THE HEALTH AND FITNESS PROFILES OF SPORT STUDIES STUDENTS AT A TERTIARY INSTITUTION IN SOUTH AFRICA

By

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A thesis submitted in fulfilment of the requirements for the degree of Masters in Sport Science in the College of Health Sciences at the University of KwaZulu-Natal

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Year: **2014**

DECLARATION

I declare that "**The Health and Fitness Profiles of Sport Studies Students at a Tertiary Institution in South Africa**" is my own work, that it has not been submitted, in whole or in part, for any degree or examination at any other university, and that all sources I have used or quoted have been indicated and acknowledged by means of complete references.

Gregory Glossop

Signature: _____ November 2014

Witness

Name: _____

Signature: _____

DEDICATION

To my Wife, and Daughter, thank you for the love and joy you bring into my life.

“Family is not an important thing. It’s everything.”

Michael J. Fox

ACKNOWLEDGEMENTS

It is important that I take the opportunity to thank those individuals and institutions that have assisted me and guided me in completing this study.

Dr. Rowena Naidoo from the **Department of Biokinetics, Exercise and Leisure Sciences at the University of KwaZulu-Natal.** Your guidance, kindness, friendship and perseverance have been greatly appreciated.

To all the participants who willingly participated in the study, your efforts are much appreciated.

To the Durban University of Technology, many thanks for granting me permission to conduct research at your Institution.

To the staff in the Department of Sport Studies and students who assisted and encouraged me throughout the process and in the testing.

Finally, to my Dad, Mom, Sister and Brother who have given support, love and lots of encouragement.

Abstract

Introduction

The first time most adolescents start to take care of themselves with limited parental support is when they attend university. The watchful guidance of parental support typically wanes and students start to change their habits to suit their lifestyle. This study therefore presents data and related analysis of health and fitness profiles of a selected cohort of students.

Aim of the Study:

The aim of this study was to determine the health and fitness profiles of Sports Studies students at a tertiary institution in KwaZulu-Natal, South Africa.

Methodology:

The study was a cross-sectional design of undergraduate students. Three separate year groups (first year, second year and third year) were recruited. A purposive sample of first, (n=70) second (n=90) and third (n=90) year Sport Studies students completed a health questionnaire and a range of physical fitness tests. Descriptive and inferential techniques including the use of correlations and chi square test values were used to analyse data.

Results:

The sample consisted of 165 students with a mean age of 21.48 years (SD±2.48). First year's (n = 41) comprised 24.85% of the sample, while second year's (n = 62) 37.58% and third year's (n = 62) 37.58%. The sample comprised of 116 males (70.3%) and 49 females (29.7%). According to South African racial classifications the

sample consisted of 86.1% of the students who self-identified as Black African, 7.9% Indian, 3.6% Coloured and 2.4% White. The cohort's mean BMI was 24.09 kg/m², with a general increase from first year (22.65 kg/m²) to second year (24.24 kg/m²) and to third year (24.87 kg/m²). Similarly, there was a mean increase in body weight of 4.09kgs between first and second year, and a mean increase of 3.81kgs from second to third year. In total, there was a mean body weight increase of 7.9kgs from first to third year.

The mean body fat was 13.32% for the cohort with first year females at 23.87% and first year males 6.44%. In total, 31.5% males and 4.8% females were overweight or obese. Only 1.8% of the total sample was underweight.

There was a mean increase in relative VO_2max in the study cohort (1^{st} years 31.86 $ml.kg^{-1}.min^{-1}$, 2^{nd} years 33.47 $ml.kg^{-1}.min^{-1}$ and 3^{rd} years 34.42 $ml.kg^{-1}.min^{-1}$). The mean VO_2max for the entire sample was 33.43 $ml.kg^{-1}.min^{-1}$ with male students averaging 36.48 $ml.kg^{-1}.min^{-1}$ and female students 26.1 $ml.kg^{-1}.min^{-1}$.

It was reported 78.2% of the sample exercised on a regular basis, with 72.9% being male.

Conclusions:

Overall results showed that throughout the three years of study, weight and body fat percentage of students increased progressively along with body mass index, waist circumference and waist-to-hip ratios. Such increases are of utmost concern and may be directly associated with low physical activity levels and poor dietary habits.

A decrease in physical activity, frequency and participation may be the cause of the reported decrease in physical fitness levels. This area of concern may be a major factor related to the general increase in selected anthropometric measurements.

Also prevalent was the variance in results between males and females, with males accounting for 72.9% of regular exercisers. The discrepancy in gender and physical activity and fitness levels is of concern.

Key Word: Health, fitness, students, university, profiles

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CHAPTER ONE

1.1 Introduction

Between 1976 and 2004 overweight and obesity increased internationally, with the number of overweight children aged 6-11 years tripling from 6% to 18%, with the proportion of overweight adults aged 20-74 years increasing from 47% to 66% (Centre for Disease Control and Prevention, National Centre for Health Statistics, 2006).

Olusanya and Omotayo (2011) defines obesity as an abnormal accumulation of fat in the adipose tissue throughout the body. Obesity rose from 11.5% in 1986 to 18% in 2004 in participants aged 25–64 years in Northern Sweden. It was further identified that the weight gain and body mass index (BMI) increase was the highest in the younger age categories, raising concern as to the impact on future health status (Lilja, Eliasson, Stegmayr, Olsson and Söderberg, 2008).

Male BMI and waistline circumferences have increased in Catalonia, Spain, in ten-year trends, whilst females only have larger waistlines. Furthermore, male BMI levels have overtaken those of females (García-Álvarez, Serra-Majem, Ribas-Barba, Castell, Foz, Uauy, Plasencia and Salleras, 2007). Additionally, the prevalence of abdominal obesity and overweight has risen in both men and women in England between 1993 and 2008 (Howel, 2012).

Puoane, Fourie, Shapiro, Rosling, Tshaka and Oelefse (2005) identified the four major race groups in South Africa and stated that despite limitations in previous research, such as geographical and urban versus rural variables, it was possible to estimate the current prevalence of obesity (BMI>30). Obesity among Black women ranged from 31-34%, White women, 18-24%, Indian women, 20-22% and Coloured women, 26-28%. Furthermore 8% of Black men, 3-9% of Indian men and 6-9% among Coloured men, were obese. The highest prevalence of obesity was presented amongst White males, at 15-20%.

Similarly, the demographic health survey conducted by the Department of Health (2003) found 54.9% of adult women to be overweight or obese, and 29.8% of adult men as overweight or obese. In KwaZulu-Natal, South Africa, a study of 328 Black women found a mean BMI of 37, with over 90% of participants being overweight or obese (Devanathan, Esterhuizen and Govender, 2013).

Being overweight and obese is also prevalent amongst adolescents. A study conducted on the overweight and obesity rates of South African adolescents showed that being overweight amongst boys increased from 6.3% in 2002 to 11% in 2008, and in adolescent girls being overweight increased from 24,3% to 29%. The rate of obesity increased from 1.6% to 3.3% in boys and from 5% to 7.5% in girls during the same period (Reddy, Resnicow, James, Funani, Kambaran, Omardien, Masuku, Sewpaul, Vaughn & Mbewu, 2012).

Studies on students' physical activity levels have been reported. In Australia a study reported that 47% of university female students and 32% of male students were insufficiently active (DeVahl, King and Williamson, 2005).

Keating, Guan, Castro-Piñero and Bridges (2005) also reported that more than 40% of students were physically inactive in the United States of America. Similarly, a South African study conducted by Bloemhoff (2010) at the University of Free State (Bloemfontein) reported that 33% of students were also inactive.

Preventative measures and habits formed as young adults may have an impact on health care delivery in the 21st century. It was reported that students represent the future consumers of health care services (Simpson, Brehm, Rasmussan, Ramsay and Probst, 2002). Sport Management students are not merely future consumers, but also future service providers. Therefore it is imperative that their health and fitness levels 'should' be of a desirable standard, however there is limited literature on the physical fitness levels of students at tertiary institutions in South Africa.

1.2 Problem Statement

The literature indicates that students are becoming more and more sedentary and participating in fewer sports and physical activities in general. This is leading to lifestyle diseases and poor health and fitness results. Haskell, Lee, Pate, Powell, Blair, Franklin and Bauman (2007) reported that approximately 50% of students failed to meet the American College of Sports Medicine (ACSM) and American

Heart Association (AHA) recommendations for vigorous physical activity of 150 minutes of cardio respiratory exercise, and two to three days of resistance exercise on all major muscle groups (American College of Sports Medicine, 2011).

1.3 Aim of the study

The aim of this study was to provide insights into the health and fitness profiles of students studying towards a tertiary qualification in Sport Management at a South African University.

The objectives of the study were to:

- Determine the health profile of students at a tertiary institution.
- Identify areas of concern relating to the health and lifestyle of students at a tertiary institution.
- Assess the physical fitness levels of students at a tertiary institution.
- Identify areas of concern relating to physical fitness of the students at a tertiary institution.

1.4 Hypotheses

1.4.1 Hypothesis

There will be a relationship between students who study towards a qualification in Sport Management and their overall health and fitness profile.

1.4.2 Null Hypothesis

There will be no relationship between students who study towards a qualification in Sport Management and their overall health and fitness profile.

1.5 Significance

Results from this study will assist in filling the gap in the literature regarding the health and fitness levels of students at a tertiary institution in South Africa. This profiling will enable the department and the institution to develop intervention programmes that can assist students with improving as well as promoting healthy habits and physical activity.

1.6 Definitions of Terms

In this section, definitions of terms used in this study will be clarified as interpreted in this study.

Agility: The ability to change the body's position, and requires a combination of balance, coordination, speed, reflexes, and strength.

Balance: The ability to stay upright or stay in control of body movement.

Battery: A series of tests or test items.

Blood pressure: The force exerted upon the walls of the blood vessels by the blood.

Body Composition: Concerns the percentages of muscle, fat and body tissues.

Cardiovascular: Of or pertaining to or involving the heart and blood vessels.

Chronic diseases: Diseases such as coronary artery disease, diabetes and hypertension occurring for a long duration or recurring frequently.

Coronary Artery Disease: A disorder in which the cardiac muscle receives an inadequate amount of blood due to a disruption of its blood supply.

Diabetes: A disease resulting from insulin deficiency in which there is an excessive amount of glucose in the blood.

Exercise: Performance of physical exertion for improvement of health or correction of physical deformity.

Explosive Power: The ability to gather maximum strength in a very short period of time.

Fitness tests: Measures used to determine an individual's ability to perform specific activities involving the muscles and systems of the body.

Flexibility: The ability of a joint or a series of joints to move through a pain-free range of motion.

Hypertension: Also referred to as high blood pressure. A pathology that results in higher resting blood pressure due to genetic or lifestyle inefficiencies.

Intervention: A set of activities designed to change the nutrition and physical activity behaviour of learners.

Mean: The arithmetic average of a set of scores.

Muscular Endurance: The ability of a muscle or group of muscles to sustain repeated contractions against a resistance for an extended period of time.

Muscular strength: The ability of a muscle to exert a maximal or near maximal force against an object.

Non-communicable Disease: A non-communicable disease is a disease which is not infectious. Such diseases may result from genetic or lifestyle factors. e.g. hypertension, diabetes, asthma.

Nutrition: The intake of food, considered in relation to the body's dietary needs.

Obesity: The condition of being extremely overweight.

Overweight: An individual's body composition with more body fat than is optimally healthy.

Physical activity: Is any task/movement that causes the body to work harder than normal.

Physical fitness: The body's ability to function efficiently and effectively, using muscular strength, muscular endurance, cardiovascular endurance, power and flexibility.

Reliability: The degree to which a measure is consistent and unchanged over a period of time.

Sample: Any subgroup of a population.

Sedentary: Tending to spend to spend much time seated; somewhat inactive.

Speed: Is the ability to move quickly across the ground or move limbs rapidly.

Strength: The ability to exert a force against a resistance.

Validity: The degree to which interpretations of test scores lead to correct conclusion.

1.7 Abbreviations

In this section, abbreviations of terms used in this study will be clarified

ACSM	American College of Sports Medicine
AHA	American Heart Association
BMI	Body mass index
CDC	Centre for Disease Control
cm	Centimetres
DoH	Department of Health
kg	Kilograms
min	Minutes
n	Sample size
WHO	World Health Organisation
KZN	KwaZulu-Natal
VO_2Max	Maximal oxygen uptake

CHAPTER TWO

2. Review of Related Literature

This chapter will present literature related to health and fitness, specifically related to the university student. The chapter is divided into six sections, namely:

SECTION A: Obesity

SECTION B: Exercise and Sport Participation

SECTION C: Dietary Habits

SECTION D: Sleeping Habits

SECTION E: Smoking Habits

SECTION F: Alcohol Consumption

Each section reviews literature internationally as well as from South Africa.

SECTION A

2.1 Obesity

The World Health Organisation (WHO) defines overweight or obesity as an excess accumulation of body fat that may impair an individual's health (World Health Organisation, 2006). A calculation of Body Mass Index (BMI) is a simple method of measuring obesity. This method uses an equation taking into account height and weight to calculate the effect. A BMI of greater than or equal to 25 is classified as overweight and a BMI of greater than or equal to 30 is considered obese (World Health Organisation, 2006).

The WHO estimates that globally from 2008 obesity was the fifth leading risk for death (World Health Organisation, 2011). The 2008 global report stated that more than 1, 4 billion adults aged 20 and older were overweight, with over 200 million and 300 million men and women respectively to have been obese. This equated to more than 10% of the world's population being obese. Stovitz and Batt (2010) stated that there are currently over one billion adults globally with a BMI over 25. To stress that obesity is a global problem, the WHO has coined the term 'globesity' (World Health Organisation, 2011).

The 2006 Nationwide United States Behavioral Risk Factor Surveillance System found that the prevalence of overweight and obesity in 18-24 year-olds was 42.7% (Centre for Disease Control, 2006). According to the National Health and Nutrition Examination Surveys (NHANES) 2003–2004, nearly two-thirds of adults living in

the United States are overweight or obese (Ogden, Carroll, Curtin, McDowell, Tabak and Flegal, 2006).

According to Dawson et al. (2007), university-aged Canadian students (n=638) (University of Southern Ontario) are at high risk of making unhealthy lifestyle choices that could affect their health and wellbeing. Male students reported drinking alcohol 2-4 days per week (34.5%), with 46.3% of male students consuming more than seven drinks per session. Males (70.7%) reported being more involved in sexual activities than females (60%). The prevalence of overweight freshman students ranged from 15% to 26% (Butler, Black, Blue, et al., 2004), with 35% of all college students exceeding the overweight criterion of a body mass index (BMI) >= 25 kg/m^2 (Lowry, Wechsler, Galuska, Fulton, and Kann, 2002).

2.1.1 International student obesity

'Leaving the nest' for most people is inevitable. Adolescents leave home for a number of reasons: to seek higher education, to undertake military service, to seek employment, or for marriage (Edwards, Meiselman, 2003). These milestones can have a profound effect, and it has long been suggested that they have the greatest influence on the stability of food habits (Lewin, 1943). In Saudi Arabia it was found that 30.6% of the 222 female medical and nursing college students who participated in the study were either overweight or obese (Rasheed, Abou-Hozaifa & Khan, 1994). Also in Saudi Arabia, Al-Rethaiaa, Fahmy and Al-Shwaiyat (2010)

examined the obesity levels of male university students and found 21.8% of the sample overweight and 15.7% obese. Similarly, a study conducted in the Lebanon showed the prevalence of overweight and obesity in male college students to be 37.5% and 12.5% respectively (Yahia, El-Ghazale, Achkar and Rizk, 2011). In a similar study conducted at a Kuwait University involving 842 participants, similar corresponding results were noted of 32% and 8.9% with grade I and II obesity, respectively (Al-Isa, 1999).

Cash and Pruzinsky (2004) define body image as a person's perception and attitude regarding his or her physical appearance. At Cornell University, New York, United States of America, 68 freshmen participants gained an average of 4.2 pounds (1.9kg) during their first 12 weeks on campus, with the mean BMI increasing from 20.8 to 21.5 (Levitsky, Halbmaier and Mrdjenovic, 2004).

"The Freshman 15 - A Closer Look" determined selected anthropometrical measurements of freshmen students (Simmons, Connell, Ulrich, Skinner, Balasubramanian and Gropper, 2011). All the students in the study were permanent residents within the United States. The test period was for an academic year. Of the 214 students tested, there was a mean weight gain of 2.6 lbs (1.18kg); more than half (65.9%) of the students gained weight. The average weight gain of this group was 6.0lbs (2.72kg). These results show that the increase in obesity of freshmen (male and female) is increasing at a significant level ($p<0.0001$ and $p<0.0065$, respectively). Furthermore, the effect of body image and body

satisfaction among the freshmen was found as a common area of dissatisfaction for both males and females who gained weight. The increase in BMI can ultimately change a person's perception of their body image, which can also lead to numerous disorders including bulimia, anorexia nervosa and depression (Eisneberg, Neumark-Sztainer and Lust, 2005).

Kasparek, Gilmore-Corwin, Valois, Sargent and Morris (2008) purport that the average weight gain of an American adult is 0.8 pounds (0.36kg) per year, fueling the modern obesity epidemic. Kasparek et al. (2008) further examined the effects that physical activity, fruit and vegetable intake and alcohol use had on weight change in freshmen over a six-month period. It was found that 57% of the freshmen gained weight over the six-month period and of the 57%, the average gain was 7.1 lbs (3.22kg). The entire sample (n=193), including those who lost weight and those who had no change in weight, had an average increase of 2,5lbs (1.13kg). In the same study, when students were separated into those with desirable BMI scores (BMI <25) and those who were overweight (BMI>= 25), 77% of students had an initial desirable BMI. Students in the desirable BMI group had an average weight gain of 6,21lbs (2.82kg), whilst those in the overweight category had an increase of 10,96lbs (4.97kg) (Kasparek et al., 2008).

At the University of Wisconsin-Stevens Point in the United States, research determining the health and fitness changes of students over a fifteen-year period found that the percentage of males classified as being overweight or obese

increased from 24% and 7.4% in 2005-06 to 27.4% and 10.6% in 2010-11, respectively. Results for the women showed that overweight and obesity increased from 30.2% to 30.7% and 10.4% to 14.0%, respectively (Wetter, Wetter & Schoonaert, 2013).

2.1.2 South African Student Obesity

“South Africa has not been spared in the rampant global increase in obesity.” (van der Merwe and Pepper, 2006). Morar, Seedat, Naidoo and Desai (1998) reported a prevalence of overweight and obesity of 24.3% for black medical students at the former University of Natal, KwaZulu-Natal. It was concluded from this study of 154 medical students that there needs to be emphasis placed on the prevention of risk factors which lead to coronary heart disease at an early age.

Research at the University of Limpopo identified 24.0% of black students being overweight. The relationship between BMI and self-concept found overweight participants did have a lower self-esteem, which was coupled with feelings of frustration (Bodiba, 2008).

An examination into the dietary intake, weight status and nutrition knowledge of young black South African women indicated the prevalence of overweight or obesity amongst first-year female students as 25% at the University of Limpopo (Turfloop Campus). It was concluded that the prevalence of overweight females was high in urban (22.7%) and rural (22.9%) women, and the waist to hip ratio was

significantly greater in rural women (0.76) compared with urban women (0.73) (Steyn, Senekal, Brtis and Nel 2000).

Hattingh, Walsh, Veldman, Bester and Oguntibeju (2008) asserted that 53.3% of black woman aged 25–34yrs in Mangaung, Free State, were overweight or obese. This study profiled anthropometric and biochemical information from a sample of 500 randomly selected participants. Participants' BMI, waist to hip ratios, and body fat tests were performed, as well as triglycerides, cholesterol, glucose and insulin sensitivity. It was concluded that the prevalence of overweight and obesity in this population may pose an increased risk of chronic lifestyle diseases.

A four-year follow-up study on female students at the Stellenbosch University utilised a self-help, weight management manual. Results showed the prevalence of overweight or obesity as 24.7% in black first-year students. Additionally, it was found that the experimental group who received the manual and utilised it had a lower weight gain (Cilliers, 2004).

On a positive note, a study conducted on female students at the Stellenbosch University in South Africa, showed an average BMI of 21.7kg/m² (Van Niekerk & Barnard, 2011). This is within the recommended range for BMI. The study further reported that over three years students performed regular exercise at the rate of 80%, 95% and 90% respectively, for each year of study.

Peltzer and Pengpid (2012) examined the BMI of both female and male students at the University of Limpopo in South Africa. Results showed that female students (30.5%) as well as male students (8.7%) were overweight or obese. Both female (62.5%) and male (61.1%) students, however, perceived their weight to be normal. Furthermore, it was found that 15.2% of the men and 9.6% of the women were underweight.

Nursing students at the University of Fort Hare (Eastern Cape) were categorised as 31.7% being overweight, according to the BMI classification, and 15% being obese. Females were found to be more overweight and obese (36.4% and 21.8% respectively) than males (21.6% and 9.8%, respectively). It was concluded that 49.7% of the students were overweight and obese. Waist circumference and waist to hip ratio (38.5% and 37.3% of the participants) respectively, were at substantial risk for non-communicable diseases (Van den Berg, Okeyo, Dannhauser and Nel, 2012).

In conclusion, obesity is clearly a worldwide concern and the majority of research shows trends towards increasing BMI levels. Trends both internationally and locally presented very similar results among university students.

SECTION B

2.2 Exercise and Sport Participation

In 1995 the American College of Sports Medicine (ACSM) and the Centre for Disease Control (CDC) recommended that, “Every adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week.” In 2011, the ACSM released new recommendations regarding the duration and mode of exercise that adults should participate in:

- People should engage in 150 minutes of moderate intensity cardiorespiratory exercise per week, either by working out five days each week at a moderate level of intensity or engaging in less frequent, more intense workouts.

- Each major muscle group should be trained two or three days per week. During resistance training, doing a lower number of repetitions, between 8 and 15, improves strength and power, whereas doing 15 to 20 repetitions improves muscular endurance.

- The ACSM recommends stretching several times each week to improve range of motion as well as doing 20 to 30 minutes of neuromotor exercises, which should include balancing and coordination exercises in addition to multifaceted activities, such as tai chi and yoga, two or three days per week (American College of Sports Medicine, 2013, p. 133-173).

Having been reviewed, the exercise guidelines need to be strictly adhered to, in order to ensure optimal health. The university student population is at high risk of non-communicable diseases should they choose not to follow the recommendations as set out by the ACSM (Lippincott, Williams & Wilkins 2013).

2.2.1 International student Exercise and Sport Participation Habits

At the University of Oklahoma, United States of America, Behrens and Dinger (2003) reported no differences in gender and exercise participation among the 31 participants wearing pedometers to measure ambulatory activity levels. There was a decrease in activity levels on weekend, however, compared with activity levels from Monday to Friday.

Canadian undergraduates at the University of Alberta (n=146), showed a decline in vigorous physical activity from 66.2% to 44.1% respectively in the transition from high school to college. Only 11% became active once at university (Bray and Born 2004). Levitsky, Halbmaier & Mrdjenovic (2004) studied the weight gain of freshmen students over a twelve week period. The average weight gain of 1.9±2.4kg was highly significant ($p<0.01$) among the 68 freshmen at Cornell University (New York, United States).

According to Buckworth and Nigg (2004), students spent almost 30 hours in a typical week engaged in sedentary behaviours, mostly studying. Male students spent more hours per week watching television, however they also reported higher levels of exercise when compared with women. Nelson, Gortmaker, Subramnian,

Cheung and Wechsler (2007) found that among United States college students (n=24 613), both males and females watched television for an average of two hours per day, with African-American students averaging just below three hours. Greater hours of television watching were positively associated with overweight among males (AOR 1.14, 95% CI 1.11 – 1.18) and females (AOR 1.16, 95% CI 1.12 – 1.20).

The findings of a questionnaire by Miller, Staten, Rayens and Noland (2005) suggested that of the 903 undergraduates females (n=551) participate in moderate activity more than males (n=352) (p=0.04), whereas males participated more in vigorous activity (p=0.005). Furthermore, it was found that younger students were more likely to participate in moderate activities. (p=0.003).

Reed and Phillips (2005) identified that the intensity and duration of physical activity increased as the proximity to exercise facilities increased. Participants (n=411) reported that 66.7% engaged in physical activity less than two-thirds of a mile (1.61 kilometers) from where they lived.

Research by Kasparek et al. (2008) examined the effect that a physical activity programme had on freshman students' weight changes over a six-month period. Over this period 57% of the participants reported weight gain, with an average gain of 7.1 lbs (3.22kg). The respondents' physical activities were reported as 18.1% having a low activity level, 56% at a moderate level and 24.9% at a high frequency

activity level on entering college. After the six-month period the results fell within a similar range, 20.2%, 48.2% and 31.6% respectively. It was concluded that students were more likely to stay in the physical activity range with which they entered university than to change to another level.

Boyle and LaRose (2008) assessed the needs of the campus community for nutrition and physical activity resources at the State University of New York at Brockport. The respondents surveyed (n=169) showed 40% to be overweight or obese, however, 51% of these students viewed themselves as overweight or obese.

Shang-Min, Yue, Shang-Chun and Tzi-Li (2012) identified the relationship between sedentary and active leisure participation in college students (n=1200) from four Midwestern states in the United States. They found that of the 1134 population, 14% participated in strength sport, 42% in recreational sport, 30% in a team sport and 15% did not participate in sport. Additionally, passive leisure pursuits such as watching TV, videos and DVDs during the week were also recorded, with 20% of the sample spending less than one hour per day on those activities and 80% spending at least one hour per day.

2.2.2 South African Student Exercise and Sport Participation Habits

Bloemhoff and Coetzee (2007) identified that 54.2% of the 410 respondents experienced barriers to participation in physical activities in grade 12, whereas of the 281 third year students (University of Free State) it was shown that 69.4% experienced barriers to physical activity. Study responsibilities, time constraint and the lack of motivation were the major barriers identified in sequential order.

Research by Bloemhoff (2010) examined the physical activities of third year students (n=405) at a South African university (University of Free State) using the International Physical Activity Questionnaire (IPAQ). Results identified that 33% of students were inactive. Males were significantly ($p<0.01$) more physically active than females and this difference becomes more evident with vigorous exercise.

It is evident that the student population is failing to meet the recommendations of the ACSM in terms of exercise requirements. Studies have shown the negative and potentially dangerous results of increasing obesity levels. Both local and international studies have identified a general decrease in exercise participation amongst university students. One of the greatest barriers identified was excessive television watching.

SECTION C

2.3 Dietary Habits

According to Healthy People 2010 (United States Department of Health and Human Services, 2000), dietary intake plays a key role in four out of ten leading causes of death in the United States of America. In addition, diet contributes to a variety of health problems such as obesity, hypertension and osteoporosis (United States Department of Health and Human Services, 2000).

One of the major causes of obesity is a change in diet in terms of quantity and quality, which has become more “Westernized” (Gasbarrini and Piscaglia, 2005). Additionally, studies conducted by the WHO (2000) found that obesity is generally more common in women than in men (World Health Organisation, 2000). Furthermore, Patrick and Nicklas (2005) believed that students moving into their college years are living away from home generally for the first time and are faced with many different food choices, which often results in poor eating habits.

2.3.1 International Student Dietary Habits

Undergraduate Students from the University of Athens (Greece) (n=80) and University of Glasglow (Scotland) (n=80) completed a food frequency questionnaire, which examined the habitual meal and snacking patterns. It was found that 26% of students never consumed breakfast, however no correlation between BMI and snacking was found (Spanos and Hankey, 2010). Al-Rethaiaa, Fahmy and Al-Shwaiyat (2010) studied the eating habits of male students (n=357)

in the Kingdom of Saudi Arabia. The findings showed that 63% of the students engaged in irregular meal consumption, with 55.7% only eating two meals a day. Additionally, 32.2% of students rarely ate fruit while 36.1% reported rarely eating vegetables.

2.3.2 South African Student Dietary Habits

Lubbe (1973) and Labadarios et al. (2005) showed that in the Gauteng urban areas there was an increase in mean fat intake from 17% in 1962 to 25.8% in 1999, whilst mean carbohydrate intake decreased from 72% to 60.3%. The South African National Burden of Disease estimated that non-communicable disease, together with high BMI readings, were responsible for 37% of all deaths (Bradshaw, Groenewald, Laubscher, Nannan, Nojilana, Norman and Timæus, 2003).

In a 2012 study on the eating practices of university undergraduate nursing students (n=161) (University of Fort Hare, Eastern Cape), it was reported that 97.5% of the respondents ate less than three servings of vegetables daily and 42.2% ate less than the recommended two fruits per day. It was also reported that 23.6% ate fewer than three meals per day; all of them indicated that lunch was the meal that they most frequently skipped. Most students consumed margarine, oil or fat (68.3%), sugar (59%) and bread (55%) daily. More than four servings of sugar and sweets per day were eaten by 78.3% of the nursing students (Van den Berg et al., 2012).

Overall, it is clear that food choice is an area of concern amongst students selecting the wrong types of foods. Secondly, irregular meal consumption is common among students at university. South Africans are highly exposed to fast foods through the formal (commercial franchises) and informal (street vendors) sectors (Feeley, Musenge, Pettifor and Norris, 2012).

SECTION D

2.4 Sleeping Habits

Sleep is considered to serve restorative functions for the nervous and other physiological systems, but the optimal duration of night sleep is not known. Traditionally eight hours of sleep per night is considered necessary to achieve the restorative functions (Akerstedt and Nilsson, 2003). Chaput, Despres, Bouchard and Tremblay (2011) and Hublin, Partinen, Koskenvuo, Silventoinen, Koskenvuo and Kaprio (2010) suggest seven to eight hours sleep each night as optimal. Ayas, White, Al-Delaimy, Manson, Stampfer, Speizer and Hu (2003) found increasing evidence that less than optimal sleep can be associated with numerous health problems, including obesity, coronary heart disease, type II diabetes and hypertension.

2.4.1 International Trends

Studies on the sleeping habits and patterns of students are limited. In 2001 Hicks, Fernandez and Pellegrini sampled 1585 students at the University of San Jose (California, United States of America) and found median sleep duration of 6.65 hours. Contrary to this, a study (n=313) in the United States of America reported the mean sleep duration of 7.2 hours during week days and 8.6 hours on weekends. Furthermore, students stated that sleep problems interfered with daily activities (Forquer, Camden, Gabriau and Johnson, 2008). Additionally, research at a Midwest University on sleep duration of college students (n=820) concluded that freshmen slept over twenty minutes longer than upper division students, with a

mean sleep duration of 7.43 hours, well within the recommended hours (Liguori, Schuna & Mozumdar, 2011).

Most studies have focused on the general population. In the United Kingdom, Groeger, Zijlstra and Duk (2004) identified that there was no decline in sleep duration for the preceding forty years. In a period of one week, however, 58% of participants experienced one night or more of sleep problems. Eighteen percent reported that their amount of sleep at night was insufficient.

The United States National poll taken in 2005 by the National Sleep Foundation found that the average number of participants who slept for eight hours or more per night dropped from 38% in 2001, to 26% in 2005. Similarly, in Australia the duration of sleep declined by 33 minutes and 28 minutes for boys and girls respectively between 1984 and 2004 (Dollman, Ridley, Olds and Lowe, 2007).

2.4.2 South African Trends

The South African population is socio-economically and ethnically diverse, which may influence sleep behaviour. Ethnicity is a major predictor of other health behaviours in South Africans, such as exercise, smoking, and diet (Peltzer, 2002). Further research by Peltzer (2012) found that 9.1% of older adults over the age of fifty in South Africa had some form of sleeping disorder. It was further identified that the average hours of sleep per night was 8.6 hours.

A study by Reid and Baker (2008) at the University of Witwatersrand (Johannesburg), found that the 986 students reported going to bed significantly later ($p<0.0001$) and woke up significantly later ($p<0.0001$) on weekends compared with during the week. Eighty-two percent of students reported moderate to very good sleep quality, with 52% feeling fairly or very sleepy within 30 minutes of awakening. It is well-documented that sufficient sleep is vitally important for optimal health and wellness. Poor lifestyle habits, smoking and alcohol are common causes of poor sleeping habits. It was identified that in the majority of studies there was a decline in the number of hours slept.

SECTION E

2.5 Smoking Habits

Illnesses related to smoking, such as lung cancer, emphysema, and chronic bronchitis kills more than 430,000 Americans annually, making smoking the nation's primary cause of preventable death (Fiore, 2000). Additionally, adults aged 18-24 years and 25-44 years have the highest prevalence of smoking (23.9% and 23.5%, respectively) in the United States of America (Rock, Malarcher, Kahende, Asman, Husten and Caraballo, 2007).

2.5.1 International Trends

A comparative study of 548 college students over a four year period by Wetter, Wetter and Schoonaert (2013) found that 87% of daily smokers and 50% of occasional smokers continued to smoke. A study by Halperin, Smith, Heiligenstein, Brown and Fleming (2009) of college students (n=2091) at five universities in the United States on cigarette smoking among students, reported that 41% of those questioned reported smoking less that one cigarette per day. At the University of Maryland in the United States, Caldeira, O'Grady, Garnier-Dykstra, Vincent, Pickworth and Arria (2012) identified that 3.4% of first year college students smoked daily, with signs of dependence showing in 4.1%. Research into smoking habits of 200 male medical students in Bangladesh identified 20% as smokers. Of the smokers, 32.5% smoked less than ten cigarettes per day, 30% smoked between ten and twenty cigarettes per day and 37.5% smoked more than twenty per day (Siddiqui, Sultana, Sharif and Ekram, 2011).

2.5.2 South African Trends

The Western Province of South Africa has the highest smoking rate, with nearly half of all adults smoking (Madu and Matla, 2003). This is attributed to the relatively high smoking prevalence among the Coloured population in the Province (Madu and Matla, 2003; Reddy, Meyer-Weitz and Yach, 1996). A study among students at the University of Limpopo (Polokwane) found that the odds of a student smoking increased if the student was male, was from a “single mother only” family, or has a parent that smokes (Phiri, Debusho, Lewgesse and Mashegoane, 2011). Furthermore, the number of students who smoked increased from their first year of study (19.2%) to their third and fourth year of study (97.4% and 96% respectively).

At the University of the Western Cape, however, 16% of the students reported to be smokers with a third of the smokers being female (Popovac, Mwaba and Roman, 2011). The authors further analysed the data in terms of race and deduced that Coloured students made up 76% of all the smokers, followed by African students (18%). Coloured females constituted the majority of smokers (58%), followed by Coloured males (18%) and African males (9%). African females comprised of 5.5% of all smokers.

It was evident that in South Africa there is a discrepancy in the smoking habits among the different race groups. The international research presented a slightly higher percentage of students who smoked compared with selected race groups in South Africa.

SECTION F

2.6 Alcohol Consumption

2.6.1 International Trends

Of a sample of 58,453 students from 125 colleges in the United States, Leichliter, Meilman, Presley and Cashin (1998) identified that ten percent of students drink fifteen or more alcoholic drinks per week. Furthermore, it was identified that 13% of the participants reported drinking alcohol, and 25% exceeded the current recommendations of the Dietary Guidelines of Americans (DGA).

In a study conducted by Edwards and Meiselman (2003), it was noted that students who were always short of money would assume alcohol and entertainment to be a higher priority than academic books and food. The results of the study identified an increase in the consumption of alcohol in males, however this increase was not significant. In females, a decrease in alcohol consumption early in the year was noted, with a slight increase later in the year. None of these changes were found to be significant.

It was noted that although the population of freshmen students (Winthrop University, United States of America) could not legally drink alcohol, 77% of underage students reported drinking alcohol. Kasparek et al. (2008) also identified that 35.2% of respondents (n=193) had never consumed alcohol and after a six-month follow-up, 27.5% had still never consumed.

2.6.2 South African Trends

The WHO (2011) reported that the highest alcohol consumption levels are found in the developed world. Medium consumption levels were found in Southern Africa, with Namibia and South Africa having the highest levels. (WHO, 2011)

Amongst the South African youth, Whites had the highest rates of weekly drinking (32%), followed by Indian (26%) and African (23%) respondents; Coloureds had the lowest rates (19%) (Reddy et al., 2012). Of further interest, Visser and Routledge (2007) identified that 26% of South African adolescents reported current alcohol use, with 14% reporting excessive or binge drinking (more than five alcoholic drinks per occasion) in the previous 30-day period. Data from around the world suggests that substance use often starts between the ages of fourteen and fifteen years of age (Richter, Panday, Emmett, Makiwane, du Toit, Brooks and Mukhara, 2006).

Young and de Klerk (2009) studied the patterns of alcohol usage at Rhodes University (Eastern Cape). Results showed that 33.4% were hazardous drinkers, 7.8% harmful drinkers and 9.0% probably alcohol dependent. ‘Hazardous drinking’ is a pattern of alcohol consumption that increases the risk of harmful consequences for the user or others. ‘Harmful’ use refers to alcohol consumption that results in consequences to physical and mental health (Babor, Higgins-Biddle, Saunders and Monteiro, 2001).

Further research in Africa found a high prevalence of hazardous or harmful alcohol use among Malawian university students, being 54.1% among males and 16.5% among females (Zverev, 2008).

Positively, Van den Berg et al. (2012) reported that 73.9% of nursing students (n=161) did not use any alcohol, and less than one percent reported daily consumption. A recent study of South African undergraduate students identified that 32.2% among men and 8.5% among women were hazardous or harmful alcohol users (Pengpid, Peltzer, van der Heever and Skaal, 2013).

In conclusion, studies regarding health behaviour habits and patterns may have presented with conflicting results, specifically when comparing results both internationally and locally. Most of the results do, however, appear to support each other when similar tests were conducted. Obesity is a well-researched area with much literature on the topic, whereas studies on students' exercise participation and health behaviour habits and patterns is fairly limited.

CHAPTER THREE

3. Methodology

3.1 Research Design

The study was a cross-sectional design of students studying at a tertiary institution.

3.2 Population and Sample

Registered, undergraduate students from the Durban University of Technology from three separate year groups (first year, second year and third year) were recruited.

A purposive sample of first, (n=70) second (n=90) and third (n=90) year Sport Studies students were selected to participate in this study. For the study to be a statistically significant representation of Sport Studies students, n=42 for first, n=55 for second and n=55 third years was adequate.

3.2.1 Inclusion Criteria

- Full-time registered students at the Durban University of Technology.
- No history of, or current medical condition, prohibiting physical activity participation.

3.2.2 Exclusion Criteria

- Part-time registered students at the Durban University of Technology.
- A history of, or current medical condition, prohibiting physical activity participation.
- Any history of lower back pain or joint injury.

3.3 Procedures and Testing Protocol

Procedures

Step 1

A letter requesting permission to conduct this study was sent to the Dean of the Faculty of Applied Sciences (Appendix 1). A subsequent letter (Appendix 2) was sent informing the research office at the Durban University of Technology of the proposed study and ethical clearance was granted (Appendix 1).

Step 2

A call for volunteers to participate in the study was posted in the Sport Management Department (Appendix 4). Information sheets (Appendix 4) were handed out to participants who fulfilled the inclusion criteria, outlining the purpose and possible outcomes of the study. All participants completed a consent form (Appendix 4) prior to participation.

Step 3

The selected participants were contacted and suitable times arranged to administer the questionnaires and complete the fitness tests. The researcher was present to

oversee the process and was available to assist participants with any queries or concerns. Questionnaires were collected immediately upon completion.

Step 4

The selected participants completed the modified Eurofit testing protocol.

3.4 Instrumentation

All participants completed a health questionnaire and a battery of fitness tests.

The Questionnaire

The questionnaire was adapted from the Kazi and Coopoo (2010) study which examined the “Physical activity, alcohol use, smoking and dietary profiles of a cohort of university students.”

- Demographics:

  Demographics such as age, gender and race were recorded.

- Smoking Habits:

  Smoking history and the number of cigarettes smoked per day, as well as whether the participant is a social smoker, was documented.

- Alcohol Consumption:

  The types of alcohol consumed, as well as the quantities and frequency of alcoholic consumption, were recorded.

- Diet:

  The size of meals, frequency, types of foods and method of preparation was recorded.

- Exercise:

  Exercise habits, whether recreational or competitive, were questioned as well as the frequency, intensity, duration and nature of activity.

The Fitness Test Battery

The Eurofit (Eurofit, 1993) test battery has been extensively used, and research conducted by Tsigilis, Douda and Tokmakidis (2002) showed the test/re-test reliability when administered to students at the University of Thessaly in Greece. The intra-class correlation coefficient indicated satisfactory coefficients above 0.70 for most tests, with the majority of the Eurofit test battery fitting well within the 95% confidence interval. These findings indicated that the Eurofit test battery yielded reliable data for undergraduate students.

The modified Eurofit battery of fitness tests consisted of the following:

3.4.1 Blood Pressure and Resting Heart Rate (American College of Sports Medicine, 2013)

Blood pressure was tested using a standard stethoscope and sphygmomanometer. The test was conducted with the participant seated and relaxed. Resting heart rate

was taken with the participant seated and relaxed. The heart rate was taken manually using the radial pulse for fifteen seconds and converted to get beats per minute.

Figure 3.1: Blood Pressure Sphygmomanometer and Stethoscope

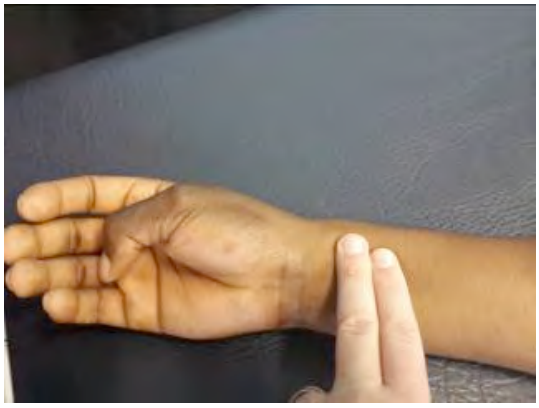

Figure 3.2: Measurement of Heart Rate at the Radial Pulse

3.4.2 Height and Weight measurements (American College of Sports Medicince, 2013)

An ADE medical scale triple beam balance was used on a stable surface for measuring the height and weight of the participants. The apparatus was calibrated before use. All measurements were recorded with the participants in the most basic of clothing, being cotton shorts for men and cotton shorts and a t-shirt for girls.

Figure 3.3: ADE Triple Beam Balance Scale and Height Ruler

3.4.3 Body Mass Index (American College of Sports Medicince, 2013)

The body mass index (BMI) was calculated using the height and weight measurements of the participants. This was calculated by dividing the weight by the height (measured in meters) squared.

$$\text{BMI} = \frac{Weight\,(kg)}{Height^2\,(m^2)}$$

3.4.4 Skinfold measurements (American College of Sports Medicince, 2013)

Skinfold measurements using a Harpenden skinfold caliper were taken from three sites on the body, to determine the percentage body fat of each participant. A three-site formula for skinfold measurement is more commonly used for mass testing as opposed to a seven-site formula. Percentage readings were recorded from the Pollock, Schmidt and Jackson (1998) table of generalised equations.

Figure 3.4: Harpenden Skinfold Caliper

3.4.5 Flexibility (Eurofit, 1993)

The sit-and-reach test was used to assess lower back and hamstring flexibility. This test involved sitting on the floor with legs out straight ahead. Feet (shoes off) were placed with the soles flat against the box, shoulder-width apart. Both knees are held flat against the floor by the tester. With hands on top of each other and

palms facing down, the participant was instructed to reach forward along the measuring line as far as possible. After one practice reach, the second reach is held for at least two seconds while the distance was recorded. There should be no jerky movements and fingertips should remain level and the legs flat.

Figure 3.5: Sit-and-Reach test

3.4.6 Handgrip Test (Eurofit, 1993)

The participant held the dynamometer in the hand to be tested, with the arm at right angles and the elbow by the side of the body. The handle of the dynamometer was adjusted if required. The base should rest on the first metacarpal (heel of palm), whist the handle should rest on the middle of four fingers. The participant squeezed the dynamometer with maximum isometric effort, which was maintained for about five seconds. No other body movement was allowed.

Figure 3.6: Hand Grip Dynamometer

3.4.7 Bent Arm Hang (Eurofit, 1993)

The participant was assisted into position, the body lifted to a height so that the chin was level with the horizontal bar. The bar was grasped using an overhand grip (palms are facing away from body), with the hands shoulder width apart. The timing started when the participant was released. They should attempt to hold this position for as long as possible. Timing stopped when the participant's chin fell below the level of the bar, or the head was tilted backward to enable the chin to stay level with the bar.

Figure 3.7: Bent Arm Hang Test

3.4.8 Sit-ups in 30 seconds (Eurofit, 1993)

The aim of this test was to perform as many sit-ups as possible in 30 seconds. The participant lay on the mat with the knees bent at right angles, the feet flat on the floor and held down by a partner. The fingers were interlocked behind the head. On the command 'Go', the chest was raised so that the upper body was vertical, and then returned to the floor. This continued for 30 seconds. For each sit-up the back needed to return to touch the floor.

Figure 3.8: Sit-up starting position

Figure 3.9: Sit-up end position

3.4.9 10 x 5 Meter Shuttle Run

Marker cones and/or lines were placed five metres apart. When instructed by the timer, the participant ran to the opposite marker, turned and returned to the starting line. This was repeated five times without stopping (covering 50 metres total). At each marker both feet needed to fully cross the line.

3.4.10 Standing Broad Jump (Eurofit, 1993)

The athlete stood behind a line marked on the ground with feet slightly apart. A two-foot take-off and landing was used, with swinging of the arms and bending of the knees to provide forward drive. The participant attempted to jump as far as possible, landing on both feet without falling backwards. Two attempts were allowed.

Figure 3.10: Demonstration of the Standing Broad Jump

3.4.11 20m Endurance Course Navette (Eurofit, 1993)

This test was designed to test maximal aerobic power and involved continuous running between two lines 20m apart in time to recorded beeps (Leger et al., 1988). For this reason the test is also often called the 'beep' or 'bleep' test. The test participants stood behind one of the lines facing the second line, and began running when instructed by the CD or tape. The speed at the start is quite slow. The participants continued running between the two lines, turning when signalled by the recorded beeps. After about one minute, a sound indicates an increase in speed, and the beeps were closer together. This continues each minute (level). If the line is not reached in time for each beep, the participant must run to the line turn and try to catch up with the pace within two more ‘beeps’. Also, if the line was reached before the beep sounds, the participant must wait until the beep. The test was stopped if the participant failed to reach the line (within 2 meters) for two consecutive ends. There are several versions of the test, with one commonly used version having an initial running velocity of 8.5 km/hr, which increases by 0.5 km/hr each minute.

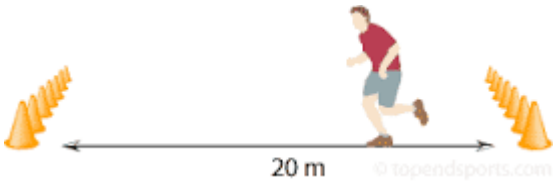

Figure 3.11: 20m course (Image retrieved from http:www.topendsports.com)

Figure 3.12 represents the order in which the tests were conducted.

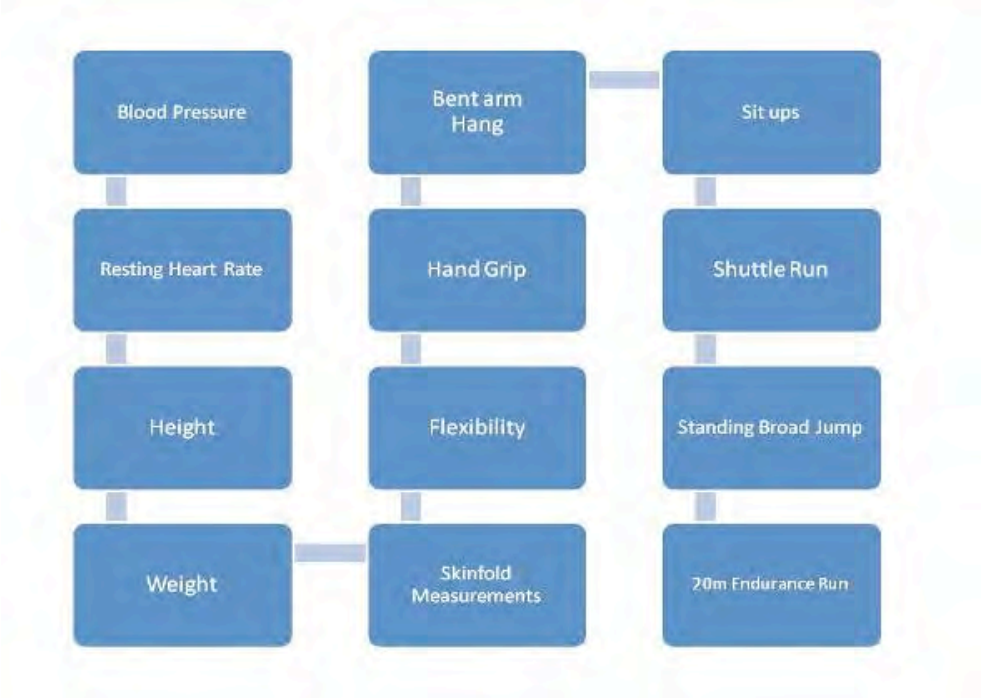

Figure 3.12: Test Battery Circuit

3.5 Ethical considerations

Once ethical clearance (BE359/14) from the University's Biomedical Research Committee was granted, the study began. Prior to the administration of the questionnaire and fitness test battery, all participants were requested to sign the agreed consent form. Participation in this study was voluntary. Each participant was allocated a number and alphabetical code to ensure that confidentiality and anonymity was maintained.

3.6 Records

Results of this project may be published however any data included will not be linked to a specific participant or institution. The data collected was securely stored in such a way that only the researcher was able to gain access to it. In accordance with the University's research policy, however, any raw data on which the results of the project depend, will be retained in a secure storage place for five years after which will be destroyed by incineration.

3.7 Statistical analysis

The data recording sheets were the primary tools used to collect data. The data collected was analysed with SPSS version 22.0. The results will present the descriptive statistics in the form of graphs, cross tabulations and other figures for the qualitative data that was collected. Inferential techniques include the use of correlations and chi square test values; which are interpreted using the p-values.

The statistical aspect of the research will encompass the following:

- Descriptive statistics using frequency and cross-tabulation tables and various types of graphs (including pie charts, bar charts, etc.).
- Inferential statistics using Pearson’s and/or Spearman’s correlations at a significance level of 0.05.
- Testing of hypotheses using chi-square tests for nominal data and ordinal data at a level of significance of 0.05.
- Interval data will be analysed using t-tests or ANOVA.

CHAPTER FOUR

4. RESULTS

This chapter presents the results and discussion of the findings obtained from the measurements in this study.

The chapter will comprise the following sections:

SECTION A: Biographical and Anthropometrical data

SECTION B: Lifestyle questionnaire

SECTION C: Fitness test battery

SECTION D: Discussion

SECTION A

4.1 Biographical data

This section summarises the biographical and anthropometrical characteristics of the respondents.

4.1.1 Demographics

4.1.2 Anthropometrical Measurements

4.1.1 Demographics

The sample consisted of 165 students with a mean age of 21.48 years (SD±2.48). The first year group's mean age was 19.4 years (SD±2.5), the second year group's mean age was 21.7 years (SD±2.1) and the third year group's mean age was 22.7 years (SD±2.0). First year's (n = 41) comprised 24.85% of the sample, while second year's (n = 62) 37.58% and third year's (n = 62) years 37.58%. The sample comprised of 116 males (70.3%) and 49 females (29.7%). Figure 4.1 depicts the percentage of males and females per year of study.

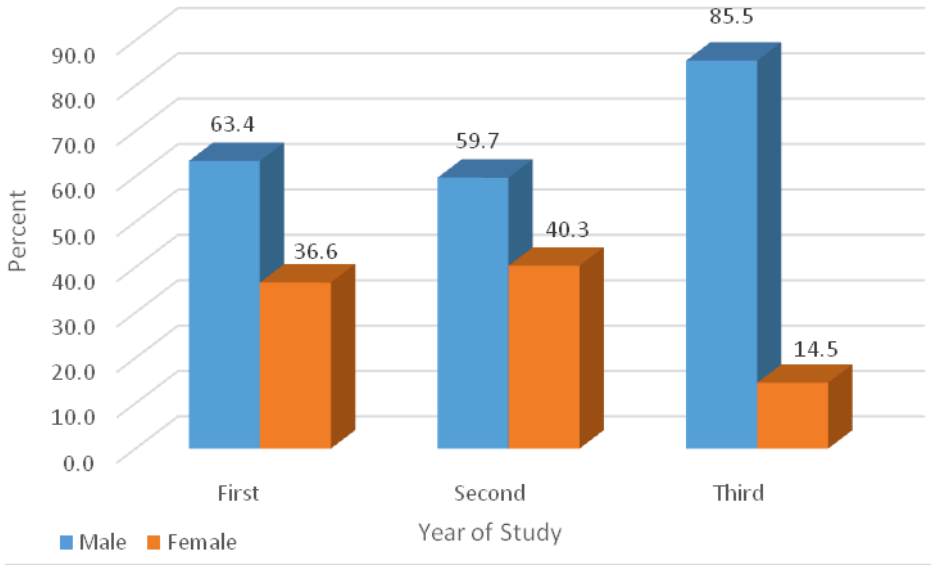

Figure 4.1 Gender composition

Each year presented with a higher percentage of male students. Eighty-five percent of third year students were male. The number of male students exceeded the female students with a ratio of (3:2) for the first and second year students. The ratio for the third year students was approximately 6:1 (males to females). Overall, the difference in gender was significant (p=0.000).

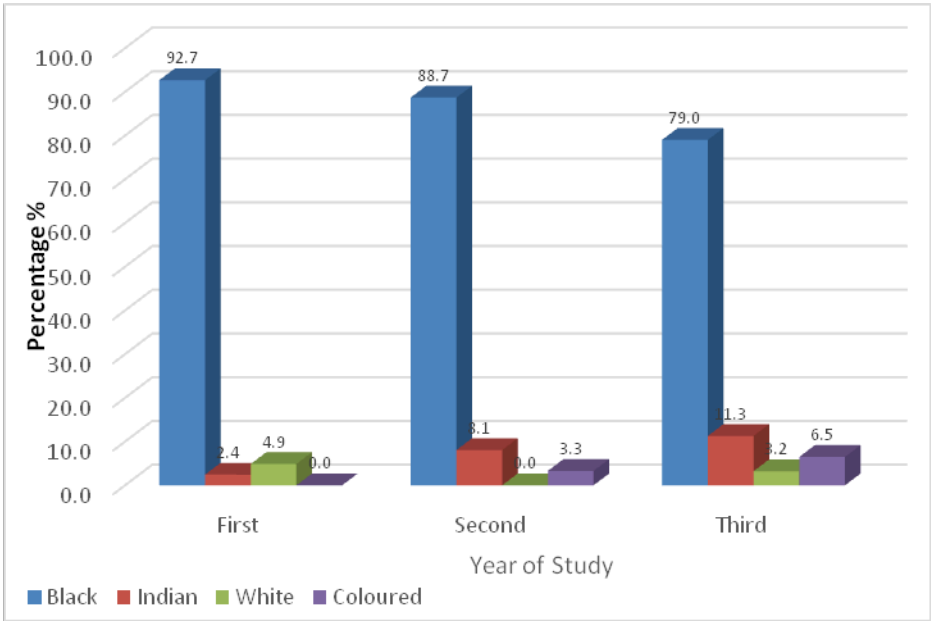

Figure 4.2 Racial composition

The sample comprised 86.1% of the students being Black, 7.9% Indian, 3.6% Coloured and 2.4% White. Figure 4.2 depicts a much higher percentage of Black students compared with other race groups. Black students have exceeded the other race groups collectively by 8 or 8/9:1. It is a noticeable trend that over the three year period the number of Black students decrease. The chi-square test between race groups and year of study indicates the changes observed, although these have not been significant (Fisher's Exact Test p = 0.17).

4.1.2 Anthropometrical Measurements

Table 4.1 shows that the cohort's mean BMI was 24.09 kg/m², with a general increase from first year (22.65 kg/m²) to second year (24.24 kg/m²) and to third year (24.87 kg/m²). All the mean values were below the acceptable World Health Organisation (WHO) recommendations (World Health Organisation, 2008), although an increasing trend in mean values of BMI was noticed.

Table 4.1 Weight, Height and BMI

Year of Study		Weight (kg)	Height (m)	BMI (kg/m²)
1st	n	40	41	40
	Mean	61.53	1.65	22.65
	SD	7.60	0.09	2.85
2nd	n	62	62	62
	Mean	65.62	1.65	24.24
	SD	12.32	0.101	4.69
3rd	n	62	62	62
	Mean	69.43	1.67	24.87
	SD	13.57	0.071	4.27
Total	n	164	165	164
	Mean	66.06	1.66	24.09
	SD	12.20	0.08	4.21

It was identified that there was a mean variance in body weight of 4.09kgs between first and second year, and a mean difference of 3.81kgs from second to third year. In total, there was a mean body weight change of 7.9kgs from first to third year.

It was noted that the variation amongst the second and third year students was larger than for the first years.

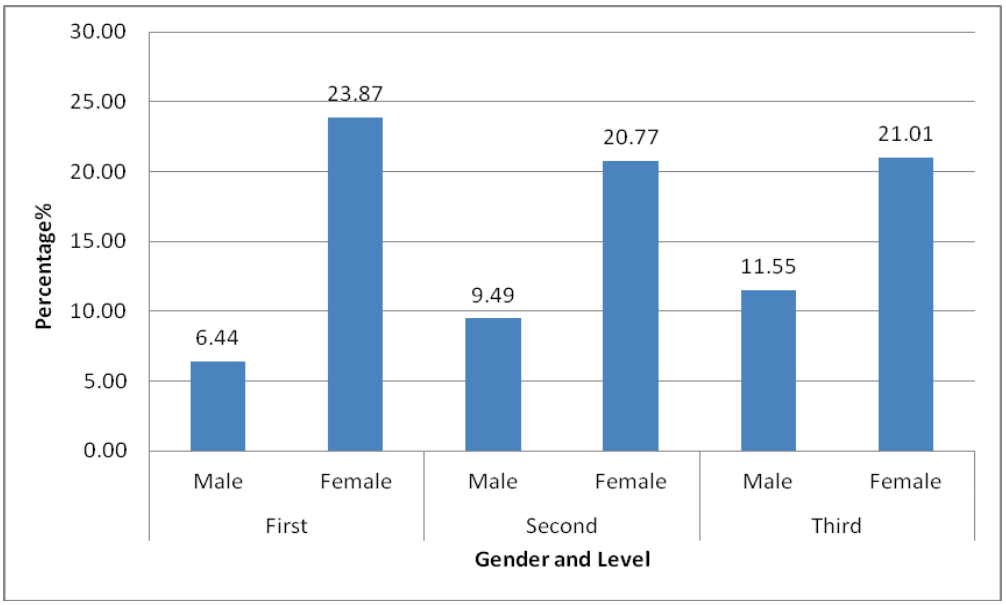

Figure 4.3 Body fat percentages for males and females

The mean body fat was 13.32% for the cohort, and was at 12.81%, 14.03% and 12.92% respectively for each year of study. The mean body fat percentage of the first year females was 23.87% and first year males 6.44%. Second year results show that females presented with a mean body fat of 20.77% and males with 9.49%. The third year cohort presented with a mean body fat percentage of 21.01% and 11.55% for females and males respectively.

Body Mass Index results were divided into four classifications, namely:

Table 4.2 BMI classification and range

Classification	**Range**
Underweight	BMI < 18.5kg/m²
Normal	18.5 – 24.99kg/m²
Overweight	25-29.99kg/m²
Obese	>30kg/m²)

Source: (Gallagher et al., 2000).

Table 4.3 represents the cohorts BMI category per year of study.

Table 4.3 BMI Category per year of study

			Year of study			
			1st	**2nd**	**3rd**	**Total**
BMI	**Underweight**	**n**	1	1	1	3
		% within year	2.4%	1.6%	1.6%	1.8%
	Normal	**n**	29	40	33	102
		% within year	70.7%	64.5%	53.2%	61.8%
	Overweight	**n**	11	19	22	52
		% within year	26.8%	30.6%	35.5%	31.5%
	Obese	**n**	0	2	6	8
		% within year	0.0%	3.2%	9.7%	4.8%
Total		**n**	41	62	62	165
		% within year	100.0%	100.0%	100.0%	100.0%

The majority (61.8%) of students' BMI results were within the normal range (18.5 – 24.99kg/m²) for BMI. There was an increase in mean BMI from first year to third year in the overweight and obese category. In total, 31.5% and 4.8% of students were overweight or obese. Only 1.8% of the sample was underweight. There were no significant differences between year of study and BMI.

Table 4.4 BMI Category according to gender

			Year of Study					
			1st		2nd		3rd	
			Gender		Gender		Gender	
			Male	Female	Male	Female	Male	Female
BMI	Underweight	%	3.8%	0.0%	0.0%	4.0%	1.9%	0.0%
	Normal	%	84.6%	46.7%	70.3%	56.0%	49.1%	77.8%
	Overweight	%	11.5%	53.3%	27.0%	36.0%	37.7%	22.2%
	Obese	%	0.0%	0.0%	2.7%	4.0%	11.3%	0.0%

The first year cohort of males (84.6%) fell within the normal BMI category, with only 46.7% of females in the same category. More than half (53.3%) of the females in the first year were classified as being overweight. The second year cohort revealed that 27% of males and 36% of females were classified as being overweight. Males and females in the obese category were 2.7% and 4% respectively. Only males (11.3%) in the third year cohort were obese. Overall, 36.6% of males and 37% of females were classified as being overweight.

Waist-to-hip ratios are used to determine health risk and body fat distribution by dividing the waist circumference by the hip circumference. Health risk is high when the ratio exceeds 0.95 in men and 0.8 in women (World Health Organisation, 2008).

Table 4.5 Waist and Hip Circumferences and Waist-to-Hip Ratio

Year of study		Waist (cm)	Hip (cm)	Waist to Hip Ratio
1st	n	41	41	41
	Mean	72.14	95.02	0.76
	SD	5.73	6.62	0.036
2nd	n	62	62	62
	Mean	74.62	97.12	0.76
	SD	9.62	8.68	0.081
3rd	n	62	62	62
	Mean	77.84	98.74	0.78
	SD	11.22	8.55	0.07
Total	n	165	165	165
	Mean	75.22	97.21	0.77
	SD	9.71	8.25	0.07

Table 4.5 reflects a mean waist circumference of 75.22 cm (p=0.01), with mean results increasing from first year through to third year (72.15cm, 74.63cm, and 77.85cm). Similarly, the waist-to-hip ratio increases sequentially with a mean waist-to-hip ratio of 0.76, 0.77, and 0.77 through the three years of study (p=0.04). The Kruskal Wallis test indicates that the differences between the groups for waist and waist-to-hip ratios were significant (p=0.01 and p=0.04 respectively). The percentage of males who were at increased risk due to high waist circumferences was 5.4% of second year's and 9.4% of third year's. Contrary to this, females

showed an increased risk of 6.7% of first year and 8% of second year students, with no increased risk reported in the third year.

SECTION B

4.2 Lifestyle questionnaire

The questionnaire was completed by all students (n=165). The results of the questionnaire will be reported as per profile, namely:

- Physical Activity
- Smoking
- Drinking
- Dietary
- General Health

4.2.1 Physical Activity Profiles

This section shows the frequency of bouts of exercise performed per week, as well as the types of activities that students were engaging in during campus hours as well as after hours.

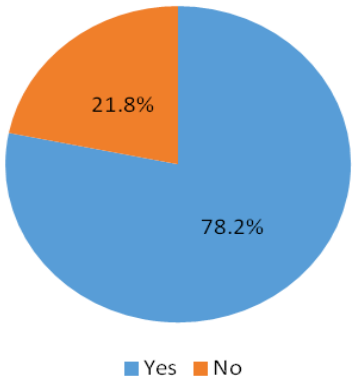

Figure 4.4 Regular exercise

Figure 4.4 reflects that 78.2% of the sample reported exercising on a regular basis, with 72.9% being male. The first year's reported that 80.5% exercised on a regular basis with 72.6% of second year's and 82.3% of third year's exercising regularly. The greatest frequency of exercise was twice a week, with 48.5% of first year's, 48.9% of second year's and 45.1% of third year's. At least half (47.3%) of the total sample exercised twice a week, whilst 32.6% exercised 3-4 times a week, and only 8.5% exercised five or more times a week.

Additionally, nearly twice as many first year students exercised daily (18.2%), compared with second year (8.9%) and third year (9.8%) students. Training at the gym during campus hours yielded a high frequency for first year's. Students who exercised daily comprised 11.6% of the cohort.

4.2.2 Smoking Profile

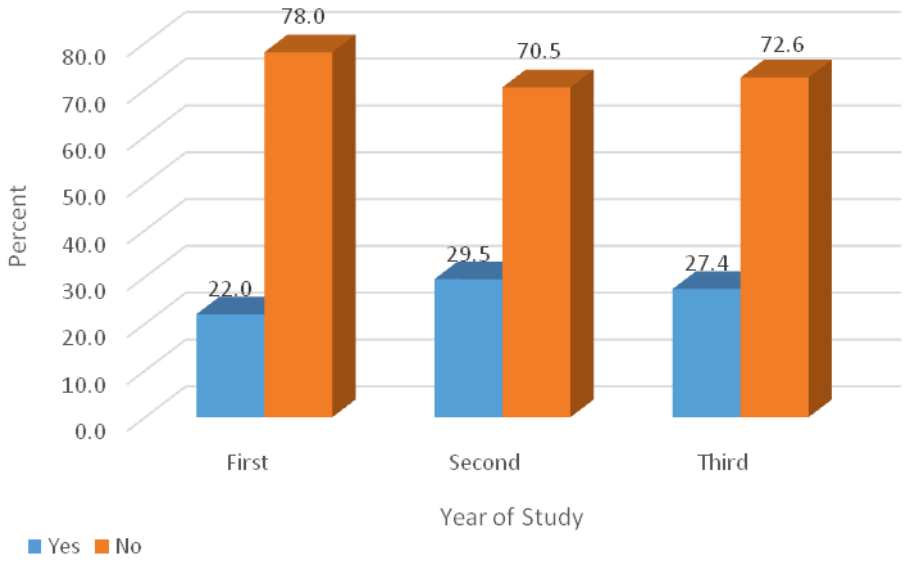

Figure 4.5 Smoking profile

On average, approximately a quarter (26.8 %) of the students had smoked. Second year's had the highest rate at 29.5%, third year's with 27.4%, whilst first year's reported the lowest percentage of students who smoked at 22%. The chi-square (Fisher's p-value = 0.751) tests indicated that smoking patterns across the levels of study were similar.

Results show that one in ten students are currently smoking (10.4%), with third year's being the highest of that category at 16.1%. The chi-square test (0.6) indicates that the patterns are similar across the levels of study.

The mean age at which smoking started was 16.93 years. The mean age at which students quit smoking was 19.36 years, which was statistically significant (p=0.013). First year students started smoking at a mean age of 15.75 years, more than a year earlier than the other years of study.

4.2.3 Alcohol Consumption Profile

Table 4.6 Frequency of alcohol consumption

Year of study		During the past month, how many days did you drink alcoholic beverages ?	During the past month, how many times did you have five or six more drinks per occasion?	Number of glasses per week			
				Beer	Wine	Spirits	Other
1st	n	14	10	9	1		5
	Mean	3.50	2.80	6.00	1.00		8.00
	SD	3.11	1.4	5.79			7.38
2nd	n	24	21	15	9	9	10
	Mean	4.13	4.19	8.07	4.44	7.89	8.30
	SD	3.95	4.082	7.18	2.74	6.35	11.53
3rd	n	31	24	22	9	6	7
	Mean	4.26	2.79	8.05	2.33	2.33	3.86
	SD	3.91	1.82	10.27	2.35	1.03	2.34
Total	n	69	55	46	19	15	22
	Mean	4.06	3.33	7.65	3.26	5.67	6.82
	SD	3.73	2.89	8.48	2.68	5.60	8.56

Table 4.6 shows that on average the students consumed alcohol on approximately four days per month. Within the last 30 days, 3.33 students reported to have consumed five or six more drinks per occasion. First year students reported drinking on average six beers per week, with second and third year students drinking on average just over eight beers per week. The total sample reported an average consumption of 7.65 beers, 3.26 glasses of wine, 5.67 units of spirits and 6.82 glasses of other alcoholic beverages.

Significant differences for wine (p=0.031) and spirit (p=0.032) consumption of the cohort was reported. Overall, the consumption of alcohol was the highest amongst second year students.

4.2.4 Dietary Profile

This section presents results of the eating habits of students, including, snacking, meal patterns and portion size.

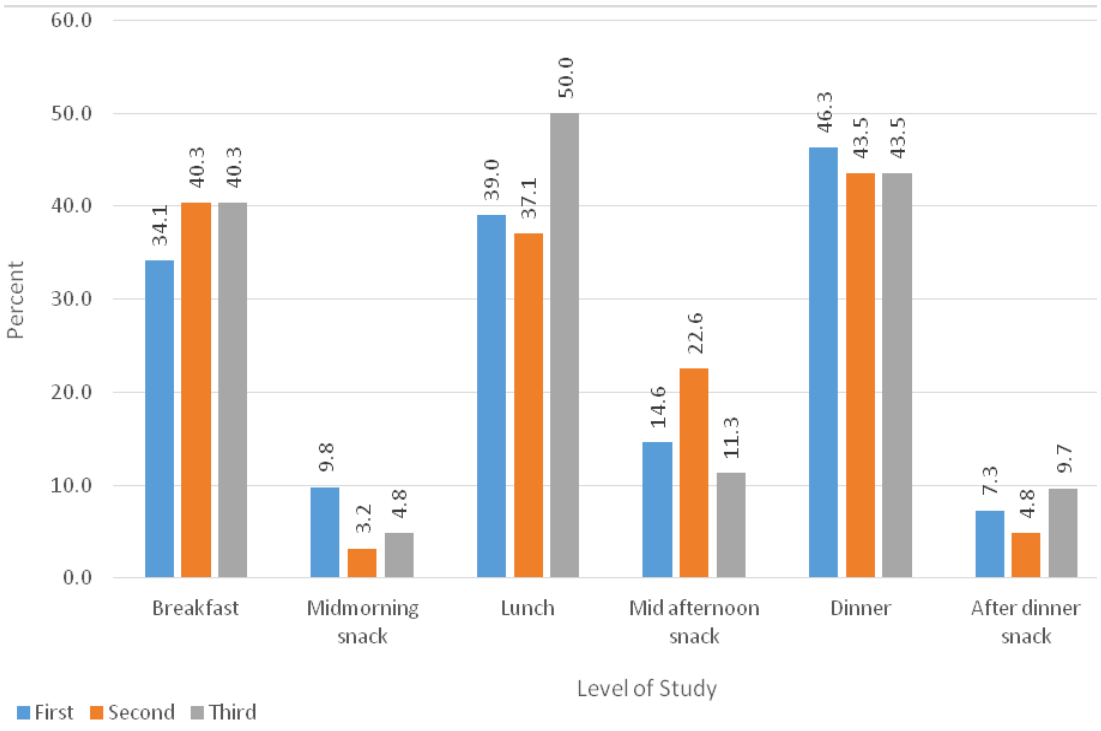

Figure 4.6 Meal Choice

There was a trend of eating breakfast, lunch and dinner with a low percentage of students having a snack between meals. The total sample “eat out” on average, at least 3.25 times per week. First year students “eat out” more than twice as often as the other years of study. Portion sizes of meal patterns are not similar across the different years of study (χ^2 p-value = 0.00). Apart from the moderately sized meals,

students from each year of study consumed portions of various quantities. Results indicate that 57.9% of the sample occasionally have more than one serving, while 11.2% do not have second servings. The average time to consume a meal was 13.40 minutes. Second year's were the slowest taking 14.12 minutes, whilst first year's were the fastest to consume a meal in 12.83 minutes per meal.

Amongst the first years, candy was the most common choice of snack. The second year students preferred soft drinks and candy. Amongst the third year's, diet soda and candy were consumed the most.

Students reported eating only two portions of fruit per day, with 2.21 units of soft drinks and 2.22 units of diet soda. The majority of students did not eat dessert very often. Results show that the average number of students who occasionally ate dessert increased from 43.9% in first year's to 67.7% in second year's, up to 80.6% in third year's.

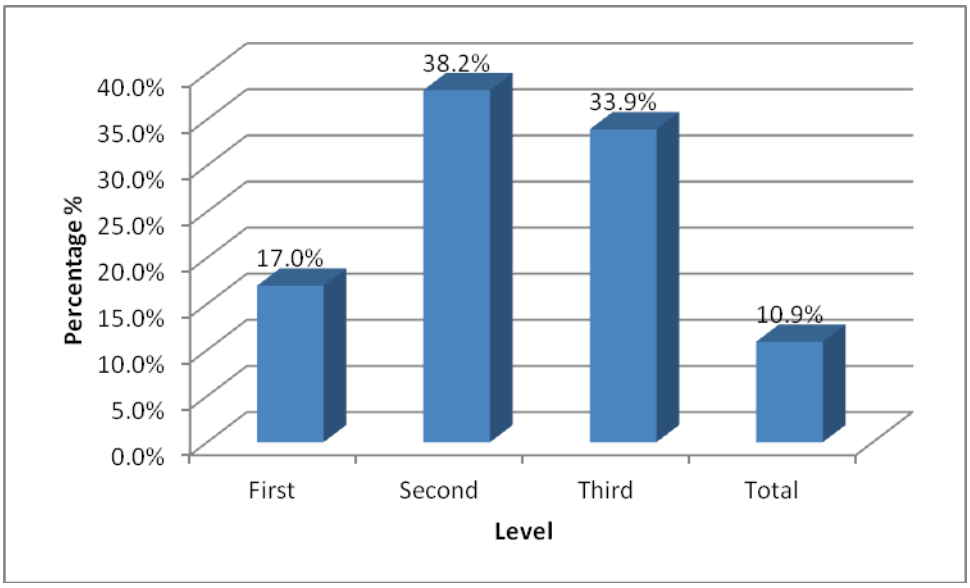

Figure 4.7 Consumption of fried foods

Positively, only 10.9% of the cohort consumed fried food on a weekly basis. Furthermore, on average 7.3%, 11.3% and 12.9% across each year respectively consumed fried foods 5-7 times per week.

4.2.5 General Lifestyle Profile

This section presents the perceived causes of stress for students, their general safety, and social trends.

Findings show that the majority of students did not experience stress or stress-related issues. The highest perceived cause of stress amongst students was workload related.

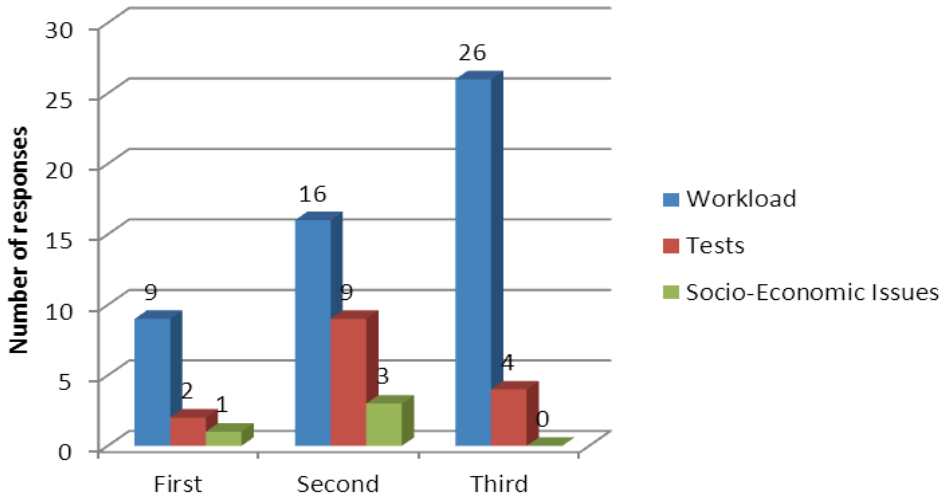

Figure 4.8 Causes of stress on campus

Figure 4.8 represents the students' responses to causes of stress on campus. Stress caused by tests and socio-economic issues were low-scoring. Personal safety concerns due to crime were reported, with second year students being the most concerned about personal safety. Furthermore, open-ended questions show that family issues are a concern for third year students (n=8).

SECTION C

4.3 Fitness test battery

Physical Fitness Measurements

This section presents the results of the various physical fitness tests performed by the cohort. Table 4.7 depicts the means and standard deviations of each test performed by the cohort. Each year of study is also graphically presented.

Table 4.7 Physical fitness tests

		Flexibility: Sit and Reach (cm)	Hand Grip: Left (kg)	Hand Grip: Right (kg)	Hand Grip: Combined (kg)	Bent Arm Hang (s)	Muscular Strength Endurance: 30 s sit-up	Anaerobic Fitness: 10 x 5 m Shuttle Run (s)	Standing Broad Jump (cm)	Aerobic Fitness: Multistage Bleep Test - Vo2Max
Total	n	163	165	165	165	161	163	158	165	160
	Mean	44.92	41.14	42.73	41.93	32.78	22	20.37	173.07	33.43
	Std. Deviation	11.18	11.38	11.57	11.16	19.00	5.19	2.84	31.45	8.58

4.3.1 Flexibility

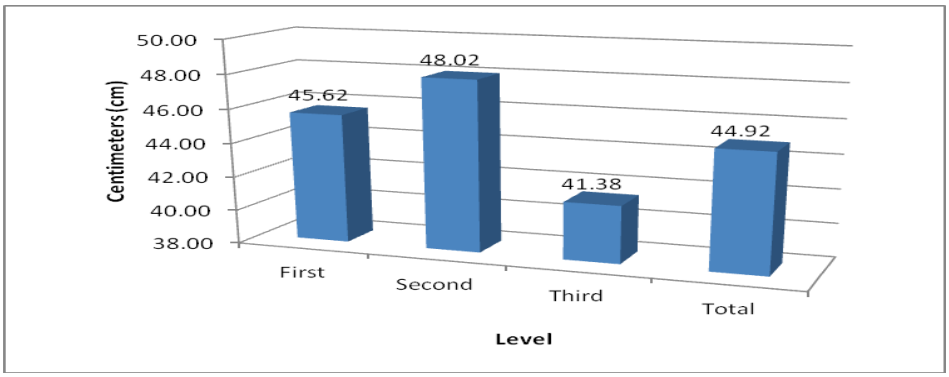

Figure 4.9 The sit-and-reach test

Flexibility results were measured by students performing the sit-and-reach test. The mean score for the cohort was 44.92cm. Figure 4.9 shows differences between first (45.62cm) and second (48.02cm) year students. A decline in the third year (41.38cm) scores was demonstrated (p=0.00). Females presented greater flexibility results (47.19cm) than males (44cm).

4.3.2 Hand grip strength

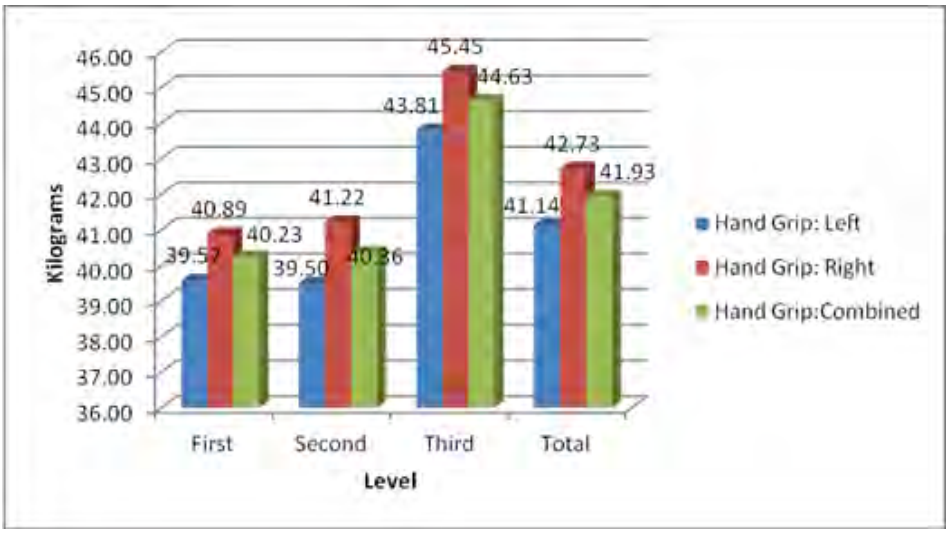

Figure 4.10 Left and right hand grip strength

Results for hand grip strength (Figure 4.10) indicated a dominant right hand across all three years of students, with a mean right hand grip strength of 42.72kg and left hand grip strength of 41.14kg (p=0.05). Combined grip strength presented with an average of 41.93kg for all students. Male students demonstrated a higher average of 46.88kg over female students (30.22kg).

4.3.3 Bent arm hang

Figure 4.11 shows a mean score of 32.78 seconds for the bent arm hang test, with little change between first, second and third years.. The third year's demonstrated the highest score. Male students averaged 39.05 seconds and females 16.61 seconds.

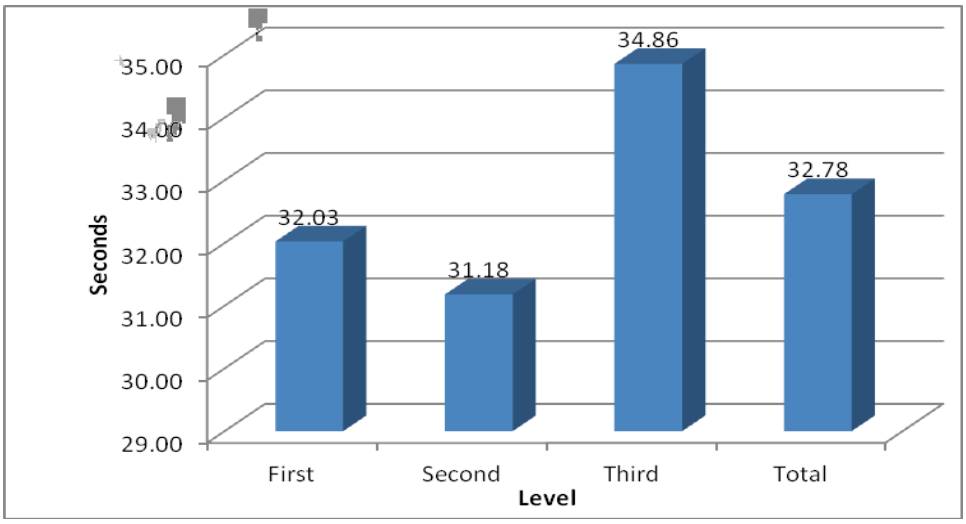

Figure 4.11 The bent arm hang test

4.3.4 30-second sit-ups

Muscular endurance was tested via the 30-second sit-up test. Scores revealed a marginal increase in the average number of sit-ups from first year to third year students (p=0.04). Students performed an average of 21 sit-ups, with males averaging 23 and females averaging 18 (Figure 4.12).

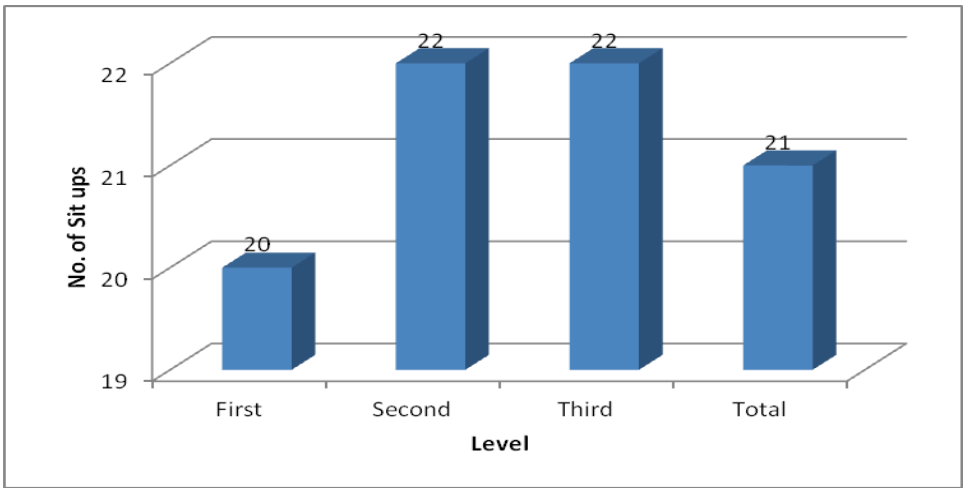

Figure 4.12 The 30-second sit-up test

4.3.5 Anaerobic fitness

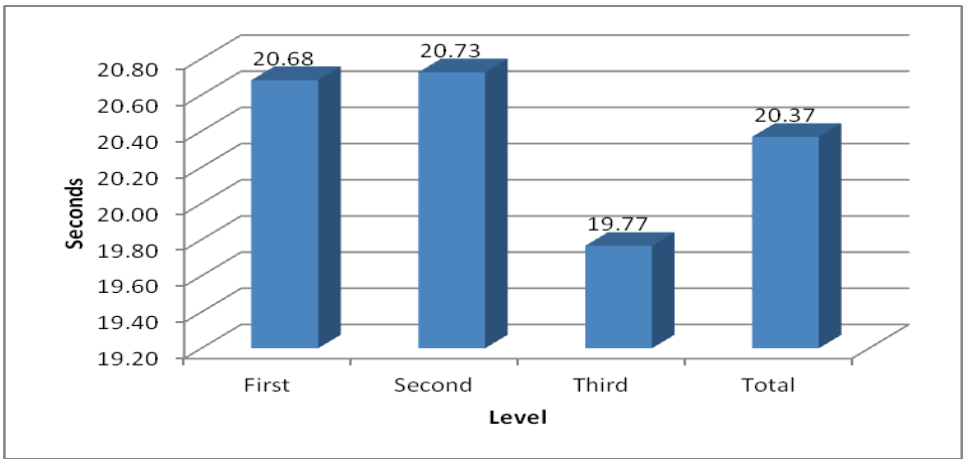

Figure 4.13 The anaerobic 10 x 5m shuttle test

The results show a mean time of 20.37 seconds, with similar mean scores of 20.68 seconds and 20.73 seconds for first and second year's respectively. For the third year's, however, a decrease of almost one second was demonstrated for the anaerobic shuttle test (Figure 4.13). On average, male students completed the test quicker (19.75 seconds) than female students (21.93 seconds).

4.3.6 Standing broad jump

The standing broad jump test measures explosive power. The mean score of the cohort was 173.07cm, with male students averaging 185.49cm and female students 143.67cm. The first year students' mean score of 167.46cm was well below the cohort mean (Figure 4.14).

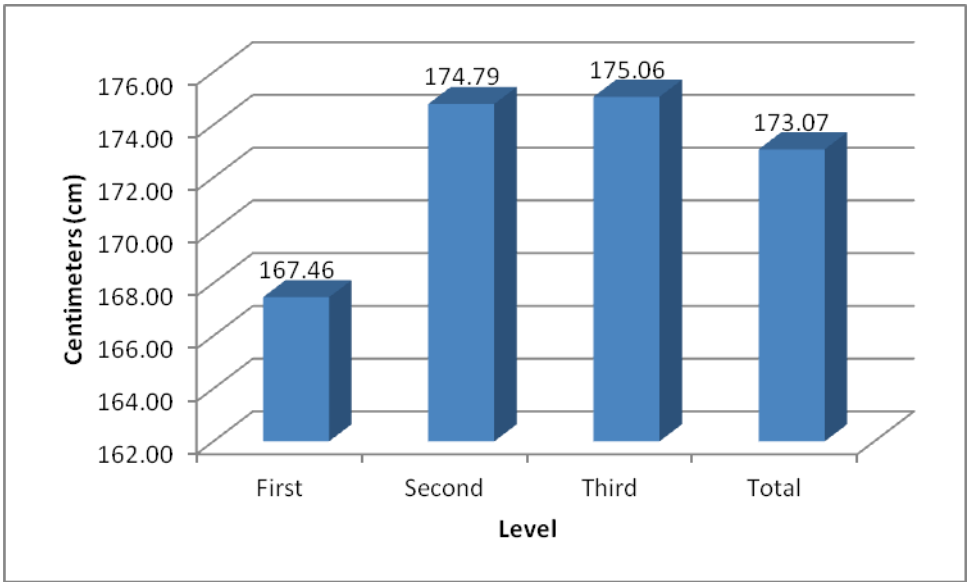

Figure 4.14 The standing broad jump test

4.3.7 Aerobic fitness

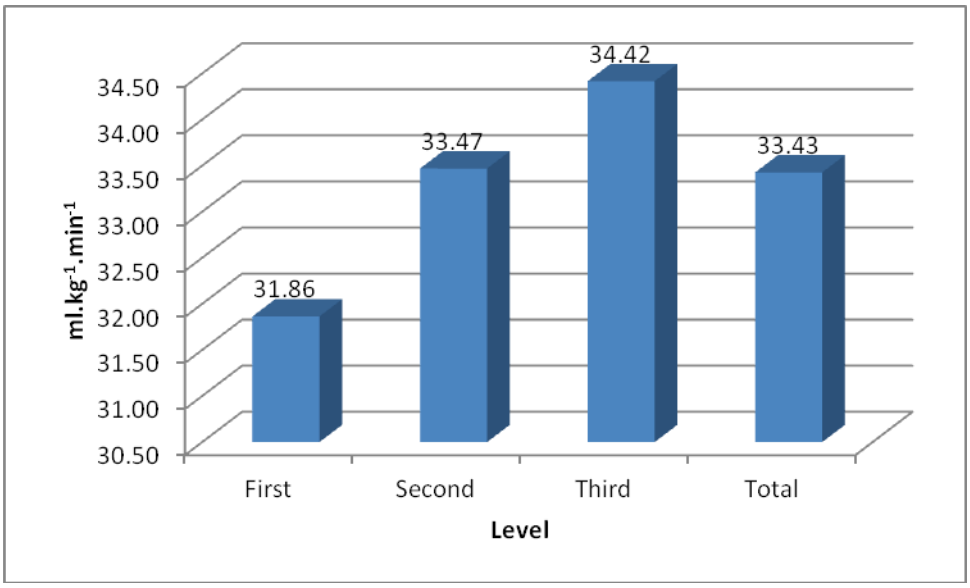

Figure 4.15 The aerobic multistage bleep test - VO_2Max

The number of shuttles completed for the multi-stage bleep test was converted to relative maximal oxygen consumption (VO_2max). Maximal oxygen consumption is calculated by a prediction equation according to the number of shuttles performed in the test. The VO_2max is the criterion for measurement of cardiorespiratory fitness and is the product of maximal cardiac output and arterial-venous oxygen difference (American College of Sports Medicine, 2006).

The scores for relative VO_2max were as follows; first years (31.86 $ml.kg^{-1}.min^{-1)}$, second years (33.47 $ml.kg^{-1}.min^{-1)}$, and third years (34.42 $ml.kg^{-1}.min^{-1}$). There was a mean increase in VO_2max among all years of study. The mean VO_2max for the entire sample was 33.43 $ml.kg^{-1}.min^{-1}$ with male students averaging 36.48 $ml.kg^{-1}.min^{-1}$ and female students 26.1 $ml.kg^{-1}.min^{-1.}$.

CHAPTER FIVE

5. DISCUSSION

The aims and objectives of the study were achieved through the use of the modified Health and Physical Activity Questionnaire (Kazi and Coopoo, 2010) and the modified Eurofit (Eurofit, 1993) physical fitness testing protocol. Results have provided insight into the health and lifestyle profile of students at the selected tertiary institution. The health profile of students will include anthropometrical trends and lifestyle habits determined via the questionnaire and anthropometric tests. The physical fitness level of students was determined via the fitness testing results. Based on these findings, areas of concern have been identified and will also be presented.

5.1 Health profiles

Anthropometrical trends

The results showed a clear variations in anthropometric measurements between first, second and third year students. The results appear to indicate that BMI, waist circumference, waist-to-hip ratio and body fat percentage increased as students spent more years at university. There was also a trend towards female students exhibiting higher results in all areas of anthropometry.

Weight

Results of this study show a large variation between first, second and third year students. It was established that the average weight gain between first and third year students was 7.9kgs. The average body mass increase amongst first year students was 4.09kg. Similar studies in the United States found a 1.18kg increase in freshmen (Simmons et al., 2008), and a mean increase of 1.13kg over a six-month period was reported by Kasparek et al. (2008). Hence, students in this study showed greater than normal annual weight increases. Rapid weight gain is related to an increase in blood pressure or impaired fasting glucose levels in young adulthood in low and middle income countries (Adair, Martorell, Stein, Hallal, Sachdev, Prabhakaran and Victora, 2009). Thus, selected students in this study may be at an increased risk for the development of hypertension and may also be pre-diabetic.

Body fat

Both male and female students across all three years reported body fat results within the ACSM recommended range (Heyward, 2010). The average body fat percentages across three years of study for female (21.88%) and male (9.16%) students showed similar trends to Israeli sport science females (mean 26.6% SD+-0.5) and males (mean 14% SD +-0.4) (Meckel, Galily, Nemet and Eliakim, 2011). The mean body fat percentage of first year students in this study was 12.81%, which was comparatively desirable when compared with an average score of 30% (SD±5.8) for freshman in the United States.(Kasparek et al., 2008).

Waist circumference and Waist-to-Hip Ratio

The WHO has identified an increased risk of developing non-communicable diseases if waist circumference increases more than 94cm in men and 88cm in women (World Health Organisation, 2008). Findings from this study showed that a minority of students (6.06%) were at risk. This is in contrast to students from The University of Fort Hare (Eastern Cape), where 38.5% of students were found to be at increased risk. Interestingly, 68.3% of students from the University of Fort Hare (Eastern Cape) were females, as compared with the 70.3% of male students in this study.

Similarly, the waist-to-hip ratio measurement is a prediction of increased health risk. By dividing the circumference of the waist by that of the hip, it is shown that ratios of over 0.95 and 0.8 in men and women respectively increase the risk. The waist-to-hip ratio indicates the distribution of adipose tissue and indicates the risk of morbidity and cardiovascular disease. It has been shown that 'pear–shaped' bodies are less likely to develop cardiovascular disease compared with 'apple-shaped' bodies which have a higher WHR (Lebovitz, 2003). Positively, only 1.2% of male students presented with ratios above 0.95. Similarly, only 1.8% of females were above the 0.8 norm. Contrary to this, 37.3% of nursing students from the University of Fort Hare (Eastern Cape) presented with ratios over the norms, placing them at increased risk (van den Berg et al., 2012).

Body Mass Index

Body mass index is used to assess weight relative to an individual's height. Also known as the quetelet index, this test identifies whether an individual is the correct weight relative to their height.

The overweight and obese category in this study showed that 28.45% of male students were overweight, with 6% being obese. These results appeared to be similar to those of male Saudi Arabia students who were found to be 21.8% overweight and 15.7% obese (Al-Rethaiaa et al., 2010), although this study presented with a lower percentage of obese students. Nevertheless, these results are of concern as being overweight or obese has negative health implications. These health implications may not be immediately apparent, but can lead to significant lifestyle diseases in the future if preventative measures are not introduced. It is known that metabolism slows with age, compounding existing levels of obesity.

When combining the overweight and obese categories, however, results showed that more than half (53.3%) of the first year females in this study were classified into this category. Steyn et al. (2000) showed that a quarter (25%) of first year female students were classified into this category. Moreover, the University of Limpopo reported that 30.5% of females and 8.7% of males were overweight or obese (Peltzer and Pengrid, 2012). This is somewhat lower than the percentages of 40.82% for females and 34.48% males in the current study. These high

percentages of students being overweight or obese are also demonstrated among 31.37% of and 58.18% of female students at the University of Fort Hare (van den Berg et al., 2012).

Findings have shown, that the average BMI of students is not at an acceptable level and that with female students showing unacceptable levels they are at a greater risk of developing non-communicable diseases, namely diabetes, hypertension and heart disease. The large percentage of students in the overweight and obese category is a concern for the future health of this population. Van Niekerk and Barnard (2011) found that when exercise was a contributing factor, mean BMI was somewhat reduced (21.7kg/m²) in female students, thus the need to increase exercise frequency.

Lifestyle Habits

According to Popkin, Adair and Ng (2012) there have been large shifts in how humans eat and drink, the incidence of energy imbalance, overweight and obesity, and the vast array of other nutrition-related cardiometabolic problems. Furthermore, it was suggested that humans should evolve towards a healthier diet that is less processed and more nutrient dense, preventing nutrition-related non-communicable diseases, namely obesity, diabetes and some cancers. Students' lifestyle habits were determined based on eating, smoking and alcohol habits, as well as their physical activity patterns.

Almost two-thirds (61.21%) of students in the current study did not consume breakfast. The consumption of breakfast provides energy and nutrients for the entire day and is considered an important dietary factor for energy regulation (Behrens and Dinger, 2003). Additionally, this is supported with studies amongst students finding a range of positive outcomes, including better attendance, academic performance, nutrient intake, fitness, and appropriate body weight (Hoyland, Dye, and Lawton, 2009; Moore, Moore, Tapper, Lynch, Desousa, Hale and Murphy, 2007; Sandercock, Voss and Dye, 2010). Furthermore, missing breakfast was associated with negative effects on cognitive function, academic performance, attendance and psychological function (Rampersaud, Pereira, Girard, Adams and Metzl, 2005).

Research into the cardiovascular risk with increased consumption of fruit and vegetable intake showed an inverse association in the general US population. Results revealed an intake of three or more pieces of fruit or vegetable per day lowered cardiovascular mortality by 27% ($p=0.008$). Students in this study reported that two-thirds (66.06%) ate only two pieces of fruit per day. Surprisingly, at the University of Fort Hare 42.2% ate less than two fruits per day, revealing that there is a need for increased fruit and vegetable intake in this population.

The consumption of fast food and take-away foods represents a public health concern, and is found to be associated with being overweight and poorer diet quality because these menus often consist of energy-dense high fat/sugar foods

(Jeffery & French, 1998; Satia et al., 2004; Rosenheck, 2008). This study reported students eating ‘take-out’ food approximately 3-4 times per week, which is of concern.

Smoking is an easily accessible and often socially accepted activity. Nicotine dependence was reported to develop within a month of initiation, even after smoking only a few cigarettes per week (Di Franza, 2008).

It was reported that one-third of college students have never smoked cigarettes, and one-sixth are current users (Johnston, O’Malley, Bachman and Schulenberg, 2011). Tremendous stress and inadequate sleep, common amongst college students, were associated with increased rates of smoking (Primack, Sidani, Agarwal, Shadel, Donny and Eissenberg, 2008). Popovac, Mwaba & Roman (2011) identified that 16% of students at the University of Western Cape were smokers, well below the 26.8% of smokers in this study.

The lifestyle habits of students show that there needs to be a change in patterns in order to prevent future lifestyle diseases and incidence of cardiovascular disease. Students need to be educated in nutrition and good eating practices to create a change in habits. Overall, the health profile results have indicated an upward and somewhat concerning trend towards obesity and poor health. This trend has also been identified with an increased risk of non-communicable diseases.

The US Department of Health and Human Services (2008) recommends 150-300 minutes (30 minutes, five times per week or 60 minutes, three times per week) of cardio-respiratory exercise per week (Heyward, 2010). Less than half (47.3%) of the total sample achieved the recommended exercise duration of participating twice a week, with 32.6% exercising 3-4 times a week and only 8.5% exercising five or more times a week.

Physical activity results showed that 21.8% of students were inactive, which is below comparisons of similar studies where 40% of students in the United States were inactive (Keating et al., 2005) and 33 % of students from the University of Free State (Bloemfontein) were also inactive (Bloemhoff, 2010). Behrens and Dinger (2003) reported no differences in gender and exercise participation at the University of Oklahoma (United States). Contrary to this, results of this study identify 72.9% of regular exercise participants to be male. Bloemhoff (2010) also identified males to be more physically active than females ($p<0.01$).

Overall, increasing anthropometrical measurements and decreasing physical activity levels increase the risk of developing lifestyle diseases. Poor lifestyle habits have created concern around general health and wellness.

5.2 Fitness levels

Tsigilis, Douda & Tokmakidis (2002) utilised the Eurofit protocol to test physical fitness levels of university students in Greece. A comparison of the mean results

shows that the flexibility results in this study (44.92cm SD±11.18) were higher than those for the students in Greece (31.2cm SD±6.8), by more than 10cm. An increase in lower back and hamstring flexibility is associated with less lower back problems, improved athletic ability and reduced sports injuries.

The average combined hand grip strength of males (93.76kg) was rated as 'Good' (90-97kg) with females' combined average of 60.43kg rated as 'Very Good' (60-67kg) (Heyward, 2010). The comparison may imply that although males scored higher, when compared with norms females presented more favourable results.

Aerobic fitness refers to the utilisation of oxygen in the body to create energy. This energy is created through aerobic metabolism. The benefits of aerobic fitness are vast, ranging from decreased cardiovascular risk to improved mental health and psychological well being (Katch, McArdle and Katch, 2011). A mean score for males of 36.48 $ml.kg^{-1}.min^{-1}$ categorised students in the 'Poor' category (<41 $ml.kg^{-1}.min^{-1}$) according to ACSM norms (Heyward, 2010). Similarly, female students recorded a mean of 26.1 $ml.kg^{-1}.min^{-1}$ categorising students in the 'Poor' category (<35 $ml.kg^{-1}.min^{-1)}$ (Heyward, 2010). Furthermore, aerobic fitness scores demonstrated that students in this study were not as aerobically fit as students in Greece. The mean VO_2max of students in the current study was 33.43 $ml.kg^{-1}.min^{-1}$ while the Greek students presented with a mean VO_2max of 46 $ml.kg^{-1}.min^{-1}$.

Due to the low to middle socio-economic status of students in this study, many students commute by foot, i.e walking. The researcher believes that many students identify activities such as walking as a means of travel, and not necessarily as a method that may be used to improve health and wellness. Whilst the students indicate that they walk regularly, this however does not appear to correspond to an improved aerobic fitness score. The poor aerobic fitness does not indicate that students walk long distances, however this could be due to the possible low intensity of walking.

Overall, the physical fitness levels of participants did not show any significant changes between the years of study, although fitness scores were of concern. The general physical fitness levels of students were found to be fairly poor. Most results were categorised below general norms as well as age-specific norms when compared with peers of the same age (Heyward, 2010).

CHAPTER SIX

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

This chapter aims to conclude the research and propose recommendations for future studies.

- Overall results showed that there was a significant variation between first, second and third year students. Thus, the weight and body fat percentage, along with the body mass index, waist circumference and waist-to-hip ratios were the lowest among the first year cohort, and highest among the third year cohort. The reported increases, for each year cohort are a concern and may be associated with low physical activity levels and poor dietary habits.

- A decrease in physical activity frequency and participation may be the cause of the reported decrease in physical fitness levels. This area of concern may be a major factor related to the general increase in anthropometric measurements. Also prevalent was the variance in results between males and females, with males accounting for 72.9% of regular exercisers. The discrepancy in gender and physical activity and fitness levels is of concern.

- The results of this study indicate that students appear to be making poor decisions in regard to their nutrition. Students reported eating main meals

(breakfast, lunch and dinner) with very few snacking between meals. Those who did snack generally made poor choices with fruit low on the list. Students' nutrition and dietary habits are a great concern, which requires greater insight and discussion.

- Exercise is not only beneficial in improving health and fitness but can help improve self-awareness and ability to cope with stress, all important factors for coping at university.

- Based on the outcomes of this study, the null hypothesis is not fully refuted. Rather it would appear that irrespective of the fact that the students are registered for a Sport Management qualification, there should be a greater concern or interest for their overall health and fitness. However these results do not indicate a positive relationship, but rather this cohort of students are characterised by declining levels of physical activity between first, second and third years and take poor decisions in terms of nutrition.

- Finally, a limitation of this study is that the sample is a representation of a cohort of undergarduate students from a selected department within the university, therefore generalisations to the university population cannot be inferred.

6.2 Recommendations

Based on the results, discussion and conclusion, the following recommendations are warranted:

- Universities should adopt a greater responsibility for the health and wellness of the student population. Universities should have a vested interest in the health and physical activities of their students who are ‘central’ to their existence. A student who is healthier and more physically active could achieve greater levels of academic success. Further research should attempt to determine a relationship between university wellness programmes and student success and throughput.

- The introduction of educational programmes on general health and nutritional guidelines should be offered to all students as part of the university curriculum.

- Education and awareness campaigns are to ensure undergraduate students are provided with the correct knowledge to make informed decisions as to their dietary health and lifestyle habits.

- Universities could engage students on campus by creating facilities and an environment that promote physical activity and healthy living. Universities

need to create a platform for exercise programmes to be developed and implemented to encourage participation and adherence to the programmes.

- International and local universities use the medium of sport to attract publicity. It is recommended that universities encourage sport participation for all students, not only on a competitive level but on a social level as well.

- Although selected students did engage in physical activity, specifically training at the university gym, the frequency was low. Therefore, university gym facilities should have trained staff who can advise students on proper training programmes and methods.

- Further research into the student population could focus on motivation factors affecting physical activity adherence. This could identify the causes of low participation rates. Furthermore, research into the facilities and programmes that exist at universities and the success rates of these for the health benefits of students needs to be explored.

REFERENCES

Adair, L. S., Martorell, R., Stein, A. D., Hallal, P. C., Sachdev, H. S., Prabhakaran, D., & Victora, C. G. (2009). Size at birth, weight gain in infancy and childhood, and adult blood pressure in 5 low- and middle-income-country cohorts: when does weight gain matter? *The American Journal of Clinical Nutrition, 89*(5), 1383-1392. doi: 10.3945/ajcn.2008.27139

Åkerstedt, T., & Nilsson, P. M. (2003). Sleep as restitution: an introduction. *Journal of Internal Medicine, 254*(1), 6-12. doi: 10.1046/j.1365-2796.2003.01195.

AI-Isa, A. N. (1999). Obesity among Kuwait University students: an explorative study. *The Journal of the Royal Society for the Promotion of Health, 119*(4), 223-227. doi: 10.1177/146642409911900404

Al-Rethaiaa, A. S., Fahmy, A. A., & Al-Shwaiyat, N. M. (2010). Obesity and eating habits among college students in Saudi Arabia: a cross sectional study. *Nutrition Journal, 9*, 39-39. doi: 10.1186/1475-2891-9-39

American College of Sports Medicine. (2013). *Guidelines for Exercise Testing and Prescription* (7th ed.). Lippincott, Williams & Wilkins.

Ayas, N. T., White, D. P., Al-Delaimy, W. K., Manson, J. E., Stampfer, M. J., Speizer, F. E., & Hu, F. B. (2003). A Prospective Study of Self-Reported Sleep Duration and Incident Diabetes in Women. *Diabetes Care, 26*(2), 380-384. doi: 10.2337/diacare.26.2.380

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). The alcohol use disorders identification test. *Guidelines for use in primary care, 2*.

Behrens, T. K., & Dinger, M. K. (2003). A Preliminary Investigation of College Students' Physical Activity Patterns. *American Journal of Health Studies, 18*(2/3), 169-172.

Bloemhoff, H. J. (2010). Gender- and race-related physical activity levels of South African university students. *African Journal for Physical, Health Education, Recreation & Dance*, 25-35.

Bloemhoff, H. J., & Coetzee, N. A. J. (2007). Sport and recreation participation : the transition from grade 12 to third-year at university : recreation and leisure. *13*(2), 149-161. http://reference.sabinet.co.za/webx/access/electronic_journals/ajpherd/ajpherd_v13_n2_a5.pdf

Bodiba, P. (2008). The relationship between body mass index and self-concept among adolescent black female university students. *Curationis (Pretoria), 31*(1), 77. doi: 10.4102/curationis.v31i1.917

Boyle, J. R., & LaRose N. R. (2008). Personal Beliefs, The Environment and College Students' Exercise and Eating Behaviors. *American Journal of Health Studies, 23*(4), 195.

Bradshaw, D., Groenewald, P., Laubscher, R., Nannan, N., Nojilana, B., Norman, R., & Timæus, I. M. (2003). Initial burden of disease estimates for South Africa, 2000: original article. *South African Medical Journal, 93*(9), p. 682-688.

Bray, S. R., & Born, H. A. (2004). Transition to University and Vigorous Physical Activity: Implications for Health and Psychological Well-Being. *Journal of American College Health, 52*(4), 181-188. doi: 10.3200/JACH.52.4.181-188

Buckworth, J., & Nigg, C. (2004). Physical Activity, Exercise, and Sedentary Behavior in College Students. *Journal of American College Health, 53*(1), 28-34. doi: 10.3200/JACH.53.1.28-34

Butler, S. M., Black, D. R., Blue, C. L., & Gretebeck, R. J. (2004). Change in diet, physical activity, and body weight in female college freshman. *American journal of health behavior, 28*(1), 24-32.

Caldeira, K. M., O'Grady, K. E., Garnier-Dykstra, L. M., Vincent, K. B., Pickworth, W. B., & Arria, A. M. (2012). Cigarette Smoking Among College Students: Longitudinal Trajectories and Health Outcomes. *Nicotine & Tobacco Research, 14*(7), 777-785.

Cash, T. F., & Pruzinsky, T. (2004). *Body image: A handbook of theory, research, and clinical practice*: The Guilford Press.

Chaput, J-P., Després, J-P., Bouchard, C., & Tremblay, A. (2011). The association between short sleep duration and weight gain is dependent on disinhibited eating behavior in adults. *Sleep, 34*(10), 1291-1297. doi: 10.5665/SLEEP.1264

Cilliers, J. (2004). *Impact of a multidimensional weight-management programme on the weight status and associated factors of first-year female students.* Stellenbosch: Stellenbosch University.

Dawson, K. A., Schneider, M. A., Fletcher, P. C, & Bryden, P. J. (2007). Examining gender differences in the health behaviors of Canadian university students. *The Journal of the Royal Society for the Promotion of Health, 127*(1), 38-44

De Vahl, J., King, R., & Williamson, J. W. (2005). Academic Incentives for Students Can Increase Participation in and Effectiveness of a Physical Activity Program. *Journal of American College Health, 53*(6), 295.

Devanathan, R., Esterhuizen, T. M., & Govender, R. D. (2013). Overweight and obesity amongst Black women in Durban, KwaZulu-Natal: A 'disease' of perception in an area of high HIV prevalence. *Surpoids et obésité parmi les femmes noires à Durban, KwaZulu-Natal: Une « maladie » de la perception dans une région à forte prévalence de VIH en Afrique du Sud., 5*(1), 1-7. doi: 10.4102/phcfm.v5i1.450

Di Franza, J. R. (2008). Hooked from the first cigarette. *Scientific American, 298*(5), 82-87.

Dollman, J., Ridley, K., Olds, T., & Lowe, E. (2007). Trends in the duration of school-day sleep among 10- to 15-year-old South Australians between 1985 and 2004. *Acta Paediatrica, 96*(7), 1011-1014. doi: 10.1111/j.1651-2227.2007.00278.x

Edwards, J. S. A., & Meiselman, H. L. (2003). Changes in dietary habits during the first year at university. *Nutrition Bulletin, 28*(1), 21-34. doi: 10.1046/j.1467-3010.2003.00306.x

Eisenberg, M. E., Neumark-Sztainer, D., & Lust, K. D. (2005). Weight-related issues and high-risk sexual behaviors among college students. *Journal of American College Health, 54*(2), 95-101.

Eurofit (1993). *Handbook for the Eurofit tests of physical fitness*. (2nd ed). Strasbourg.

Feeley, A., Musenge, E., Pettifor, J. M., & Norris, S. A. (2012). Changes in dietary habits and eating practices in adolescents living in urban South Africa: The birth to twenty cohort. *Nutrition, 28*(7–8), e1-e6. doi: http://dx.doi.org/10.1016/j.nut.2011.11.025

Fiore, M. C. (2000). US Public Health Service clinical practice guideline: treating tobacco use and dependence. *Respiratory Care, 45*(10), 1200-1262.

Forquer, L. M., Camden, A. E., Gabriau, K. M., & Johnson, C. M. (2008). Sleep Patterns of College Students at a Public University. *Journal of American College Health, 56*(5), 563-565.

García-Álvarez, A., Serra-Majem, L., Ribas-Barba, L., Castell, C., Foz, M., Uauy, R., & Salleras, L. (2007). Obesity and overweight trends in Catalonia, Spain (1992–2003): gender and socio-economic determinants. *Public Health Nutrition, 10*(11A), 1368-1378. doi: doi:10.1017/S1368980007000973

Gasbarrini, A., & Piscaglia, A-C. (2005). A Natural Diet Versus Modern Western Diets? A New Approach to Prevent “Well-Being Syndromes”. *Digestive Diseases and Sciences, 50*(1), 1-6. doi: 10.1007/s10620-005-1268-y

Groeger, J. A., Zijlstra, F. R. H., & Dijk, D. J. (2004). Sleep quantity, sleep difficulties and their perceived consequences in a representative sample of some 2000 British adults. *Journal of Sleep Research, 13*(4), 359-371. doi: 10.1111/j.1365-2869.2004.00418.x

Gropper, S. S., Simmons, K. P., Gaines, A., Drawdy, K., Saunders, D., Ulrich, P., & Connell, L. J. (2009). The Freshman 15—A Closer Look. *Journal of American College Health, 58*(3), 223-231.

Halperin, A. C., Smith, S. S., Heiligenstein, E., Brown, D., & Fleming, M. F. (2009). Cigarette smoking and associated health risks among students at five universities. *Nicotine & Tobacco Research*. doi: 10.1093/ntr/ntp182

Haskell, W. L, Lee, I-M., Pate, R. R, Powell, K. E, Blair, S. N, Franklin, B. A, & Bauman, A. (2007). Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation, 116*(9), 1081.

Hattingh, Z., Walsh, C. N., Veldman, F. J., Bester, C. J., & Oguntibeju, O. O.. (2008). Anthropometric and biochemical profiles of black south african women. *African Journal of Biomedical Research, 11*(2).

Heyward, V. H. (2010). *Advanced Fitness Assessment and Exercise Prescription* (6th ed.). Champaign: Human Kinetics.

Hicks, R. A., Fernandez, C., & Pellegrini, R. J. (2001). The Changing Sleep Habits of University Students: An Update. *Perceptual and Motor Skills, 93*(3), 648-648. doi: 10.2466/pms.2001.93.3.648

Howel, D. (2012). Trends in the prevalence of abdominal obesity and overweight in English adults (1993-2008). *Obesity (Silver Spring, Md.), 20*(8), 1750-1752. doi: 10.1038/oby.2011.127

Hoyland, A., Dye, L., & Lawton, C. L. (2009). A systematic review of the effect of breakfast on the cognitive performance of children and adolescents. *Nutrition Research Reviews, 22*(02), 220-243.

Hublin, C., Partinen, M., Koskenvuo, K., Silventoinen, K., Koskenvuo, M., & Kaprio, J. (2010). Shift-work and cardiovascular disease: a population-based 22-year follow-up study. *European Journal Of Epidemiology, 25*(5), 315-323. doi: 10.1007/s10654-010-9439-3

Jeffery, R. W., & French, S. A. (1998). Epidemic obesity in the United States: are fast foods and television viewing contributing? *American journal of public health, 88*(2), 277-280.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2011). Monitoring the Future National Survey Results on Drug Use, 1975-2010. Volume I, Secondary School Students. *Institute for Social Research*.

Kasparek, D., Gilmore-Corwin, S. J., Valois, R. F. Sargent, R. G. Morris, R. L. (2008). Selected Health Behaviors That Influence College Freshman Weight Change. *Journal of American College Health, 56*(4), 437.

Katch, V. L., McArdle, W. D., Katch, F. I.,(2011) Essentials of Exercise Physiology, 7th Edition. Lippincott, Williams and Wilkiins.

Kazi, H. A., & Coopoo, Y. (2010). Physical activity, alcohol use, smoking and dietary profiles of a cohort of university students. *African Journal for Physical, Health Education, Recreation & Dance*, 104-118.

Keating, X. D., Guan, J., Castro-Piñero, J., & Bridges, D. M. (2005). A Meta-Analysis of College Students' Physical Activity Behaviors. *Journal of American College Health, 54*(2), 116.

Labadarios, D., Steyn, N. P., Maunder, E., MacIntryre, U., Gericke, G., Swart, R, Huskisson, J., Dannhauser, A., Vorster, H. H., Nesmvuni, A. E. (2005). The national food consumption survey (NFCS): South Africa, 1999. *Public health nutrition, 8*(05), 533-543.

Lebovitz, H. E. (2003). The relationship of obesity to the metabolic syndrome. *International journal of clinical practice. Supplement*(134), 18-27.

Léger, L. A., Mercier, D., Gadoury, C., & Lambert, J. (1988). The multistage 20 metre shuttle run test for aerobic fitness. *Journal of Sports Sciences, 6*(2), 93-101. doi: 10.1080/02640418808729800

Leichliter, J. S., Meilman, P. W., Presley, C. A., & Cashin, J. R. (1998). Alcohol Use and Related Consequences Among Students With Varying Levels of Involvement in College Athletics. *Journal of American College Health, 46*(6), 257-262. doi: 10.1080/07448489809596001

Levitsky, D. A., Halbmaier, C. A., & Mrdjenovic, G. (2004). The freshman weight gain: a model for the study of the epidemic of obesity. *International Journal of Obesity & Related Metabolic Disorders, 28*(11), 1435-1442. doi: 10.1038/sj.ijo.0802776

Lewin, Kurt. (1943). Forces behind food habits and methods of change. *Bulletin of the national Research Council, 108*, 35-65.

Liguori, G., Schuna, J., & Mozumdar, A. (2011). Semester Long Changes in Sleep Duration for College Students. *College Student Journal, 45*(3), 481.

Lilja, M., Eliasson, M., Stegmayr, B., Olsson, T., & Söderberg, S. (2008). Trends in Obesity and Its Distribution: Data From the Northern Sweden MONICA Survey, 1986–2004. *Obesity, 16*(5), 1120-1128. doi: 10.1038/oby.2008.8

Lowry, R., Wechsler, H., Galuska, D. A., Fulton, J. E., & Kann, L. (2002). Television viewing and its associations with overweight, sedentary lifestyle, and insufficient consumption of fruits and vegetables among US high school students: differences by race, ethnicity and gender. Journal of school health, 72(10), 413-421.

Lua, L. P., & Elena, W. D. W. P. (2012). The Impact of Nutrition Education Interventions on the Dietary Habits of College Students in Developed

Nations: A Brief Review. *Malaysian Journal of Medical Sciences, 19*(1), 4-18.

Lubbe, A. M. (1973). Nutritional status survey of Pretoria schoolchildren from four racial groups. *South African medical journal= Suid-Afrikaanse tydskrif vir geneeskunde, 47*(16), 679-687.

Madu, S. N., & Matla, M-Q. P. (2003). Illicit drug use, cigarette smoking and alcohol drinking behaviour among a sample of high school adolescents in the Pietersburg area of the Northern Province, South Africa. *Journal of Adolescence, 26*(1), 121-136. doi: http://dx.doi.org/10.1016/S0140-1971(02)00120-3

Margoti, T. (2009). Comparison of Results Between the Equations of Body Composition of Jackson & Pollock of Three and Seven Skinfolds. *8*(3), 191-198. doi: 10.3900/fpj.8.3.191.e

Mazic, S., Djelic, M., Suzic, J., Suzic, S., Dekleva, M., Radovanovic, D., & Starcevic, V. (2009). Overweight in trained subjects–are we looking at wrong numbers?(Body mass index compared with body fat percentage in estimating overweight in athletes.). *Gen Physiol Biophys, 28*, 200-204.

Meckel, Y., Galily, Y., Nemet, D., & Eliakim, A. (2011). Changes in weight indexes and aerobic fitness of physical education students over three years of college. *Journal of Human Sport & Exercise, 6*(1), 112-121.

Miller, K., Staten, R. R., Rayens, M. K., & Noland, M. (2005). Levels and Characteristics of Physical Activity among a College Student Cohort. *American Journal of Health Education, 36*(4), 215-220. doi: 10.1080/19325037.2005.10608187

Moore, L., Moore, G. F, Tapper, K., Lynch, R., Desousa, C., Hale, J., Murphy, S. (2007). Free breakfasts in schools: design and conduct of a cluster randomised controlled trial of the Primary School Free Breakfast Initiative in Wales [ISRCTN18336527]. *BMC Public Health, 7*(1), 258.

Morar, N., Seedat, Y. K., Naidoo, D. P., & Desai, D. K. (1998). Ambulatory Blood Pressure and Risk Factors for Coronary Heart Disease in Black and Indian Medical Students. *Journal of Cardiovascular Risk, 5*(5-6), 313-318. doi: 10.1177/174182679800500505

Nelson, T. F., Gortmaker, S. L., Subramanian, S. V., Cheung, L., & Wechsler, H. (2007). Disparities in Overweight and Obesity Among US College Students. *American Journal of Health Behavior, 31*(4), 363-373. doi: 10.5993/AJHB.31.4.3

Ogden, C. L., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of overweight and obesity in the united states, 1999-2004. *Journal of American Medical Association, 295*(13), 1549-1555. doi: 10.1001/jama.295.13.1549

Olusanya, J. O., & Omotayo, O. A. (2011). Prevalence of obesity among undergraduate students of Tai Solarin University of Education, Ijagun, Ijebu-Ode. *Pak J Nutr, 10*, 940-946.

Patrick, H., & Nicklas, T. A. (2005). A review of family and social determinants of children's eating patterns and diet quality. *Journal Of The American College Of Nutrition, 24*(2), 83-92

Peltzer, K. (2002). Health-Promoting Lifestyles and Personality Among Black South African Students. *Social Behavior & Personality: An International Journal, 30*(4), 417.

Peltzer, K., & Pengpid, S. (2012). Body Weight and Body Image among a Sample of Female and Male South African University Students. *Gender & Behaviour, 10*(1), 4509-4522.

Pengpid, S., Peltzer, K., van der Heever, H., & Skaal, L. (2013). Screening and brief interventions for hazardous and harmful alcohol use among university

students in South Africa: results from a randomized controlled trial. *International journal of environmental research and public health, 10*(5), 2043-2057.

Phiri, L. L., Debusho, Legesse, K., & Mashegoane, S. (2011). Psychosocial Correlates of Smoking Behaviour Among Students at a Historically Black University. *Journal of Psychology in Africa, 21*(3), 447-450.

Pollack, M. L., Schmidt, D. H., & Jackson, A. S. (1980). Measurement of cardio-respiratory fitness and body composition in the clinical setting. *Comprehensive Therapy, 6*(9), 12.

Popkin, B. M, Adair, L. S., & Ng, S. W. (2012). Global nutrition transition and the pandemic of obesity in developing countries. *Nutrition reviews, 70*(1), 3-21.

Popovac, M., Mwaba, K., & Roman, N. V. (2011). Smoking behaviour, risk perception and attitudes toward anti-smoking legislation among a sample of South African students. *African Journal for Physical, Health Education, Recreation & Dance, 17*(3), 473-480.

Primack, B. A., Sidani, J., Agarwal, A. A., Shadel, W. G., Donny, E. C., & Eissenberg, T. E. (2008). Prevalence of and associations with waterpipe

tobacco smoking among US university students. *Annals of behavioral medicine, 36*(1), 81-86.

Puoane, T., Fourie, J. M., Shapiro, M., Rosling, L., Tshaka, N. C., & Oelefse, A. (2005). 'Big is beautiful'-an exploration with urban black community health workers in a South African township. *South African Journal of Clinical Nutrition, 18*(1), p. 6, 8-11, 14-15.

Rampersaud, G. C., Pereira, M. A., Girard, B. L., Adams, J., & Metzl, J. D. (2005). Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. *Journal of the American Dietetic Association, 105*(5), 743-760.

Rasheed, P., Abou-Hozaifa, B. M., & Khan, A. (1994). Obesity among young Saudi female adults: a prevalence study on medical and nursing students. *Public Health (Nature), 108*(4), 289-294. doi: 10.1016/S0033-3506(94)80008-1

Reddy, P., Meyer-Weitz, A., & Yach, D. (1996). Smoking status, knowledge of health effects and attitudes towards tobacco control in South Africa. *South African Medical Journal - Cape Town - Medical Association of South Africa, 86*, 1389-1393.

Reddy, S. P. Resnicow, K., James, S., Funani, I. N., Kambaran, N. S., Omardien, R. G., Masuka, P., Sewpaul, R., Vaughan, R. D., & Mbewu, A. (2012). Rapid Increases in Overweight and Obesity Among South African Adolescents: Comparison of Data From the South African National Youth Risk Behaviour Survey in 2002 and 2008. *American Journal of Public Health, 102*(2), 262. doi: 10.2105/AJPH.2011.300222

Reed, J. A., & Phillips, D. A. (2005). Relationships Between Physical Activity and the Proximity of Exercise Facilities and Home Exercise Equipment Used by Undergraduate University Students. *Journal of American College Health, 53*(6), 285.

Reid, A, & Baker, F. C. (2008). Perceived sleep quality and sleepiness in South African university students. *South African Journal of Psychology, 38*(2), 287-303.

Richter, L., Panday, S., Emmett, T., Makiwane, M., du Toit, R., Brooks, H, & Mukhara, M. (2006). Young people in South Africa: The status of youth report 2003—Final report: Research commissioned by the Umsobomvu Youth Fund. Pretoria: Human Sciences Research Council.

Rock, V. J., Malarcher, A., Kahende, J. W., Asman, K., Husten, C., & Caraballo, R. (2007). Cigarette smoking among adults—United States, 2006. Morbidity and Mortality Weekly Report, 56, 1157–1161.

Rosenheck, R. (2008). Fast food consumption and increased caloric intake: a systematic review of a trajectory towards weight gain and obesity risk. *Obesity Reviews, 9*(6), 535-547.

Sandercock, G. R. H., Voss, C., & Dye, L. (2010). Associations between habitual school-day breakfast consumption, body mass index, physical activity and cardiorespiratory fitness in English schoolchildren. *European journal of clinical nutrition, 64*(10), 1086-1092.

Satia, J. A., Galanko, J. A., & Siega-Riz, A. M. (2004). Eating at fast-food restaurants is associated with dietary intake, demographic, psychosocial and behavioural factors among African Americans in North Carolina. *Public health nutrition, 7*(08), 1089-1096.

Shang-Min, M., Yue, T., Shang-Chun, M., & Tzi-Li, L. (2012). Relationship Between Sedentary and Active Leisure Participation Among Midwestern College Students. *South African Journal for Research in Sport, Physical Education & Recreation (SAJR SPER), 34*(1), 107-122.

Siddiqui, M. N. A., Sultana, S., Sharif, T., & Ekram, A. R. M. S. (2011). Smoking habits of medical students in a private medical college of Bangladesh. *Bangladesh Journal of Medical Science, 10*(4), 280-283.

Simmons, K., Connell, L. J., Ulrich, P., Skinner, H., Balasubramanian, M., & Gropper, S. (2011). Body Image and Body Satisfaction for College Freshmen: Investigation into the Fabled "Freshman 15". *International Journal of Health & Wellness, 1*(1), 117-126.

Simpson, W. F., Brehm, H. N., Rasmussen, M. L., Ramsay, J., & Probst, J. C. (2002). Health and Fitness Profiles of Collegiate Undergraduate Students. *Journal of Exercise Physiology Online, 5*(3), 14-27.

South Africa. Medical Research Council (2003): South Africa Demographic and Health Survey .

Spanos, D., & Hankey, C. R. (2010). The habitual meal and snacking patterns of university students in two countries and their use of vending machines. *Journal of Human Nutrition & Dietetics, 23*(1), 102-107. doi: 10.1111/j.1365-277X.2009.01005.x

Steyn, N. P., Senekal, M., Brits, S., & Nel, J. (2000). Urban and rural differences in dietary intake, weight status and nutrition knowledge of black female students. *Asia Pacific Journal of Clinical Nutrition, 9*(1), 53-59. doi: 10.1046/j.1440-6047.2000.00137.x

Stovitz, S. D., & Batt, M. E. (2010). The epidemic has gone global: can Exercise is Medicine help quell the tide? *British Journal Of Sports Medicine, 44*(10), 693-693. doi: 10.1136/bjsm.2010.077073

Tsigilis, N., Douda, H., & Tokmakidis, S. P. (2002). Test-retest reliability of the Eurofit test battery administered to university students. *Perceptual and motor skills, 95*(3f), 1295-1300.

United States. Centers for Disease Control and Prevention (CDC) : National Health and Nutrition Examination Survey (NHANES) 2005-2006

United States. Department of Health and Human Services (2000). *Healthy People 2010*. Centers for Disease Control

United States. Department of Health and Human Services (2008). *Physical Activity Guidelines for Americans*. Centers for Disease Control

Van den Berg, V. L., Okeyo, A. P., Dannhauser, A., & Nel, M. (2012). Body weight, eating practices and nutritional knowledge amongst university nursing

students, Eastern Cape, South Africa. *Poids corporel, pratiques alimentaires et connaissances en matière de nutrition parmi les étudiants en sciences infirmières, Cap Oriental, Afrique du Sud., 4*(1), 1-9. doi: 10.4102/phcfm.v4i1.323

Van der Merwe, M. T., & Pepper, M. S. (2006). Obesity in South Africa. *Obesity Reviews, 7*(4), 315-322. doi: 10.1111/j.1467-789X.2006.00237.x

Van Niekerk, E., & Barnard, J. G. (2011). Health and Lifestyle Practices Among Female Students in a South African University Setting. *College Student Journal, 45*(3), 649.

Visser, M., & Routledge, L-A. (2007). Substance abuse and psychological well-being of South African adolescents. *South African Journal of Psychology, 37*(3), 595-615.

Wetter, A. C., Wetter, T. J., & Schoonaert, K. J. (2013). Fitness and Health in College Students: Changes across 15 Years of Assessment. *Journal of Exercise Physiology Online, 16*(5), 1-9.

World Health Organisation. (2000). *Obesity: preventing and managing the global epidemic*: World Health Organisation.

World Health Organisation. (2011). *Global Status Report on Alcohol and Health*: World Health Organisation.

Wood, R. Image of Bleep Test. Accessed June 20, 2014. http://www.topendsports.com/testing/images/beep-test-diagram.gif

Yahia, N., El-Ghazale, H., Achkar, A., & Rizk, S. (2011). Dieting practices and body image perception among Lebanese university students. *Asia Pacific Journal Of Clinical Nutrition, 20*(1), 21-28.

Young, C., & de Klerk, V. (2009). Patterns of alcohol use on a South African university campus: The findings of two annual drinking surveys. *African Journal of Drug & Alcohol Studies, 7*, 101-112.

Zverev, Y. (2008). Problem drinking among university students in Malawi. *Collegium antropologicum, 32*(1), 27-31.

Appendices

Appendix One

- Letter to the Dean
- Letter to the Acting HOD
- Letter to the Durban University of Technology: Research Office

Appendix Two

- Questionnaire (English)
- Questionnaire (isiZulu)

Appendix Three

- Fitness evaluation form

Appendix Four

- Informed consent (English)
- Informed consent (IsiZulu)

6.1 Appendix One

36 Lambert Rd

11 Lambert Walk

Morningside

Durban

Attention: Dean of Applied Sciences

Dear Professor Lortan,

RE: Permission to conduct a research on Sport Studies students

I am currently registered as a Masters student (Discipline of Biokinetics, Exercise and Leisure Sciences) at the University of KwaZulu Natal.

I write to you as my intentions for research relate to the "THE HEALTH AND FITNESS PROFILES OF SPORT STUDIES STUDENTS AT A TERTIARY INSTITUTION IN SOUTH AFRICA."

My request is that I would like the students in the Sport Studies Department at Durban University of Technology to participate in the study.

My super visor is Dr. Rowena Naidoo and she is available on naidoor3@ukzn.ac.za or on 031 260 8235 for further enquiry.

I look forward to your response.

Kind regards,

Greg Glossop

(Lecturer: Department of Sport Studies)

Cell: 084 608 3186

36 Lambert Road
11 Lambert Walk
Morningside
Durban
4001

Attention: HOD (Acting) Department of Sport Studies

Dear Mr. Bongani Yengwa,

Re: Permission to conduct research on Sport Studies students

I am currently registered as a Masters student (Discipline of Biokinetics, Exercise and Leisure Sciences) at the University of KwaZulu-Natal.
I write to you as my intentions for research relate to “THE HEALTH AND FITNESS PROFILES OF SPORT STUDIES STUDENTS AT A TERTIARY INSTITUTION IN SOUTH AFRICA.”
My request is that I would like the students in the Sport Studies Department at the University of Technology to participate in the study.
My supervisor is Dr. Roweena Naidoo and she is available on naidoor3@ukzn.ac.za or on 031 260 8235 for further enquiry.
I look forward to your response.
Kind Regards,
Greg Glossop
Lecturer: Department of Sport Studies
031 373 5744

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UNIVERSITY OF
TECHNOLOGY

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17th September 2014

Mr Greg Glossop
c/o Department of Bio kinetics, Exercise and Leisure Sciences,
University of KwaZulu-Natal

Dear Mr Glossop

PERMISSION TO CONDUCT RESEARCH AT THE DUT

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research Committee (IRC) has granted permission for you to conduct your research at the Durban University of Technology.

We would be grateful if a summary of your key research findings can be submitted to the IRC on completion of your studies.

Kindest regards.
Yours sincerely

PROF. S. MOYO
DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT

6.2 Appendix Two

HEALTH AND PHYSICAL ACTIVITY QUESTIONNAIRE

A DEMOGRAPHIC DATA

YEAR OF STUDY : ……. COURSE : …….

AGE : ……. GENDER : ……..

HEIGHT : ……(m) WEIGHT ……(kg) BMI = ……..

WAIST : ……(cm) HIP : ……(cm) RATIO =……..

B PHYSICAL ACTIVITY PROFILES

1. Do you exercise on a regular basis? Yes No

Indicate whether: daily 2x per week 3-4 x per week >5 x per week

2. What type of sport or physical activity are you engaged in during campus hours?

Type of sport/physical activity	**How often weekly?**								**Duration of activity in minutes**				
	0	1	2	3	4	5	6	7	30	60	120	180	240

3. What type of sport or physical activity activity are you engaged in after campus hours?

Type of sport/physical activity	**How often weekly?**									**Duration of activity in minutes**						
	0		1	2	3	5	6	7		30	60	120	180	240		

C : SMOKING AND DRINKING PROFILE

4. Smoking Habits ;

4.1 Have you smoked cigarettes? Yes No

4.2 Do you smoke presently? Yes No

4.3 At what age did you start smoking? ……years

4.4 If you have quit smoking, when did you quit? ……..

5. Drinking Habits :

5.1 During the past month, how many days did you drink alcoholic beverages?

……..days

5.2 During the past month, how many times did you have five or six more drinks per occasion? ……..times

5.3 On the average, how many glasses of beer, wine, or spirits do you consume per week?

Beer ……..glasses

Wine …….glasses

Spirits …….glasses

Other ……glasses

C : DIETARY PROFILE

6. Eating Habit

6.1 Which do you eat regularly?

Breakfast Midafternoon snack

Midmorning snack Dinner

Lunch After-dinner snack

6.2 How often do you eat out? …….times per week

6.3 What size portions do you normally have?

Small Moderate Large

Extra large Uncertain

6.4 How often do you eat more than one serving?

Always Usually Sometimes Never

6.5 How long does it normally take you to finish a meal? …….minutes

6.6 Do you eat while doing other activities ? (watching TV, reading, working)

Yes / No

If yes, what activity ……..

6.7 When you snack, how many times per day do you generally eat the following?

Cookies, cake, pie…….. Diet soda ……

Soft drinks …….	Fruit …….
Milk or milk beverage ……	Potato chips …….
Peanuts or other nuts ……	Ice cream ……..
Cheese and/or crackers ……	Doughnuts ……
Candy ……	Other …….

6.8 How often do you eat dessert?

Occassionally Daily 2-4 times per week

6.9 How often do you eat fried foods?

1- 2 times per week 3-4 times per week 5-7 times per week

D : GENERAL LIFESTYLE PROFILE

7. Do you feel stressed at home? Yes / No If yes, why
……
……
……

8. Do you feel stressed at campus? Yes / No If yes, why……

……
……
……

9 Are you stressed about your personal safety? Yes / No If yes, why…….

……
……
……

10. Do you wear a seatbelt while driving or as passenger? Yes / No

11. Do you own a cellular phone? Yes / No

12 How many times per day do you SMS friends?

0-3 4-10 11-15 16-20 >20

UHLA LWEMIBUZO NGOKUNYAKAZISWA KOMZIMBA NEZEMPILO

A : DEMOGRAPHIC DATA

UNYAKA WOKUFUNDA: …… I- COURSE:……

UBUDALA : …… UBULILI :……

UBUDE …… (m) ISISINDO ……(kg) BMI:……..kg/m²

UKHALO ……(cm) INSINQE ……(cm) I- RATIO …….

B: UHLELO LWEMININGWANE NGEZOKUVOCAVOCA UMZIMBA

1 Ujwayele ukunyakazisa umzimba Yebo □ Cha □

Shono noma : nsukuzonke 2x ngesonto 3-4 x ngesonto >5x ngesonto

2. Yimuphi umdlalo noma uhlobo lokuvocavoca umzimba olwenzayo ngesikhathi sokufunda lapha ekhampasini ?

Uhlobo lomdlalo/noma lokuvocavoca umzimba	**Kangaki ngesonto ?**								**Isikhathi osithathayo ukwenza lokhu.**				
	0	1	2	3	4	5	6	7	30	60	120	180	240

3. Yimuphi umdlalo noma uhlobo lokuvocavoca umzimba olwenzayo ngemuva kwamahora okufunda ekhampasini?

Uhlobo lomdlalo/ noma osithathayo ukwenza lokhu lokuvocavoca umzimba	**Kangaki ngesonto** ?							**Isikhathi**			
	0	1	2	3	4	5	6	30	60	90	120

C: UHLA NGOKUBHEMA KANYE NOKUPHUZA

4. Imikhuba yokubhema

4.1 Uke wawubhema ugwayi ? Yebo □ Cha □

4.2 Ngabe usaqhubeka nokubhema? Yebo □ Cha □

4.3 Uqale uneminyaka emingaki ukubhema ? ----------iminyaka

4.4 Uma usuhlukene nokubhema , uyeke nini ?.....

5. Imikhuba yokuphuza

5.1 Kulenyanga edlule zingaki izinsuku ophuze ngazo isiphuzo esidakayo?

……..izinsuku.

5.2 Kulenyanga edlule zingaki izikhathi lapho uphinde khona isiphuzo kwaze kwakahlanu noma kasithupha umcimbi ngamunye

……..izikhathi.

5.3 Ngokuvamile, uphuza izingilazi ezingaki zikabhiya, iwayini, noma ugologo ngesonto ?

Ubhiya……. Izingilazi

Iwayini ……. Izingilazi

Ugologo ……izingilazi

Okunye ……. Izingilazi

D: UHLA NGENDLELA YOKUDLA

6. Imikhuba Yokudla

6.1 Yikuphi ovame ukukudla ?

Ibhulakufesi □

Okuncane kokusula umlomo emini yantambama.. □

Okuncane kokusula umlomo emini yasekuseni □

Isidlo santambama □

Isidlo sasemini □

Okuncane kokusula umlomo emva kwesidlo sasebusuku □

6.2 Uphuma kangaki ngesonto ukuyodla ngaphandle ? ……

6.3. Isilinganiso sokudla ovamise ukukudla ngabe ?

Okuncane □ Okulingene □ Okugcwele □

Okungaphezu kokugcwele □ Anginasiqiniseko □

6.4 .Ujwayele yini ukuphinda ukudla ?

Njalo □ Kuvamile □ Kuyenzeka nje □

Akwenzeki □

6.5 .Kukuthatha isikhathi esingakanani ukuqeda ukudla?……imizuzu.

6.6. Ngenkathi udla uyakwenza yini lokhu ? (ukubuka iTV, ukufunda noma wenze omunye umsebenzi)

Yebo / Cha

Uma kunjalo, yikuphi ovamise ukukwenza?……

.7 Uma udla okokwesula umlomo, ukudla kangaki lokhu okulandelayo ngosuku ?

Amabhiskidi, amakhekhe, uphaya… Isiphuzo esingenashukela

Isiphuzo esibandayo…… Isithelo……

Ubisi noma isiphuzo esinobisi…….. Amazambane athosiwe……

Amakinati nokusamakinati…… U –ayisikhilimu……

Ushizi / noma ama-crackers…… Amadonathi…….

Uswidi…….. Okunye ……

6.8 Ujwayele ukudla idizethi ?

Akuvamile	Nsukuzonke	2-4 izikhathi ngesonto

6.9 Ukudla okuphekwe ngamafutha uvame ukukudla izikhathi ezingaki?

1-2 ngesonto 3-4 ngesonto 5-7 ngesonto

E: INDLELA YOKUPHILA

7. Kungabe unokukhathazeka yini ekhaya ? Yebo/ Cha. Uma kunjalo, yini imbangela yaloku …..

……
……..……
……

8. Kungabe unokukhathazeka yini ekhampasini ? Yebo/ Cha. Uma kunjalo , yini imbangela yaloku….

……
……
……..

9. Ngabe ukhathazekile yini ngokuphepha kwakho ? Yebo/ Cha. Uma kunjalo yini imbangela…… .

……
……

10. Uyalifaka yini ibhande lapho ushayela, noma ungumgibeli ?Yebo/Cha……

11. Unalo ucingo lwe-cellullar ? Yebo/ Cha

12. Ujwayele ukuthumela ama- SMS amangaki aya kumangani ngelanga?

0-3…… 4-10……...11-15……..16-20……>20…….

6.3 Appendix Three

Testing Evaluation Sheet

Name:_____ Student Number:_____

Surname:_____

Weight:_____ Height: _____

BMI: _____

Resting BP: _____ Resting HR: _____

Waist: _____ Hip: _____

Skinfold Measurements:

Men:

Chest:	_____
Abdomen:	_____
Thigh:	_____
Total:	_____
BF%:	_____

Women:

Tricep:	_____
Suprailiac:	_____
Thigh:	_____
Total:	_____
BF%:	_____

Flexibility:
Sit-and-Reach: _____cm

Hand Grip: L: _____ R: _____

Bent Arm Hang: _____ Seconds

Muscular Strength Endurance: 30 second Sit-ups: _____

Anaerobic Fitness: 10 x 5m Shuttle Run: _____seconds

Standing Broad Jump: _____cm

Aerobic Fitness: Multistage Bleep Test: _____Level ___

6.4 Appendix Four

Information Sheet and Consent to Participate in Research

Date:

Dear Student at Durban University of Technology.

My name is Gregory Glossop, I am a qualified Biokineticist and lecturer at the Durban University of Technology in the field of Sport Management. My email address is gregoryg@dut.ac.za.

You are invited to consider participating in a study that involves research in profiling the health and fitness profiles of Sport Studies students at a tertiary institution in South Africa. The aim and purpose of this research is to identify the health and fitness levels of sport studies students in an attempt to design interventions at the university as well as to develop norms and standards for future students. The study is expected to enroll the majority of students in all three years of study. Participation in the study is limited to protocol completion. It will involve the following procedures.

Testing Protocol

1. Indemnity form explanation and completion
2. Explanation of outcomes of the tests and results
3. Completion of questionnaires
4. Explanation of the tests
5. Measurement of blood pressure, seated
    - Standard upper arm testing with a blood pressure cuff
6. Measurement of resting heart rate
    - Measurement will be taken at the wrist
7. Measurement of height
    - On a scale with a height measurement
8. Measurement of weight
    - On a digital scale
9. Measurement of circumference taken at the level of the waist
    - A same gender tester will place a tape measure around your waist on your skin
10. Measurement of circumference taken at the level of the hip
    - A same gender tester will place a tape measure around your hips
11. A male tester will then perform a three site skinfold measurement (Chest, abdomen and thigh) on all male participants in a private room. A female tester will perform a three site skinfold measurement (Tricep, suprailiac and thigh) on all female participants in a separate private room.
    - A skinfold is performed by pinching the skin and fat in the designated area and placing a device on that site to measure
12. The sit-and-reach test will be explained, demonstrated and then each participant will be given 3 attempts with the best score recorded.
    - The participant will be required to sit on the floor with legs flat out in front of him/her. With one hand on top of the other he/she will then lean forward as far as possible along the length of a ruler
13. The Hand grip test will be explained and demonstrated.

- A small apparatus will be placed in the palm and the participant will have to exert a force on the apparatus to get a result

14. The bent arm hand will be explained and demonstrated.
    - The participant will be required to hang from a suspended bar for as long as possible
15. The sit up test will be explained, demonstrated and participants will receive assistance on the correct technique as well as to have their ankles braced.
    - The participant will be required to perform as many sit ups as possible in one minute
16. Participants will be taken to the field where the remainder of tests will be performed.
17. The shuttle run will be explained, demonstrated.
    - This test requires the participant to run repeatedly between two beacons placed ten metres apart, five times. The floor needs to be touch with both hands on both sides
18. The standing broad jump test will be explained and demonstrated.
    - The participant will be required to jump with both feet as far as possible from a standing start
19. The multistage bleep test will be explained, demonstrated.
    - This test starts slowly and increases in speed until you can no longer maintain the pace. The participant will be required to keep up with the bleeps as indicated on a cd player
20. After testing the participants will be reminded of the possibility of delayed onset muscle soreness and the best methods of treating such pains. Participants will be shown how to stretch and relax the body.

The duration of your participation if you choose to enroll and remain in the study is expected to be for three hours.

The study may involve the following risks and/or discomforts. There is a risk of muscular soreness and muscular fatigue. The researcher will ensure that a proper warm-up is included and will be present during all tests to minimize the chance of potential injury. A first-aid kit will be available as well as a paramedic onsite.

The study will create the following potential benefits; give participants an understanding of their own health and fitness levels and allow them to identify their short-comings and strengths.

This study has been ethically reviewed and approved by the UKZN Biomedical research Ethics Committee (approval number BE359/14).

Participation is entirely voluntary and participants may withdraw at any point without any disadvantage or penalty. Notifications should be made to the researcher should you wish to withdraw.

There will be no costs incurred by participants as a result of participation in the study. Refreshments will be provided after the testing session.

You will be allocated a number and alphabetical code to ensure that confidentiality and anonymity is maintained throughout the study.

Results of this project may be published but any data included will in no way be linked to you. The data collected will be securely stored in such a way that only the researchers will be able to gain access to it. At the end of the project any personal information will be destroyed immediately except that, as in accordance with the University's research policy. Raw data on which the results of the project depend will be retained in a secure storage place for five years, after which will be destroyed by incineration.

If interested, please sign the form to participate in this study.

In the event of any problems or concerns/questions you may contact the researcher at (031 373 5744 / gregoryg@dut.ac.za) or the UKZN Biomedical Research Ethics Committee, contact details as follows:

Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001, Durban, 4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609
Email: BREC@ukzn.ac.za

Thanking you

Researcher: Gregory Glossop
Durban University of Technology
Mobile: 084 608 3186
Email address: gregoryg@dut.ac.za

Supervisor: Dr Rowena Naidoo
University of KwaZulu Natal
Tel work: 031 260 8235
Email: naidoor3@ukzn.ac.za

Consent to participate:

Please sign below to provide consent for your participation in the study.

I …… (name of student) give informed consent to participate in the above-mentioned study. I have read and fully understand the information about the study.

I understand that my participation in the project is entirely voluntary. I understand that I can stop participating at any stage simply by saying that I would no longer like to be involved in the research study. I understand that I will be required to complete a questionnaire and participate in a fitness battery. The data will be destroyed at the conclusion of the project but any raw data on which the results of the projects depend will be retained in secure storage for five years, after which it will be destroyed. The results of the project may be published but my anonymity will be preserved.

Please note that a copy of the signed consent form will be given to you.

Signature of student: …….DATE: ……..

Witness:……. DATE: …….