AFRICA

## Appendix II: Approval from Head of the Skills Development Unit and the Head of Parks, Recreation and Culture at the eThekwini Municipality


Pod 1, Second Floor, Intuthuko Junction, 750 Mary Thiphe Street, Umkhumbane, Cato Manor, Durban 4001.
Tel: 031 322 4513, Fax: 031 261 3405, Fax to email: 086 265 7160, Email: mile@durban.gov.za, Website: www.mile.org.za

For attention: Dr F.Haffejee
Department of Basic Medical Science
Faculty of Health Sciences
Durban University of Technology
P.O Box 1334
Durban
4000

5 June 2015

YOUR REF: 20902962 (N. KADER)

RE: LETTER OF SUPPORT TO MS NUSRAT KADER, (M.TECH STUDENT - DUT) TOWARDS THE GRANTING OF PERMISSION FOR CONDUCTING RESEARCH IN ETHEKWINI MUNICIPALITY.

The Parks, Recreation and Culture Department of eThekwini Municipality in partnership with the Municipal Institute of Learning (MILE), have considered your request to use eThekwini Municipality as the research area – the outcome of which may lead to the award of a M.Tech degree, entitled " ***Profiles of exercise participation by South African Indians residing in KwaZulu-Natal, South Africa.*** "

We wish to inform Ms Kader of our acceptance of her request and hereby assure her of the utmost cooperation towards achieving her academic goals; the outcome which we believe will help the municipality improve service delivery. In return, we request that the researcher embrace the guidance of the "gate-keeper" and lastly present the results and recommendations of the study to the city for consideration.

It is agreed that you are to liaise with Collin Pillay for any assistance you might need from our professional level employees in eThekwini municipality.

[redacted]

Mr T. Ngcobo
Head: Parks, Recreation and Culture
eThekwini Municipality

[redacted]

Dr. M. Ngubane
Head: Skills Development Unit
eThekwini Municipality

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## Appendix III: Questionnaire used in the study

**PHYSICAL ACTIVITY QUESTIONNAIRE**

**Dear Sir/madam**

**Please answer the questions in this form as completely as you can. Where applicable, please tick the appropriate box. Please provide honest answers. Your participation is appreciated.**

**Section A: Demographics**

AGE: 18-21☐ 21-31☐ 31-41☐ 41-51☐ 51-61☐ >60☐

GENDER: Male☐ Female☐

RELIGION: Islam☐ Hinduism☐ Christianity☐ Other☐_____

LANGUAGE GROUP (Mother tongue): Urdu☐ Tamil☐ Gujrati☐ Punjabi☐ Telegu ☐
Other☐ _____

PRIMARY LANGUAGE USED: English ☐ Urdu☐ Tamil☐ Gujrati ☐ Punjabi☐
Telegu ☐ Other☐ _____

OCCUPATION: _____

HEIGHT: _____

BODY WEIGHT: _____

**Section B: Health and Exercise**

1. Have you been diagnosed with any health conditions? (E.g. Diabetes, Gout) Yes ☐ No☐

If yes, please specify._____

2. Is it possible that you may have a health condition that has not yet been diagnosed by a health care professional? Yes ☐ No ☐

If yes, please specify.
_____

3. Do you control your diet? Yes ☐ No ☐

If yes, please specify. _____

**Section C: Exercise History**

4. At approximately what age did you begin to exercise regularly? _____

5. Please complete the table below

| | Please tick the type of exercise that you did perform. | If you have stopped any of the exercises, please tick the appropriate box. | When did you stop performing these exercises? | Why did you stop performing these exercises? |
|---|---|---|---|---|
| Jogging | | | | |
| Swimming | | | | |
| Cycling | | | | |
| Treadmill | | | | |
| Walking | | | | |
| Yoga | | | | |
| Free-weights | | | | |
| Tennis | | | | |
| Soccer | | | | |
| Cricket | | | | |
| Squash | | | | |
| Netball | | | | |
| Hockey | | | | |
| Rugby | | | | |
| Zumba | | | | |
| Aerobics | | | | |
| Pilates | | | | |
| Running | | | | |
| Machine-weights | | | | |
| Taebo | | | | |
| Stationary cycling | | | | |
| Other (please specify) | | | | |
| | | | | |
| | | | | |

6. In total what was the approximate duration for which you exercised per day?

½ hour☐ 1 hour☐ 1.5 hours☐ 2 hours☐ 2.5 hours☐ 3 hours☐ Other☐_____

7. In total how often did you perform those exercises per week?

Once a week☐ Twice a week☐ every day☐ Other☐_____

8. Where did you perform those activities? E.g. private gym, home gym, beachfront, residential areas.

_____

**SECTION D: Current Activity**

9. Do you perform any exercise? Yes ☐ No ☐

If no, please skip to question 21.

10. What types of exercises do you perform? (Can tick more than one box)

Jogging☐ Swimming☐ Cycling☐ Treadmill☐ Walking☐ Yoga☐ Free-weights☐ Tennis☐ Soccer☐ Cricket☐ Squash☐ Netball☐ Hockey☐ Rugby☐ Zumba☐ Aerobics☐ Pilates☐ Running☐ Machine-weights☐ Stationary cycling☐ Other☐ _____

11. When do you perform the above exercises? (Can tick more than one box)

Morning☐ Mid-day☐ Afternoon☐ Night☐ Anytime of the day☐

12. In total what is the approximate duration for which you do exercise?

½ hour☐ 1 hour☐ 1.5 hours☐ 2 hours☐ 2.5 hours☐ 3 hours☐ Other☐_____

13. In total how often do you perform these exercises per day?

1 x day☐ 2 x day☐ 3 x day☐ every alternate day☐ everyday☐ Other☐_____

14. In total how often do you perform these exercises per week?

Once a week☐ Twice a week☐ Entire week☐ Other☐_____

15. How long does it take you to recover after exercise?

15 minutes☐ 30 minutes☐ 1 hour☐ >1hour☐ Other☐_____

16. Does the post-exercise recovery time impact on your willingness to be consistent with exercise? Yes ☐ No ☐

If yes, please specify how_____

17. How do you prefer to exercise? Alone☐ In a group☐

Please provide a reason for your answer.

_____

18. Does the continuously changing knowledge and trends on exercise guidelines impact on the way you exercise? Yes ☐ No ☐

If yes, please specify how_____

19. Do you consider sports as physical activity? Yes ☐ No ☐

20. What is your main reason/s for engaging in exercise?

_____

21. Is anything currently preventing you from performing exercise? Yes ☐ No ☐

If yes, please specify.

_____

22. Please list some of the advantages and disadvantages that you experience or have experienced from doing physical activity.

| ADVANTAGES | DISADVANTAGES |
|---|---|
| | |
| | |
| | |

**Section E: Household/ yard/ garden chores as exercise**

23. Do you do any yard chores? Yes ☐ No ☐

If yes, please complete the table below. (Can complete more than one box)

| Type of chore | Time performed per day. E.g. 30 minutes/day |
|---|---|
| Digging | |
| Raking | |
| Weeding | |
| **OTHER** | |
| | |
| | |

24. Do you do any household chores? Yes ☐ No ☐

If yes, please complete the table below. (Can complete more than one row)

| Type of chore | Time performed per day. E.g. 15 minutes/day |
|---|---|
| Scrubbing | |
| Carrying shopping bags | |
| Making beds | |
| Cleaning windows | |
| Loading dishwasher/ Washing dishes | |
| Vacuuming/ Sweeping | |
| **OTHER** | |
| | |

| | |
|---|---|
| | |

25. Do you perform any manual work? Yes ☐ No ☐

If yes, please complete the table below. (Can complete more than one row)

| Type of manual labour<br>E.g. carrying boxes to store room | Minutes/hours performed per day<br>15 minutes daily |
|---|---|
| | |
| | |

26. Do you play with your children/ nieces/nephews/ grandchildren? Yes ☐ No ☐

If yes, how much time do you spend doing this per day or per week? _____

**Section F: Unstructured Exercise**

27. Do you use the stairs at work? Yes ☐ No ☐

If no, please skip to Question 30.

28. If yes, how many flights of stairs do you climb?

_____

29. How often do you climb the stairs? E.g. thrice a day, twice a week.

_____

30. What is your main mode of transport? (Can tick more than one box)

Private car☐ Walk☐ Bicycle☐ Bus☐ Motor bike☐ Train☐ Other☐ _____

31. Do you have to walk for more than 10 minutes to and from for your desired mode of transport?
Yes ☐ No ☐

32. If you use a personal vehicle, do you find that you park:

Closer to the entrance ☐ Further from the entrance ☐ Other ☐_____

**Section G: Sports Events**

33. Do you participate in any formal or competitive events? E.g. Marathons, Soccer tournaments.
Yes ☐ No ☐

If no, please skip to Question 34.

If yes, please complete the following table. (Can complete more than one row)

| Type of event | How often do you participate in the event? | If marathon, please specify the distance covered. |
|---|---|---|
| E.g. 1. Molweni Trail Run | E.g. Once, annually | 42k |
| | | |
| | | |
| | | |

**Section H: Monitoring Health**

34. Do you take recordings of your heart rate? Yes ☐ No ☐

If no, please skip to Question 35.

If yes, when do you take these recording? (Can tick more than one block)

Before exercise ☐ After exercise☐ At any time ☐ Other ☐(please specify) _____

_____

35. Do you record your blood pressure? Yes ☐ No ☐

If no, please skip to Question 36.

If yes, when do you record you blood pressure? (Can tick more than one block)

Before exercise ☐ After exercise ☐ At any time ☐ Other ☐(please specify) _____

_____

36. Is there anything else you wish to say?

_____

_____

**Thank you for participating in this research study.**

## APPENDIX IV: Original questionnaire

**PHYSICAL ACTIVITY QUESTIONNAIRE**

**Dear Sir/madam**

**Please answer the questions in this form as completely as you can. Please provide honest answers. Your participation is appreciated**

**SECTION A: Personal Information**

**AGE: _____**

**GENDER: _____**

**RELIGION: _____**

**LANGUAGE GROUP (e.g. Tamil, Urdu): _____**

**OCCUPATION: _____**

**Are you diagnosed with any health conditions? If yes, please specify.**

**_____**

**SECTION B: History of physical activity**

1. Do you perform any physical activity? (Excluding household chores and occupational duties)

_____

2. When did you initially begin to perform physical activity?

_____

3. What types of physical activity do you perform?

_____

_____

_____

4. Do you consider sport activity as physical activity?

_____

5. When do you perform the above physical activity/ies and for how long? E.g. from 8am-9am OR every afternoon for half an hour

_____

6. How often do you perform these activities? E.g. Twice a day, every day.

_____

_____

7. Where do you perform these activities? E.g., home gym, beachfront, public gym.

_____

_____

8. Have you always performed the same physical activities?

_____

If no,

8a. What type of physical activities have you changed?

E.g. jogging →morning runs

_____ → _____

_____ → _____

_____ → _____

8b. Why have you changed to the above new activities?

_____

_____

8c. For how long do you perform the above new physical activities?

_____

8d. How often do you perform the above?

_____

8e. What do you hope to achieve from performing the above new physical activity?

---

**SECTION C: Work/household activities**

1. Do you do any household chores? If yes please explain in terms of types of chore/s performed, duration of time it takes to be completed and number of times per week/month it is performed.

E.g. Sweeping- 15 minutes - 6 days a week

_____
_____
_____
_____
_____
_____

2. At work, what types of manual labour do you perform? Please also specify the duration and frequency of these chores.

E.g. carrying of boxes to stockroom – 30 minutes – once a week

_____
_____
_____
_____

3. Do you utilize the stairs or elevators at work? If you use the stairs, please specify how many stairs/flights of stairs you climb and how many times a day/week this is done.

_____
_____
_____

**SECTION D: Transport history**

1. What is your main mode of transport? If it is public transport or by means of a lift, by what means of transport do you travel to reach the desired mode? If you do walk, how long does it take you to reach the desired mode?

_____

_____

2. Do you use any other means occasionally? E.g., bicycle, walking. If so how often does this occur and for how long?

_____
_____

3. By what means of transport do you fulfil your responsibilities? I.e. monthly grocery shopping, payments etc.?

_____
_____

3a. If you use public transport. Please specify how long it takes you to reach the desired transport and how do you get there? Also specify if you walk from one shop to another and indicate the amount of time spent walking.

_____
_____

3b. If you use a personal vehicle, how far from the mall/shop entrance do you park? How much time is spent walking during that venture?

_____
_____

**SECTION E: Participation in formal and competitive activities**

1. Do you participate in any formal events, such as fun walks, marathons?

_____

If yes, please fill in the necessary details below.

1a.Name of event/s:

1b.Distance covered (please specify separately for each event):

_____
_____

1c.How often do you participate in these event/s?

_____
_____

2. Do you participate in competitive events? E.g. Comrades

_____

If yes, please fill in the necessary details below.

2a.Name of event/s:

2b.Distance covered (please specify separately for each event):

_____
_____

2c.How often do you participate in these event/s?

_____

_____

**SECTION F: Participation in sports E.g. tennis, soccer**

1. Do you participate in any sport? Please specify

_____

2. When did you initially begin participating in the above sport/s?

_____

3. For how long and how often do you play the particular sport?

E.g. 90 minutes every Saturday night.

_____

**SECTION G: Goals and challenges**

1. What is your main reason/s for engaging in physical activity?

_____

_____

_____

_____

2. What is your motivation for performing physical activity?

_____

_____

_____

3. What do you hope to achieve from performing physical activity?

_____

_____

_____

_____

4. Do you believe that physical activity had a favourable or unfavourable influence to your health and life?

_____

5. Please list some of the advantages and disadvantages that you have gained from doing physical activity.

| ADVANTAGES | DISADVANTAGES |
|---|---|
| | |
| | |
| | |
| | |

**Thank you for participating in this research study.**

## APPENDIX V: Post-focus group questionnaire

### PHYSICAL ACTIVITY QUESTIONNAIRE

**Dear Sir/madam**

**Please answer the questions in this form as completely as you can. Where applicable, please tick the appropriate box. Please provide honest answers. Your participation is appreciated.**

**AGE:** **18-20** ☐ **20-30** ☐ **30-40** ☐ **40-50** ☐ **50-60**☐ **>60** ☐

**GENDER:** **M** ☐ **F** ☐

**RELIGION:** **Islam** ☐ **Hinduism** ☐ **Christianity**☐ **Other** ☐_____

**LANGUAGE GROUP:** **Urdu** ☐ **Tamil** ☐ **Gujrati** ☐ **Punjabi** ☐ **Telegu** ☐ **Other** ☐ _____

**OCCUPATION:** _____

**HEIGHT:** _____

**BODY WEIGHT:** _____

**Section A: Health and Exercise**

1. Have you been diagnosed with any health conditions? (E.g. Diabetes, Gout) Yes ☐ No☐

If yes, please specify._____

_____

2. Do you assume that you have a health condition that has not yet been diagnosed by a health care professional? Yes ☐ No ☐

If yes, please specify. _____

_____

3. Do you control your diet? Yes ☐ No ☐

If yes, please specify. _____

_____

4. Do you perform any exercise? (Excluding household chores and occupational duties)

If no, please skip to Question 17. Yes ☐ No ☐

**Section B: Exercise History**

5. At approximately what age did you begin to exercise regularly? _____

6. What types of exercises did you perform? (Can tick more than one box)

Jogging☐ Swimming ☐ Cycling ☐ Treadmill ☐ Walking ☐ Yoga ☐ Free-weights☐ Tennis ☐ Soccer ☐ Cricket ☐ Squash ☐ Netball ☐ Hockey ☐ Rugby ☐ Zumba ☐ Aerobics ☐ Pilates ☐ Running ☐ Machine-weights ☐ Stationary cycling ☐ Other ☐ _____

_____

7. When did you perform the above exercises? (Can tick more than one box)

Morning☐ Mid-day☐ Afternoon ☐ Night☐ Anytime of the day☐

8. What was the approximate duration for which you did exercise?

½ hour ☐ 1 hour☐ 1.5 hours☐ 2 hours☐ 2.5 hours☐ 3 hours☐ Other☐_____

9. How often did you perform those exercises per day? (Can tick more than one box)

1 x day ☐ 2 x day☐ 3 x day☐ every alternate day☐ everyday☐ Other☐_____

10. How often did you perform those exercises per week? (Can tick more than one box)

Once a week☐ Twice a week☐ Entire week ☐ Other☐_____

11. Where did you perform those activities? E.g. private gym, home gym, beachfront, residential areas.

_____

**SECTION C: Current History**

12. Do you consider sports as physical activity? Yes ☐ No ☐

13. Have you changed the type of exercise you do? Yes ☐ No ☐

If no, please skip to Question 14.

If yes, please specify:

E.g. jogging →morning runs

_____ → _____

_____ → _____

_____ → _____

14. Have you changed the amount of exercise you do? Yes ☐ No ☐

If no, please skip to Question 16.

If yes, please specify:

_____ → _____

_____ → _____

15. Why have you changed the type and amount of exercise you do?

_____

_____

16. What is your main reason/s for engaging in exercise?

_____

_____

17. Has anything prevented you from performing exercise? Yes ☐ No ☐

If no, please skip to Question 18.

If yes please specify.

_____

_____

18. Please list some of the advantages and disadvantages that you have experienced from doing physical activity.

| ADVANTAGES | DISADVANTAGES |
|---|---|
| | |
| | |
| | |
| | |

**Section D: Household/ yard/ garden chores as exercise**

19. Do you do any yard chores? Yes ☐ No ☐

If no, please skip to Question 20.

If yes, please complete the table below. (Can complete more than one box)

| Type of chore | Time performed per day. E.g. 30 minutes/day |
|---|---|
| Digging | |
| Raking | |
| Weeding | |
| Washing car | |

20. Do you do any household chores? Yes ☐ No ☐

If no, please skip to Question 21.

If yes, please complete the table below. (Can complete more than one box)

| Type of chore | Time performed per day. E.g. 15 minutes/day |
|---|---|
| Scrubbing | |
| Carrying shopping bags | |
| Making beds | |
| Cleaning windows | |
| Loading dishwasher | |
| Vacuuming | |
| **OTHER** | |
| | |

21. Do you perform any manual work? Yes ☐ No ☐

If no, please skip to Question 22.

If yes, please complete the table below. (Can complete more than one row)

| Type of manual labour<br>E.g. carrying boxes to store room | Minutes/hours performed per day<br>15 minutes daily |
|---|---|
| | |
| | |
| | |

22. Do you play with your children/ grandchildren? Yes ☐ No ☐

If no, please skip to Question 23.

If yes, how much time do you spend doing this per day or per week? _____

**Section E: Unstructured Exercise**

23. Do you use the stairs at work? Yes ☐ No ☐

If no, please skip to Question 26.

24. If yes, how many flights of stairs do you climb?

_____

25. How often do you climb the stairs? E.g. thrice a day, twice a week.

_____

26. What is your main mode of transport? (Can tick more than one box)

Private car ☐ Walk ☐ Bicycle ☐ Bus ☐ Motor bike ☐ Train ☐ Other ☐ _____

27. Do you have to walk for more than 10 minutes to and from for your desired mode of transport? Yes ☐ No ☐

If no, please skip to Question 28.

28. If you use a personal vehicle, do you find that you park:

Closer to the entrance ☐ Further from the entrance ☐ Other ☐_____

**Section F: Sports Events**

29. Do you participate in any formal or competitive events? E.g. Marathons, Soccer tournaments. Yes ☐ No ☐

If no, please skip to Question 30.

If yes, please complete the following table. (Can complete more than one row)

| Type of event | How often do you participate in the event? | If marathon, please specify the distance covered. |
|---|---|---|
| E.g. 1. Molweni Trail Run | E.g. Once, annually | 42k |
| | | |
| | | |
| | | |

**<u>Section G:</u> Monitoring Health**

30. Do you take recordings of your heart rate? Yes ☐ No ☐

If no, please skip to Question 31.

If yes, when do you take these recording? (Can tick more than one block)

Before exercise ☐ After exercise☐ At any time ☐ Other ☐(please specify) _____

_____

31. Do you record your blood pressure? Yes ☐ No ☐

If no, please skip to Question 32.

If yes, when do you record you blood pressure? (Can tick more than one block)

Before exercise ☐ After exercise ☐ At any time ☐ Other ☐(please specify) _____

_____

32. Is there anything else you wish to say?

_____

_____

**Thank you for participating in this research study.**

## Appendix VI: Changes from the original questionnaire to the focus group recommendations

| Original questionnaire | Focus group recommendations |
|---|---|
| SECTION A: Personal Information | Heading removed |
| AGE: | AGE: 18-20☐ 20-30☐ 30-40☐ 40-50☐ 50-60☐ >60☐ |
| GENDER: | GENDER: M☐ F☐ |
| RELIGION: | RELIGION: Islam☐ Hinduism ☐ Christianity☐ Other☐ |
| LANGUAGE GROUP (e.g. Tamil, Urdu): | LANGUAGE GROUP: Urdu☐ Tamil☐ Gujrati☐ Punjabi☐ Telegu☐ Other☐ |
| | Added question: HEIGHT: |
| | Added question: BODY WEIGHT: |
| | New section added, Section A: Health and Exercise |
| Are you diagnosed with any health conditions? If yes, please specify | Moved to: Section A and is Question 1.Reworded to: Have you been diagnosed with any health conditions? (E.g. Diabetes, Gout) Yes ☐ No☐<br>If yes, please specify |
| | Added question 2: Do you assume that you have a health condition that has not yet been diagnosed by a health care professional? Yes ☐ No ☐<br>If yes, please specify |
| | Added question 3: Do you control your diet? Yes ☐ No ☐<br>If yes, please specify |
| Do you perform any physical activity? (Excluding household chores and occupational duties) | Moved to Section B, question 4.<br>Reworded to: Do you perform any exercise? (Excluding household chores and occupational duties) Yes ☐ No ☐<br>If no, please skip to Question 17. |
| SECTION B: History of physical activity | Section B: Exercise History |
| | Added question 4: Do you perform any exercise? (Excluding household chores and occupational duties) Yes ☐ No ☐<br>If no, please skip to Question 17. |
| When did you initially begin to perform physical activity? | 5. At approximately what age did you begin to exercise regularly? |
| What types of physical activity do you perform? | 6. What types of exercises did you perform? (Can tick more than one box) Jogging☐ Swimming☐ Cycling☐ Treadmill☐ Walking☐ Yoga☐ Free-weights☐ Tennis☐ Soccer ☐ Cricket☐ Squash☐ Netball☐ Hockey☐ Rugby ☐ Zumba☐ Aerobics☐ Pilates☐ Running ☐ Machine-weighs☐ Stationary cycling☐ Other☐ |
| Do you consider sport activity as physical activity? | Moved to Section C, Question 12: Do you consider sports as physical activity? Yes ☐ No ☐ |
| When do you perform the above physical activity/ies and for how long? E.g. from 8am-9am OR every afternoon for half an hour | Separated to question 7 and 8.<br>7. When did you perform the above exercises? (Can tick more than one box)<br>Morning☐ Mid-day☐ Afternoon☐ Night☐ Anytime of the day☐ |

| | |
|---|---|
| | 8. What was the approximate duration for which you did exercise? ½ hour☐ 1 hour☐ 1.5 hours☐ 2 hours☐ 2.5 hours☐ 3 hours☐ Other☐ |
| How often do you perform these activities? E.g. Twice a day, every day. | Reworded to: 9. How often did you perform those exercises per day? (Can tick more than one box) 1 x day☐ 2 x day☐ 3 x day☐ every alternate day☐ everyday☐ Other☐ |
| | Added question 10: How often did you perform those exercises per week? (Can tick more than one box) Once a week☐ Twice a week☐ Entire week ☐ Other☐ |
| Where do you perform these activities? E.g., home gym, beachfront, public gym. | 11. Where did you perform those activities? E.g. private gym, home gym, beachfront, residential areas. |
| | New section added, Section C: Current History |
| | Added question 12: Do you consider sport activity as physical activity? Yes ☐ No ☐ |
| Have you always performed the same physical activities?<br>If no, What type of physical activities have you changed? | 13. Have you changed the type of exercise you do? Yes ☐ No ☐<br>If no, please skip to Question 14.<br>If yes, please specify: |
| Why have you changed to the above new activities? | 14. Why have you changed the type and amount of exercise you do? |
| For how long do you perform the above new physical activities? | 15. Have you changed the amount of exercise you do? If no, please skip to Question 16. Yes☐ No☐<br>If yes, please specify: |
| How often do you perform the above? | Combined with previous question |
| What do you hope to achieve from performing the above new physical activity? | 16. What is your main reason/s for engaging in exercise? |
| | Added question 17: Has anything prevented you from performing exercise? Yes☐ No☐<br>If no, please skip to Question 18.<br>If yes please specify. |
| | Added question 18: Please list some of the advantages and disadvantages that you have experienced from doing physical activity. |
| SECTION C: Work/household activities | Section D: Household/ yard/ garden chores as exercise |
| | Added question 19: Do you do any yard chores? Yes☐ No☐<br>If no, please skip to Question 20.<br>If yes, please complete the table below. (Can complete more than one box) |
| Do you do any household chores? If yes please explain in terms of types of chore/s performed, duration of time it takes to be completed and number of times per week/month it is performed. | 20. Do you do any household chores? Yes☐ No☐<br>If no, please skip to Question 21.<br>If yes, please complete the table below. (Can complete more than one box) |
| At work, what types of manual labour do you perform? Please also specify the duration and frequency of these chores. | 21. Do you do perform any manual work? Yes☐ No☐<br>If no, please skip to Question 22.<br>If yes, please complete the table below. (Can complete more than one box) |
| | Added question 22: Do you play with your children/ grandchildren? Yes☐ No☐<br>If no, please skip to Question 23. |

| | |
|---|---|
| | If yes, how much time do you spend doing this per day or per week? |
| | New section added, Section E: Unstructured Exercise |
| Do you utilize the stairs or elevators at work? If you use the stairs, please specify how many stairs/flights of stairs you climb and how many times a day/week this is done. | 23. Do you use the stairs at work? Yes ☐ No ☐<br>If no, please skip to Question 26. |
| | Added question 24: If yes, how many flights of stairs do you climb? |
| | Added question 25: How often do you climb the stairs? E.g. thrice a day, twice a week. |
| SECTION D: Transport history | Combined with Section E: Unstructured Exercise |
| What is your main mode of transport? If it is public transport or by means of a lift, by what means of transport do you travel to reach the desired mode? If you do walk, how long does it take you to reach the desired mode? | 26. What is your main mode of transport? (Can tick more than one box)<br>Private car☐ Walk☐ Bicycle☐ Bus☐ Motor bike☐ Train☐ Other☐ |
| | Added question 27: Do you have to walk for more than 10 minutes to and from for your desired mode of transport? Yes ☐ No ☐<br>If no, please skip to Question 28. |
| Do you use any other means occasionally? E.g., bicycle, walking. If so how often does this occur and for how long? | Question removed |
| By what means of transport do you fulfil your responsibilities? I.e. monthly grocery shopping, payments etc.? | Question removed |
| If you use public transport. Please specify how long it takes you to reach the desired transport and how do you get there? Also specify if you walk from one shop to another and indicate the amount of time spent walking. | Combined with question 27 |
| If you use a personal vehicle, how far from the mall/shop entrance do you park? How much time is spent walking during that venture? | 28. If you use a personal vehicle, do you find that you park:<br>Closer to the entrance☐ Further from the entrance☐ Other☐ |
| SECTION E: Participation in formal and competitive activities | Reworded as Section F: Sports Events |
| Do you participate in any formal events, such as fun walks, marathons?<br>Yes, please fill in the necessary details below.<br>a. Name of event/s:<br>b. Distance covered (please specify separately for each event):<br>c. How often do you participate in these event/s? | 29. Do you participate in any formal or competitive events? E.g. Marathons, Soccer tournaments. Yes ☐ No ☐<br>If no, please skip to Question 30.<br>If yes, please complete the following table. (Can complete more than one row) |
| Do you participate in competitive events? E.g. Comrades | Combined with question 29 |

| | |
|---|---|
| Yes, please fill in the necessary details below.<br>a. Name of event/s:<br>b. Distance covered (please specify separately for each event):<br>c. How often do you participate in these event/s? | |
| SECTION F: Participation in sports E.g. tennis, soccer | Removed |
| Do you participate in any sport? Please specify | Combined to question 29 |
| When did you initially begin participating in the above sport/s? | Combined to question 29 |
| For how long and how often do you play the particular sport? | Combined to question 29 |
| SECTION G: Goals and challenges | Removed |
| What is your main reason/s for engaging in physical activity? | Reworded and is question 16 in Section C |
| What is your motivation for performing physical activity? | Removed |
| What do you hope to achieve from performing physical activity? | Removed |
| Do you believe that physical activity had a favourable or unfavourable influence to your health and life? | Removed |
| Please list some of the advantages and disadvantages that you have gained from doing physical activity. | Moved to Section C and is question 18. |
| | New section added, Section G: Monitoring Health |
| | Added question 30: Do you take recordings of your heart rate? Yes ☐ No ☐<br>If no, please skip to Question 31. |
| | Added question 31: Do you record your blood pressure? Yes ☐ No ☐<br>If no, please skip to Question 32.<br>If yes, when do you record you blood pressure? (Can tick more than one block)<br>Before exercise☐ After exercise☐ At any time☐<br>Other ☐(please specify) |
| | Added question 32: Is there anything else you wish to say? |

## Appendix VII: Changes from focus group questionnaire to pilot study recommendations

| Post focus group questions | Pilot group recommendations |
|---|---|
| Section A: Health and exercise | Section A: Demographics |
| Section B: Exercise history | Section B: Health and exercise |
| Section C: Current history | Section C: Exercise history |
| Section D: Household/ yard/ garden chores as exercise | Section D: Current activity |
| Section E: Unstructured Exercise | Section E: Household/ yard/ garden chores as exercise |
| Section F: Sports Events | Section F: Unstructured Exercise |
| Section G: Monitoring Health | Section G: Sports Events |
| | Section H: Monitoring Health |
| AGE: 18-20☐ 20-30☐ 30-40☐ 40-50☐ 50-60☐ >60☐ | AGE: 18-21☐ 21-31☐ 31-41☐ 41-51☐ 51-61☐ >60☐ |
| LANGUAGE GROUP: Urdu☐ Tamil☐ Gujrati☐ Punjabi☐ Telegu☐ Other☐ | LANGUAGE GROUP (Mother tongue): Urdu☐ Tamil☐ Gujrati☐ Punjabi☐ Telegu ☐ Other☐ |
| | Added: PRIMARY LANGUAGE USED: English☐ Urdu☐ Tamil☐ Gujrati ☐ Punjabi☐ Telegu☐ Other☐ |
| Do you perform any exercise? (Excluding household chores and occupational duties) Yes ☐ No ☐<br>If no, please skip to Question 17. | Do you perform any exercise? Yes ☐ No ☐<br>Moved to Section D, question 9. |
| What types of exercises did you perform? (Can tick more than one box) Jogging☐ Swimming☐ Cycling☐ Treadmill☐ Tennis☐ Walking☐ Yoga☐ Free-weights☐ Soccer☐ Cricket☐ Squash☐ Netball☐ Hockey☐ Rugby☐ Zumba☐ Aerobics☐ Pilates☐ Running☐ Machine-weighs☐ Stationary cycling☐ Other☐ | Combined into a table. Section C, question 5. |
| When did you perform the above exercises? (Can tick more than one box) Morning☐ Mid-day☐ Afternoon☐ Night☐ Anytime of the day☐ | Removed |
| What was the approximate duration for which you did exercise? ½ hour☐ 1 hour☐ 1.5 hours☐ 2 hours☐ 2.5 hours☐ 3 hours☐ Other☐ | In total what was the approximate duration for which you exercised per day?<br>Moved to Section C, question 6. |
| How often did you perform those exercises per day? (Can tick more than one box) 1 x day☐ 2 x day☐ 3 x day☐ every alternate day☐ everyday☐ Other☐ | Removed |
| How often did you perform those exercises per week? (Can tick more than one box) Once a week☐ Twice a week☐ Entire week ☐ Other☐ | In total how often did you perform those exercises per week?<br>Moved to Section C, question 7. |

| | |
|---|---|
| | Added Section D: Current activity |
| | Added: What types of exercises do you perform? (Can tick more than one box)<br>Jogging☐ Swimming☐ Cycling☐ Treadmill☐ Walking☐ Yoga☐ Free weights☐ Tennis☐ Soccer☐ Cricket☐ Squash☐ Netball☐ Hockey☐ Rugby☐ Zumba☐ Aerobics☐ Pilates☐ Running☐ Machine-weights☐ Stationary cycling☐ Other☐ |
| | Added: When do you perform the above exercises? (Can tick more than one box)<br>Morning☐ Mid-day☐ Afternoon☐ Night☐ Anytime of the day☐ |
| | Added: In total what is the approximate duration for which you do exercise?<br>½ hour☐ 1 hour☐ 1.5 hours☐ 2 hours☐ 2.5 hours☐ 3 hours☐ Other☐ |
| | Added: In total how often do you perform these exercises per day?<br>1 x day☐ 2 x day☐ 3 x day☐ every alternate day☐ everyday☐ Other☐ |
| | Added: In total how often do you perform these exercises per week?<br>Once a week☐ Twice a week☐ Entire week☐ Other☐ |
| | Added: How long does it take you to recover after exercise?<br>15 minutes☐ 30 minutes☐ 1 hour☐ >1hour☐ Other☐ |
| | Added: Does the post-exercise recovery time impact on your willingness to be consistent with exercise? Yes ☐ No ☐<br>If yes, please specify how |
| | How do you prefer to exercise? Alone☐ In a group☐<br>Please provide a reason for your answer. |
| | Does the continuously changing knowledge and trends on exercise guidelines impact on the way you exercise? Yes ☐ No ☐<br>If yes, please specify how |
| Have you changed the type of exercise you do? Yes ☐ No ☐<br>If no, please skip to Question 14.<br>If yes, please specify: | Reworded to: If you have stopped any of the exercises, please tick the appropriate box. Combined into a table. Moved to Section C, question 5. |
| Why have you changed the type and amount of exercise you do? | Reworded to: Why did you stop performing these exercises? Combined into a table. Moved to Section C, question 5. |
| | Added question: When did you stop performing these exercises? Combined into a table. Section C, question 5. |
| Have you changed the amount of exercise you do? If no, please skip to Question 16.<br>Yes☐ No☐ | Removed |

| | |
|---|---|
| If yes, please specify: | |
| Do you consider sports as physical activity? Yes☐ No☐ | Moved to Section D and is question 19. |
| What is your main reason/s for engaging in exercise? | Moved to Section D and is question 20. |
| Has anything prevented you from performing exercise? Yes ☐ No ☐<br>If no, please skip to Question 18.<br>If yes please specify. | Is anything currently preventing you from performing exercise? Yes ☐ No ☐<br>If yes, please specify.<br>Moved to Section D and is question 21. |

## Appendix VIII: Instructions and consent form for research assistants

### INSTRUCTIONS FOR RESEARCH ASSISTANTS

**Dear research assistant**

Welcome to my research study. As a research assistant you will be asked to accompany the researcher to the Durban North beach on two random Sundays of a month beginning from 7h00 till 18h00. However, if the research sample size has not been achieved, a third Sunday will be utilized. You are to be available for all three days. The study will be conducted on a normal weekend, excluding public and religious holidays and school vacations. On each of the research days, we will meet at North Beach outside Milky lane, where I will hand you the survey questionnaires, letters of information and informed consent and two ballot boxes.

The research procedure is as follows: Individuals passing the researcher/assistants will be requested to participate in the study. To make sure they are eligible to participate, the inclusion criteria is as follows: participants, male and females to be of Indian origin who are from South Africa and reside within the KwaZulu-Natal province and who are18 years of age and older. The exclusion criteria will be individuals of other race groups, individuals who have participated in the focus and pilot group studies and individuals who are on vacation in the study location.

Please approach potential participants with a friendly smile and greeting. Tell them that you are from the Durban University of Technology and that you are assisting in conducting a survey on exercise and would like to invite them to participate.

Once the individuals accept to participate, they will be given the letter of information which will also be explained to them. They will subsequently complete and sign the consent form. Please remember that participation is voluntary and participants can withdraw at any time with no consequences. Once this written form is obtained, you are required to collect it in a ballot box labelled “informed consent.” Thereafter the participants must be given the questionnaire to fill in. It is a self-administered questionnaire which requires the participant to fill in the necessary details. Should the participant require assistance with questions please guide them. The completed questionnaire should then be put in the ballot box labelled “questionnaires”. On the side of the above box, you will find a blocked table with the numbers 1-500. For each questionnaire collected, please tick off the relevant number, in numerical order. If you need to contact me at any point please call me on 082 6464 671.

Prior to conducting these surveys, I request that we get together to form a mock interview in order to ensure that we all conduct the interviews correctly. I will notify you of the date and time for the mock interviews.

**CONSENT**

**Statement of Agreement to Assist in the Research Study:**

- I ----------hereby confirm that I have been informed by the researcher, _____ (name of researcher), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,
- I have also received, read and understood the above written information (Instructions for research assistants) regarding the study.
- I am fully aware of the contents mentioned in the instructions given to me and hereby agree to abide by them.
- In view of the requirements of research, I agree that the data collected during this study will be strictly confidential.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to assist in the study.

| _____ | _____ | _____ | _____ |
|---|---|---|---|
| **Full Name of Research Assistant** | **Date** | **Time** | **Signature** |

I, _____ (name of researcher) herewith confirm that the above assistant has been fully informed about the nature, conduct and risks of the above study.

| _____ | _____ | _____ |
|---|---|---|
| **Full Name of Researcher** | **Date** | **Signature** |
| _____ | _____ | _____ |
| **Full Name of Witness** | **Date** | **Signature** |
| _____ | _____ | _____ |

## APPENDIX IX: Letter of information and consent form for study participants

**LETTER OF INFORMATION**

**Dear Sir, Madam, I am conducting research to find out the patterns of exercise participation by South African Indians residing in KwaZulu-Natal. I will appreciate it if you will help me do this.**

**Title of the Research Study:**

Profiles of exercise participation by South African Indians residing in KwaZulu-Natal, South Africa.

**Principal Investigator/s/researcher:** Nusrat Kader (M.Tech Chiropractic)

**Co-Investigator/s/supervisor/s:** Professor T. Puckree (PhD) and Dr F. Haffejee (PhD)

**Brief Introduction and Purpose of the Study:**

Physical activity may play a role in the prevention of many diseases which may be prevented by regular exercise. We need to determine the types, frequency and reasons for exercise in the Indian community.

**Outline of the Procedures:**

A total of 384 participants will be recruited for this study. After signing an informed consent form, you will be asked to complete a questionnaire on exercise. This should take approximately 15 minutes of your time. Please answer all the questions. The researcher/assistants will be present if assistance is required. All questionnaires will be anonymous and no personal identifying information will be collected.

**Risks or Discomforts to the Participant:**

There is no risk or discomfort associated with participating in this research.

**Benefits:**

The researcher will benefit by obtaining a Master's degree. The community will benefit because results of the research will be made available in a scientific journal at the Durban University of Technology.

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

Participants are free to withdraw from the study at any time should you wish to do so without any consequence.

**Remuneration:**

Participation is voluntary and there are no payments associated with participation.

**Costs of the Study:**

There are no costs associated with participation in this study.

**Confidentiality:**

Privacy, anonymity and confidentiality will be ensured. The signed, informed consent forms will be collected separately from the survey questionnaire. No names or personal identifying information will be on the survey questionnaire. No reference will be made to specific individuals throughout the study.

**Research-related Injury:**

There will be no research related injury.

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

Miss N. Kader (031 271 3303), Dr F. Haffejee (031 262 1433), Professor Puckree (031 373 2704)

Institutional Research Ethics administrator on 031 373 2900. Complaints can be reported to the DVC: TIP, Prof F. Otieno on 031 373 2382 or dvctip@dut.ac.za.

**CONSENT**

**Statement of Agreement to Participate in the Research Study:**

- I ----------hereby confirm that I have been informed by the researcher, Nusrat Kader(name of researcher), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: 61/15,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

| _____ | _____ | _____ | _____ |
|---|---|---|---|
| **Full Name of Participant** | **Date** | **Time** | **Signature / Right thumbprint** |

I, _____ (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

| _____ | _____ | _____ |
|---|---|---|
| **Full Name of Researcher** | **Date** | **Signature** |
| _____ | _____ | _____ |
| **Full Name of Witness (If applicable)** | **Date** | **Signature** |
| _____ | _____ | _____ |
| **Full Name of Legal Guardian (If applicable)** | **Date** | **Signature** |