

DETERMINING THE EFFECTS OF A SHORT -TERM PHYSICAL
ACTIVITY INTERVENTION PROGRAMME ON BODY MASS
INDEX, BLOOD PRESSURE, PULSE RATE AND PERCENTAGE
BODY FAT AMONG HIGH SCHOOL LEARNERS

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DECLARATION

I hereby declare that "**DETERMINING THE EFFECTS OF A SHORT-TERM PHYSICAL ACTIVITY INTERVENTION PROGRAMME ON BODY MASS INDEX, BLOOD PRESSURE, PULSE RATE AND PERCENTAGE BODY FAT AMONG HIGH SCHOOL LEARNERS**" is my own work, that it has not been submitted, or part of it, 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.

Tanushree Pillay

Signature.....

November 2005



Witness:

.....

Prof. JM Frantz

DEDICATION

To my parents Sundru and Rani Pillay, whom I am eternally grateful for their love and support. Mom and dad, I love you very much. Thank you for allowing me to pursue my dreams. To my brother Shri I love you very much. May God continue to bless you all.



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ABSTRACT

Physical inactivity is recognised as a major risk factor for non-communicable diseases (NCD) such as hypertension, cardiovascular disease, diabetes and cancer. Current recommendations for participation in physical activity are 30 minutes or more of moderate-intensity physical activity on most, but preferably all days of the week. The aim of the study was to determine the effect of a physical activity programme on weight, blood pressure, body mass index and body fat classification among high school learners through a short-term physical activity intervention programme. The study utilised both quantitative and qualitative methodologies. Data was analysed using Chi-square tests to test for associations between variables and the t-test to determine statistical significance of variables within and between groups. Baseline measurements of 581 learners in the school were taken to determine the prevalence of learners at risk for developing obesity and hypertension. Among the 581 participants, 5% were underweight and 19% were classified as at risk for obesity. Pre-intervention, within the intervention group, 18% of the learners were classified as being overweight and within the non-intervention group 22% were classified as being overweight according to their BMI. 8.4% were classified as being hypertensive within the intervention group and 10.8% were classified as being hypertensive within the non-intervention group. A short three month moderate to vigorous physical activity intervention programme was offered three times a week for the duration of one hour per session. Fifty-three learners completed the programme and were re-measured post intervention to determine the effect of physical activity on the learners'

baseline measurements. Within the intervention group, there was a decrease from 18% to 13% post intervention of the learners classified as overweight according to BMI. In comparison, the non-intervention group (53 learners) had 22% of the learners previously classified as overweight and post-intervention this number rose to 32%. Post intervention a focus-group discussion was conducted with the learners to assess the physical activity programme and one with the teachers to determine the difficulties facing them having to teach physical education in a disadvantaged school. Focus group discussion data were transcribed and data were then coded and put into themes. Teachers commented on the barriers to the effective re-introduction of physical education into South African schools. The main finding of this study is that a short-term physical activity programme was successful in maintaining the learners' initial measurements within variables in comparison to the non-intervention group where there was a substantial increase in measurements amongst variables over a 3 month period. One of the main recommendations made by the learners was that the physical activity programme should be conducted within the school day to be able to include more learners in the programme. Teachers commented that more physical education staff needs to be re-employed if physical education is to be re-instated within South African schools. Teachers acknowledged that physical education improves learners' discipline, improves fine motor control and ball skills and stimulates the brain. One of the main barriers to physical education identified by the teachers was lack of staff and space within the school time-table. There is an urgent need to look at current systems within schools and evaluate how to effectively re-introduce physical education into schools.

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ABBREVIATIONS

AAHPERD	American Alliance for Health, Physical Education, Recreation and Dance
ACHPER	Australian Council for Health, Physical Education and Recreation
AIDS	Acquired Immunodeficiency Syndrome
BMI	Body Mass Index
CAHPERD	Canadian Association for Health, Physical Education, Recreation and Dance
CHD	Chronic Heart Disease
CDL	Chronic Diseases of Lifestyle
CPD	Continual Professional Development
CVD	Cardio-Vascular Disease
DoE	Department of Education
DBP	Diastolic Blood Pressure
EUPEA	European Physical Education Association
HIV	Human Immunodeficiency Virus (HIV)
LO	Life Orientation
NCD	Non-Communicable Diseases
NDHS	National Demographic Health Survey
NIDDM	Non-Insulin Diabetes Mellitus
NSC	National Sports Council
PDB-PE	Professional Development Board for Physical Education
PE	Physical Education

PDM	Partnership Development Manager
PLT	Primary Link Teacher
QDPE	Quality Day Physical Education
SBP	Systolic Blood Pressure
SSCO	Sport School Co-ordinator
US	United States
USA	United States of America
WHO	World Health Organisation



CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This chapter describes the background of the study by highlighting chronic diseases of lifestyle (CDL) and the effect of physical inactivity on obesity and hypertension in adolescents. The chapter defines and classifies obesity and hypertension and highlights the prevalence of obesity and hypertension both nationally and internationally. It takes a look at suggested exercise guidelines to combat this fast-growing epidemic, as well as at other physical activity programmes initiated globally. The chapter also includes the statement, aim and objectives of the study. The significance of the study demonstrates the need for this study on implementing a physical activity intervention programme. The chapter ends with definitions of terms used as well as a summary of the chapters that will follow in this study.

1.2 RATIONALE OF THE STUDY

South Africa is a country of many contrasts in which various communities are undergoing rapid epidemiological, nutritional and demographic transition (Lambert, Bohlmann and Kolbe-Alexander 2001). As a consequence of this transition, chronic diseases of lifestyle coexist with communicable diseases associated with under-nutrition and lower socio-economic status. Chronic diseases of lifestyle are a group of diseases that share similar risk factors as a result of exposure, over many decades, to an unhealthy diet, smoking, lack of exercise and possibly stress. The major risk factors include high blood pressure, tobacco use and nutrition-induced

cancers, chronic bronchitis, emphysema and many others that culminate in high mortality and morbidity rates. Internationally, these diseases are also called ‘non-communicable diseases’ (NCDs) or ‘degenerative diseases’.

South Africa is an emerging country burdened with diseases due to poverty and previously disadvantaged communities, which is exacerbated by an exploding epidemic of Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS). The complex disease pattern places high demands on health services undergoing transformation in the face of shrinking budgets and other infrastructure development demands. These include the provision of primary health care services for the majority of the population who were neglected in the previous regime. The consequences of these competing priorities are that there is little recognition of the magnitude of the burden of non-communicable diseases in South Africa, where 41% of the reported mortality was due to non-communicable diseases in 1996 (the most recent analysis of mortality patterns). Use of the Actuarial Society of South Africa's Demographic and Health model suggested that 487 people died from NCD'S per day in 1996 in South Africa. This figure rose to 536 deaths per day in 2001 and should reach 563 deaths per day in 2010 (Bradshaw, Groenewald, Laubsher, Nannan, Nojilana, Norman, Pieterse and Schneider 2003).

This pattern of NCD'S death occurs in the face of the emerging AIDS epidemic. The model estimated that 77 people died of AIDS per day in 1996 in South Africa. This figure increased to 628 AIDS deaths per day in 2001 and it is estimated that there will be 2 184 deaths a day in 2010. Many of these deaths occur in middle-aged members of the workforce, and constitute an enormous financial burden to the country's economy. Provision for the prevention, early detection, and cost-effective

management of NCDs is generally inadequate. It is, therefore, not surprising that these chronic conditions are poorly diagnosed and managed. In South Africa the burden for NCD'S factors is high: approximately six million people have hypertension, four million have diabetes, seven million smoke and four million have hyperlipidaemia (Steyn, Fourie and Bradshaw 1992). About 56% of the population has at least one of these risk factors and about 20% are at a high level of risk for NCD'S. Clearly, these poorly treated risk factors require lifestyle changes and medical care to reduce the projected burden of these diseases.

Literature suggests that chronic diseases of lifestyle accounted for 28% of deaths of all South Africans between the ages of 35 and 64 years and that more than 56% of all South Africans between the ages of 15 and 64 years have at least one modifiable risk factor for CDL (Steyn et al. 1992). Physical inactivity is now recognised as a major risk factor for NCDs such as hypertension, cardiovascular disease, diabetes, coronary heart disease and cancer which exist as chronic diseases of lifestyle. In a National Demographic and Health Survey (NDHS) conducted in South Africa in 1998, the prevalence of risk factors, such as hypertension and obesity were comparable with figures for developed countries (Levitt, Katzenellenbogen, Bradshaw, Hoffman and Bonnici 1993). People with other risk factors for chronic heart disease (CHD), such as obesity and high blood pressure, may particularly benefit from physical activity.

During the past 20 years, the combination of decreased physical activity and unhealthy eating has resulted in a doubling of the percentage of overweight children and adolescents (Hedley, Ogden, Johnson, Carroll, Curtin and Flegal 2004). Recent reports indicate that five out of every eight children aged nine to 13 do not participate

in any organised physical activity during their non school hours, and almost one fourth do not engage in any free-time physical activity (Centres for Disease Control and Prevention 2001). More than one in seven children aged six to 19 years are overweight (Central Statistical Services 1997), and type two diabetes, a disease traditionally restricted to adults, has been reported among adolescents.

In South Africa De Klerk (2002) found that the bodyweight of 288 boys and girls between the ages 11 to 13 years in the Western Cape was more than what the norms suggest. The BMI of these children was clearly higher than those tested in a previous South African study in 1990 in the same region. The triceps skin folds indicate high deposits of subcutaneous fat (>20%) in 19% of the subjects and the boys and girls that were tested had a higher mean percentage body fat. Of all the subjects 18.06% had a systolic blood pressure reading, indicating mild to moderate hypertension (130+ mmHg), while 4.17% indicated severe hypertension. When comparing the systolic and diastolic blood pressure it was found that 19.44% of the subjects indicated mild to moderate hypertension and 5.56% indicated severe hypertension (De Klerk 2002).

A study of 1 243 boys and girls between the ages of 13 and 17 years was conducted in some Western Cape high schools to determine youth lifestyle patterns. The results indicate that, irrespective of race, the actual participation in school sport (38%) and physical leisure activities (27%) were not considered to be important by the learners (Van Deventer 1999). White learners, as was expected, place a higher priority on participation in school sport than the other racial groups. It was also found that boys placed a much higher premium on participation in school sport than girls (Van Deventer 1999). Nel (1998, 2002) reported that 98% of the South African youth

preferred passive to active leisure time pursuits and that only 10% of the school going population participated in sport. Frantz (2004) conducted a study in the Belhar community over seven consecutive days to determine the physical activity levels of high school learners in the area. The study revealed that 80% of learners' time was spent in being physically inactive.

Increase in body fat is a serious and widespread problem throughout the world and with the increased consumption of high-fat fast food combined with the fast growing internet and television culture there is a cause for concern. Childhood obesity is a public health concern. There is currently a worldwide increase in the prevalence of obesity, especially in children and adolescents (Trent and Ludwig 1999). This is a cause of concern as obesity at this age is associated with a wide variety of conditions and metabolic abnormalities, including elevated blood pressure (Freedman, Serdula, Srinivasan and Berenson 1999). The onset of obesity in childhood leads to an increased likelihood of obesity later in life (Bar-Or 1994).

In South Africa the Sunday Times (2002) reported that a study conducted among 5 000 children between the ages of 12 and 18 years in the Western Cape found that 35% of the girls would be overweight by the time they reach 18 years. Du Toit and Pienaar (2002) found that the prevalence of obesity (11.81%) among pre-school urban children corresponded with the reported 12% in South Africa and that those figures were higher or consistent with the reported prevalence of obesity among pre-school children in the United Kingdom, Canada and the USA. In a study conducted by Frantz (2004) to examine the physical fitness and coronary heart disease risk factors in high school learners in the Belhar community, significant findings were made: Smoking, a widely recognised risk factor, was found to be present among

31% of the learners. Physical inactivity, another risk factor for heart disease, was found among 48% of the learners. In addition, 17% were obese, 35% showed signs of hypertension and 78% had a poor fitness level. It is clear that there is a need for proper intervention methods to prevent and treat obesity in children.

Hypertension is a major global public health problem. Its prevalence has been increasing worldwide, especially in the developing countries. Hypertension occurs typically at age 12 years for systolic blood pressure and at age 16 years for diastolic blood pressure. The effects of obesity present in adolescence on blood pressure levels may be related to the accumulation of abdominal fat that occurs around the time of puberty (Goran, Reynolds and Lindquist 1999). Alsendhi, Shetty, Musaiger and Myatt (2003) found that there was a significant difference in systolic blood pressure and diastolic blood pressure means between obese and non-obese school children (12 to 17 years). Frantz (2004) substantiated these findings in reporting that 17% of the high school learners in the Belhar community were overweight and 15% of the learners tended towards hypertension. However, within the overweight learner group, an average of 53% of the learners tended towards hypertension.

Lifestyle modifications are effective in lowering blood pressure and can reduce other cardiovascular risk factors at little cost and minimum risk. Children who have high blood pressure are at greater risk of becoming hypertensive adults (Lauer and Clarke 1989) and because high blood pressure is an important factor in the occurrence of coronary heart disease and stroke in adults, it is essential that the effects of physical activity on blood pressure in young people be examined. According to Sallis and Patrick (1994), obese and hypertensive adolescents can decrease their blood pressure through physical training, especially if they lose weight. Rowland (1990)

indicated that if obesity were eradicated, the occurrence of high blood pressure would be decreased by half.

The etiology of childhood and adolescent obesity is unclear (Williams 1986), but experts in human growth and development note that physical inactivity is a major risk factor (Malina 1989). Although caloric restriction is a key element in the prevention and treatment of obesity and related chronic diseases of lifestyle risk factors, such restriction in children may suppress growth and development (Rowland 1990). Accordingly, increasing caloric expenditure by habitual exercise may be even more important for children than for adults in preventing and controlling obesity. In addition, properly designed exercise programmes can lower blood pressure and serum lipid levels in obese children (Endo, Takagi, Nozue, Kuwahata and Uemasu 1992). In Kuwait, a study conducted by Moussa, Shaltout and Nkansa-Dwamena (1999) showed that both systolic blood pressure and diastolic blood pressure were significantly higher in obese than in non-obese children (6 to13 years) in both males and females. According to Lauer and Clarke (1989), adolescents can decrease their blood pressure through physical training, especially if they lose weight.

Physical activity has been called 'today's best buy in public health' (Morris 1994) as it has been estimated that significant savings in health care could result from a mere 10% increase in the physically active population worldwide. Evidence exists that physical activity is an effective method in the prevention and treatment of obesity (WHO 1998), hypertension and other CDLs. Current recommendations for participation in physical activity are based on the United States Centres for Disease Control and Prevention (1996) guidelines to accumulate 30 minutes or more of moderate-intensity physical activity on most, and preferably all days of the week.

This recommendation emphasises the benefits of moderate intensity physical activity and of physical activity that can be accumulated in relatively short bouts. In other words, adults who engage in moderate intensity physical activity enough to expend 200 calories per day can expect many of the health benefits attributed to physical activity in the prevention of CDL (Centres for Disease Control and Prevention 1996). To expend these calories about 30 minutes of moderate intensity physical activity should be accumulated during the course of the day. One way to meet this requirement is to walk two miles briskly. Other examples of moderate intensity physical activities, that is working at 3.0-6.0 METs or burning 4-7 kcal/min, including walking briskly at 3 to 4 mph, swimming with moderate effort, conditioning exercises and racket sports.

Recent Canadian guidelines suggest that children should engage in 60 minutes or more of active play daily, alternating between bouts of activity and rest periods as needed (Canadian Fitness and Lifestyle Research Institute 2000). The guidelines also recommend that adolescents should engage in three or more sessions per week of activities that last 20 minutes or more at a time, that require moderate to vigorous levels of exertion. The expected health benefits of regular participation in physical activity have been extensively reviewed (Colditz 1999). There is now substantial evidence that regular physical activity is associated with a lowered risk for chronic disease of lifestyle. The strength of this evidence is that it is both consistent (demonstrated in many different studies over time) and robust, demonstrated in a variety of different populations and age groups, to similar effect (Lambert et al. 2001). Habitual physical activity has been recognised as an important component of a ‘healthy’ lifestyle.

Even though the clinical symptoms do not become apparent until much later in life, it is known that the origin of many chronic diseases lies in early childhood. It is therefore often argued that prevention of the chronic disease has to start as early as possible. Physical activity constitutes part of an effective weight loss programme for the obese youth, and it can affect risk factors for cardiovascular disease and diabetes, such as high-density lipoprotein cholesterol levels, blood pressure, and insulin resistance (Biddle, Sallis and Cavill 1998). Physical activity is a key component of the expenditure aspect of energy balance, providing a major outlet for daily caloric usage. Cross-sectional observational and experimental intervention data suggest a significant short-term influence of exercise training on weight loss in children and adolescents (Kohl and Hobbs 1998), although prospective observational studies designed to determine the role of physical activity in the prevention of weight gain are lacking.



Literature provides several theoretical models that are used to develop physical activity intervention programmes. Two of the most commonly used theories are the Social Learning Theory and the Health Belief Model. The Social Learning Theory proposes that behaviour change is affected by environmental influences, personal factors and attributes of the behaviour itself (Bandura 1986). The Health Belief Model (Rosenstock, Strecher and Becker 1988) acts on the premise that an individual's behaviours are affected by perceived susceptibility of developing health problems, perceived impact of health problems on one's quality of life, and the belief that changing behaviour will be beneficial in avoiding the health problem. The school setting is an ideal environment for population-based physical activity interventions. It provides benefit to children from all risk groups (Harell, McMurray, Bangdiwala,

Frauman, Ganskey and Bradley 1996), particularly those with limited or no access to play areas and avoids stigmatisation of at-risk children (Harrel et al. 1996).

However, it is not clear as to what is the most effective strategy to promote life long healthy lifestyle behaviours is. Although most schools require physical education (PE) as part of their curriculum, PE classes may occur infrequently and children are often relatively inactive in them. The Worldwide Audit on PE (1999) clearly indicates that although good practices of PE do exist, it appears "to be under threat in many countries in all continental regions of the world" (Hardman and Marshall 2001). Worldwide, PE is being marginalised and undervalued by authorities; it is suffering from decreasing curriculum time allocation, budgetary controls with inadequate financial, material and personal resources and has low subject status and esteem (Hardman and Marshal 2001). Increasing the frequency and duration of the PE lesson is not always feasible, given competing curriculum demands. It is essential to promote physical activity during lunch times and recess and to develop strategies to promote more efficient use of PE class time.

Various countries have attempted to implement physical activity programmes within schools. In Canada the Quality Daily PE Programme (QDPE) is the flagship of the Canadian Association for Health, PE, Recreation and Dance (CAHPERD). The Australian Council for Health, PE and Recreation (ACHPER) believes that the best investment that can be made is an educated nation, comprising active and healthy young people. In 1995 the Australian-South African development programme between the Australian Sports Commission and the National Sports Council (NSC) of South Africa was launched. This programme was channelled through the sports federations (elite sports) and the education system ("sport for all"), whereby children

were afforded the opportunity to participate in sports and physical activity in schools (Burnett 2000).

A study conducted by Burnett (2000) indicated that the effect of the programme was diminished by a lack of opportunities to be active, too many children in the group, and not enough presenters or access to suitable and adequate fields and sport equipment. South Africa needs a structured, cost-effective approach to PE and health education that stipulates national objectives and detailed strategies to obtain these objectives to aid long-term health promotion.

The co-ordination of physical activity initiatives for health promotion in South Africa has been fragmented, with little emphasis on sustainability. There is a lack of basic infrastructure and facilities in many communities. PE within the public school system is under threat, particularly in historically disadvantaged communities, there is a high prevalence of urban violence and risk to personal safety and the current focus for government health expenditure is on the delivery of primary health care (Lambert et al. 2001). It is therefore imperative that health promoters look at alternative methods to combat the ever-increasing epidemic of physical inactivity that faces South African communities.

1.3 STATEMENT OF THE PROBLEM

Physical inactivity is a predisposing factor to chronic disease of lifestyle with the most common diseases being obesity and hypertension, bringing about a need for school-based intervention programmes.

1.4 AIM OF THE STUDY

The aim of the study was to determine the effect of a physical activity programme on weight, blood pressure, body mass index, pulse rate and body fat classification among high school learners through a short-term physical activity intervention programme in a local school in the Belhar community.

1.5 OBJECTIVES OF THE STUDY

The following objectives of the study were identified:

- to determine the prevalence of obesity among adolescents in a local school in the Belhar community;
- to determine the prevalence of hypertension among adolescents in a local school in the Belhar community;
- to determine the impact of physical activity on weight, blood pressure, body mass index and body fat classification among adolescents in a local Belhar school through a school-based intervention programme;
- to develop a suitable intervention programme based on the views and preferences of adolescents in a local Belhar school;
- to determine the views of adolescents in a local school in the Belhar community on the physical activity intervention programme; and
- to determine the views of teachers at a local school in the Belhar community regarding the introduction of a school-based physical activity intervention programme and the re-introducing of PE within South African schools.

1.6 SIGNIFICANCE OF THE STUDY

With the advent of the age of technology chronic diseases of lifestyle would be a continuing threat that faces South African communities. There is little emphasis on PE in schools the priority of the National Government is on the delivery of primary health care to the country. Youth in this country are fast forgetting traditional exercise values, and the emphasis now is on social image, technology and becoming part of the new age 'futuristic' generation. In a study conducted in Belhar amongst high school learners between 2001 and 2003 (Frantz 2004), it was found that 32% of the learners in this community were inactive. The effects of inactivity are well known and could have a detrimental effect on this community.

The outcome of this study would contribute to the establishment of effective preventive measures to counter chronic diseases of lifestyle among adolescents, thereby promoting their health. It would provide a platform for adolescents to participate in a physical activity programme, promote physical activity among adolescents and form a basis for future school-based intervention programmes. It would provide some evidence for stake-holders to invest in school-based physical activity programmes as a supplement to the current PE system in our country.

1.7 DEFINITION OF THE KEY TERMS USED

The most significant terms used in this study are defined below:

Physical activity: Physical activity is identified as any movement of the body produced by skeletal muscles and resulting in energy expenditure (Bouchard

Shephard, Stephens and McPherson 1990). Within this study, the words “exercise” and “physical activity” are used interchangeably.

High school learners: High school learners are learners aged 13-18 years who attend a secondary school.

Hypertension: The definition of hypertension in children and adolescents is based on the normative distribution of blood pressure in healthy children. Normal blood pressure is classified as <90th percentile for systolic blood pressure or diastolic blood pressure, the percentile being for the gender, age and height measured on at least three occasions. Pre-hypertension is the 90th to <95th percentile, or if blood pressure exceeds 120/80mmHG even if it is <90th percentile up to <95th percentile. When systolic and diastolic blood pressures fall into different categories, the higher category should be selected to classify the individual's blood pressure status, (American College of Sports Medicine 6th Edition 2000).

Obesity and overweight: Obesity is defined as a body mass index (BMI = weight in kilograms divided by height in metres squared) of >95th percentile for age of the population, while overweight is defined as a BMI between 85th and 95th for age (Deitz 1994).

Short term physical activity programme: A physical activity programme conducted three times a week for a period of three months.

1.8 SUMMARY OF CHAPTERS

Chapter one presents a review of literature regarding physical inactivity as a predisposing factor to NCD'S. The first section outlines the prevalence of physical inactivity in adolescents, obesity and hypertension. The second section describes the prescribed levels for physical activity in this age group, as well as demonstrates the required levels of physical activity that will impact on obesity and hypertension. The third section highlights learning theories adopted in the formulation of physical activity intervention programmes and looks at a few programmes that have been implemented globally. The chapter ends with a summary of the need for a physical activity intervention programme. The statement of the problem, the aims and objectives of the study are also given.



In chapter two, the literature illustrates the need for and the components of developing a physical activity intervention programme. These include the burden of chronic diseases of lifestyle, health benefits of physical activity, current physical activity and fitness levels in South Africa, effective physical activity intervention programmes, PE in South African schools, current government policies and physical activity as a component of public health.

Chapter three outlines the research setting and study design used in this study. It also gives the details concerning the study population and sampling techniques. An in-depth description of data collection methods is presented. This includes, tools used in data collection, data collection procedures and issues of reliability and validity as well as credibility and trustworthiness. The chapter ends by giving the method of data analysis and showing how ethical issues would be addressed.

Chapter four describes the results of the study according to the bio-demographic data and anthropometric measurements of the study population. In addition the learner's views on non-communicable diseases, risk factors for non-communicable diseases, availability of exercise facilities within the school, current physical activity programmes and the efficiency thereof are documented. The comments of the learners with regards to activities they would be interested in participating in as well as a convenient time is presented.

Chapter five describes the results of the intervention group and the non-intervention group post-intervention. Data presented includes the anthropometrical and physiological measurements and comparisons are made between the intervention group and the non-intervention group.



Chapter six discusses the quantitative results of the study. It describes the prevalence of learners at risk for developing obesity and hypertension in young people at a local school in the Belhar community as well as the effect of the physical activity programme post-intervention. This chapter discusses the findings of the current study and compares them with similar studies. The limitations of the study are also discussed.

Chapter seven describes the qualitative results and discussion. The first set of information presented is based on the focus-group discussion with the learners. Matters discussed include the benefits of the physical activity programme as well as the barriers to participation in the physical activity intervention programme. Recommendations made by the learners for future intervention programmes are also presented. The second set of information presented is based on the focus-group

discussion with the teachers in the school coaching sport or teaching physical activity. Matters highlighted included the difficulties facing them whilst teaching sport in a disadvantaged school. They also highlighted the barriers to the re-instatement of PE in South African schools as well as recommendations to facilitate this process.

The last chapter provides a summary of the study and draws conclusions based on the findings. In addition recommendations based on the main findings of this study are made.



CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter discusses the burden of chronic diseases of lifestyle. It looks at the benefits of physical activity, both physiologically in terms of reducing the risk of disease. It examines South Africa's current government policies on physical activity and sport and takes a look at PE in schools. It further considers some of the problems that face teachers. The quality and quantity of physical activity in which adolescents in South Africa are engaging are presented. Lastly, current physical activity intervention programmes are also presented.



2.2 THE BURDEN OF CHRONIC DISEASES OF LIFESTYLE

Diet and physical activity has recently been the subject of intensified high- level attention by a joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (Joint FAO/WHO Expert Consultation Geneva 2003). Four factors in the epidemiology of chronic diseases - poor diet, physical inactivity as well as tobacco and alcohol use - are of overwhelming importance to public health. The report of the Expert Consultation makes recommendations for optimum nutrition and for worldwide action to stimulate physical activity within a health context. The WHO is currently developing a global strategy on diet, physical activity and health to give effect to these and other recommendations. The world's health is undergoing an unprecedented transition on several fronts: epidemiological, nutritional and demographic. The result felt keenly at country level and substantiated unequivocally

by scientific evidence, is a broad shift in disease burden from infectious diseases to non-communicable diseases. According to Figure 2.1, the majority of deaths (59%) are from NCD'S (WHO 2003).

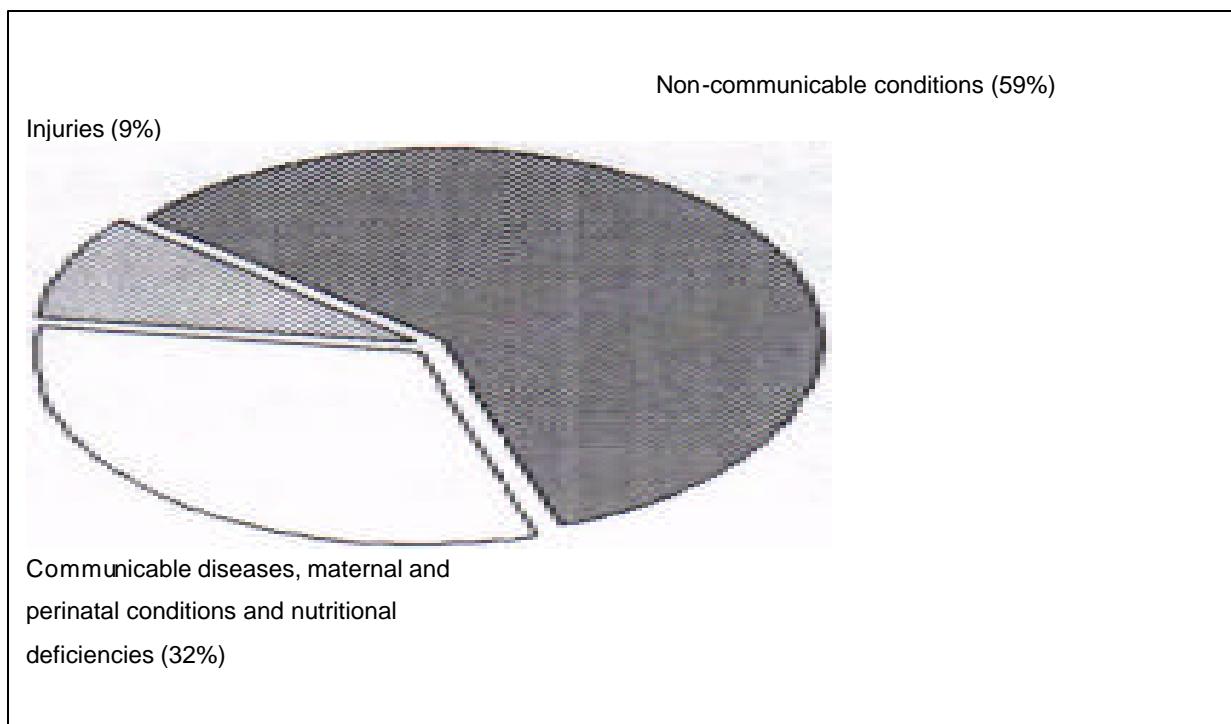


Figure 2.1 Death by broad cause group Source:WHO Health Report 2001

In the European, American and Western Pacific Regions, NCD'S are in an overwhelming majority. The South-East Asian and Eastern Mediterranean Regions are in transition, with NCD'S now a more significant public health problem than infectious disease.

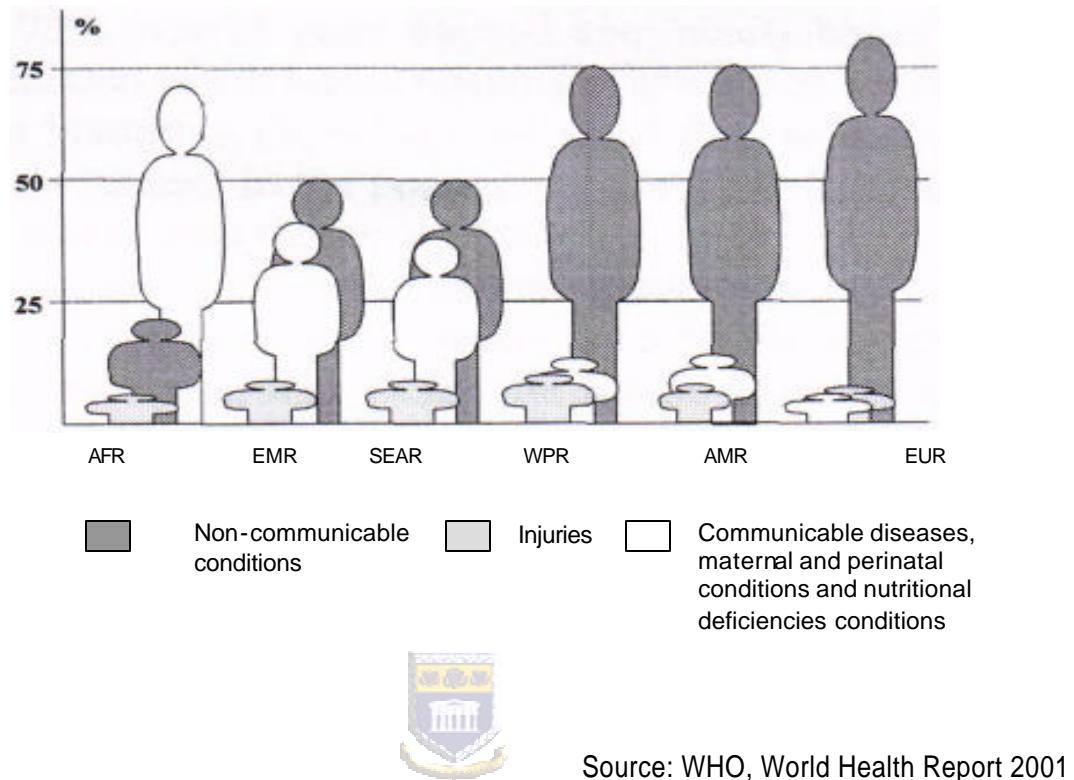
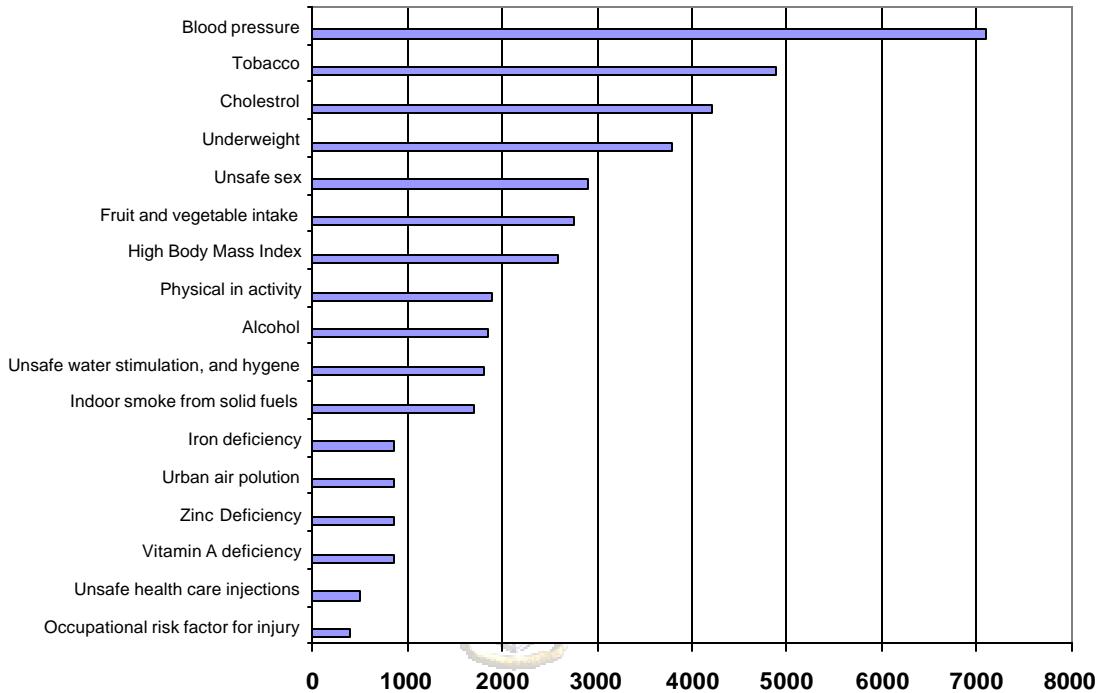


Figure 2.2 Deaths, by broad cause group and WHO Region, 2000

The African region is also in transition and, while in many countries in the region communicable diseases still predominate, the incidence of NCD'S is rising rapidly (Fig 2.2). A wealth of medical research shows the risk factors responsible for this growing pandemic and clearly points out the strategies needed to reduce their impact (World Health Report 2001). The data gathered for the World Health Report 2002 shows high blood pressure to be the major contributing factor to all deaths in the world (World Health Report 2002). Of the ten leading risk factors, six relate to nutrition, diet and physical activity. Progress in these two areas, combined with reductions in tobacco and alcohol

use, will have enormous importance for the prevention of NCD'S and lead to major health gains that are cost effective (Fig 2.3).



Source: WHO, World Health Report, 2002

Figure 2.3: Global deaths in 2000 attributable to selected leading risk factors

2.3 HEALTH BENEFITS OF PHYSICAL ACTIVITY

NCD'S, especially cardiovascular diseases, cancers, obesity and type 2 diabetes mellitus, now kill more people every year than any other cause of death. The World Health Organisation (WHO) has responded to the global rise in NCD'S by giving increasing attention to their prevention and control in recent years (WHO 2003). Regular physical activity, fitness, and exercise are

critically important for the health and well-being of people of all ages. Research has demonstrated that virtually all people can benefit from regular physical activity, whether they participate in vigorous exercise or some type of moderate health-enhancing physical activity. Therefore, physical fitness should be a priority for all ages. Regular physical activity has been shown to reduce the morbidity and mortality of many chronic diseases (Arraiz, Wigle and Mao 1992; Paffenbarger, Hyde, Wing, Lee, Jung and Kampert 1993).

Nearly 50 million adults (between the ages of 20 and 74 years), or 27% of the adult population of the world, are obese; overall more than 108 million adults, or 61% of the global adult population are either obese or overweight. Since regular physical activity helps prevent disease and promotes health, it may actually decrease health care costs. A study performed by researchers at the Centers for Disease Control and Prevention (2001) found that physically active people had, on average, lower annual direct medical costs than did inactive people. The same study estimated that increasing regular moderate physical activity among the more than 88 million inactive Americans over the age of 15 years might reduce the annual national direct medical costs by as much as \$76.6 billion in 2000. Further, it found that physically active people had fewer hospital stays and physician visits and used less medication than physically inactive people. The cost savings were consistent for men and women, for those with and without physical limitations, and even for smokers and non-smokers.

In this study the biggest difference in direct medical costs was among women 55 years and older, supporting the belief that the potential gain associated with physical activity is especially high for older women. The researchers concluded that adoption of a population-wide physical activity strategy might produce health care cost savings among most adult age groups.

2.3.1 Physiological response and long-term adaptations to exercise

Physical activity has numerous beneficial physiologic effects. Most widely appreciated are its effects on the cardiovascular and musculoskeletal systems, but benefits to the functioning of metabolic, endocrine, and immune systems are also considerable. Many of the beneficial effects of exercise training, from both endurance and resistance activities, diminish within two weeks if physical activity is substantially reduced, and effects disappear within two to eight months if physical activity is not resumed.

People of all ages, both male and female, undergo beneficial physiologic adaptations to physical activity. These adaptations include metabolic changes. The metabolic adaptations occur in skeletal muscle in response to endurance training. First, both the size and number of mitochondria increase substantially, as does the activity of oxidative enzymes. Myoglobin content in the muscle can also be augmented, increasing the amount of oxygen stored in individual muscle fibres (Hickson 1981), but the effect is variable (Svedenhag, Henriksson and Sylvén 1983). Such metabolic adaptations, combined with the increase in capillaries and muscle blood flow in the trained muscles (noted in a previous section), greatly enhance the oxidative capacity

of the endurance-trained muscle. Endurance training also increases the capacity of skeletal muscle to store glycogen (Kiens, Essen-Gustavsson, Christensen and Saltin 1993). The ability of trained muscles to use fat as an energy source is also improved, and this greater reliance fat spares glycogen stores (Kiens et al. 1993). The increased capacity to use fat following endurance training results from an enhanced ability to mobilise free-fatty acids from fat depots and an improved capacity to oxidise fat consequent to the increase the muscle enzymes responsible for fat oxidation (Wilmore and Costill 1994).

2.3.2 The effects of physical activity on health, disease and overall mortality



Higher levels of regular physical activity are associated with lower mortality rates for both older and younger adults. Even those who are moderately active on a regular basis have lower mortality rates than those who are least active. With regard to overall mortality it has been shown that persons with moderate to high levels of physical activity or cardio-respiratory fitness have a lower mortality rate than those with sedentary habits or low cardio-respiratory fitness. For example, compared with people who are most active, people who are less active experience between a 1.2-fold to a 2-fold increased risk of dying during the follow-up (Kaplan, Seeman, Cohen, Knudsen and Guralnik 1987; Slattery and Jacobs 1988; Slattery, Jacobs and Nichaman 1989; Leon and Connett 1991; Arraix et al. 1992; Chang-Claude and Beyme 1993; Paffenbarger et al. 1993). A stronger test for a causal relationship is to examine the effect that changing from lower to higher levels of physical

activity or cardio-respiratory fitness has on subsequent mortality. Two major studies provide such evidence. Among middle-aged Harvard male alumni who were sedentary in 1962 or 1966, those who took up moderately intense sports activity during the study's 11 years of follow-up had a 23% lower death rate than those who remained sedentary (Paffenbarger et al. 1993).

2.3.3 Cardiovascular diseases

Regular physical activity or cardio-respiratory fitness decreases the risk of cardiovascular disease mortality in general and of coronary heart disease mortality in particular. Existing data are not conclusive regarding a relationship between physical activity and stroke. The level of decreased risk of coronary heart disease attributable to regular physical activity is similar to that of other lifestyle factors, such as abstaining from cigarette smoking. Regular physical activity prevents or delays the development of high blood pressure, and exercise reduces blood pressure in people with hypertension. Five major cohort studies have related cardio-respiratory fitness to the risk of cardiovascular disease (CVD) mortality (Ekelund, Haskell, Johnson, Whaley, Criqui and Sheps 1988; Blair, Kohl and Paffenbarger 1989; Arraix et al 1992; Sandvik, Eriksson, Thalouw, Eriksson, Mundal and Rodahl 1993; Blair, Kohl and Barlow 1995), but only one provided a separate analysis for women (Blair et al. 1989). Each of these studies demonstrated an inverse dose-response relationship between level of cardio-respiratory fitness and CVD mortality. Three of the five studies relied on a maximal or near-maximal exercise test to estimate cardio-respiratory fitness. One study (Blair et al. 1995) demonstrated that men with low cardio-respiratory fitness who became fit had a lower risk of

CVD mortality than men who remained unfit. Taken together, these major cohort studies indicate that low levels of physical activity or cardio-respiratory fitness increase risk of CVD mortality. Findings seem to be more consistent for studies of cardio-respiratory fitness, perhaps because of its greater precision of measurement, than for those of reported physical activity. The demonstrated dose-response relationship indicates that the benefit derived from physical activity occurs at moderate levels of physical activity or cardio-respiratory fitness and increases with increasing levels of physical activity or higher levels of fitness.

2.3.4 Cancer

Evidence exists that regular physical activity can influence the risk of cancer. It has been shown that regular physical activity is associated with a decreased risk of colon cancer. There is no association between physical activity and rectal cancer. Data are too sparse to draw conclusions regarding a relationship between physical activity and endometrial, ovarian, or testicular cancers. Despite numerous studies on the subject, existing data are inconsistent regarding an association between physical activity and breast or prostate cancers. Two studies found that men who had been athletically active in college had significantly increased risks of later developing prostate cancer (Polednak 1976; Paffenbarger, Hyde and Wing 1987). One study found no overall association between physical activity and prostate cancer risk, but found a higher risk (although not statistically significant) of more aggressive prostate cancer (West, Slattery, Robinson, French and Mahoney 1991). Colorectal cancer has been the most thoroughly investigated cancer in

epidemiologic studies of physical activity. To date, nearly 30 published studies have examined the association between physical activity and risk of developing colon cancer alone. Among nine studies that have examined the relationship between physical activity and colorectal cancer, one reported an inverse relationship and three reported positive associations that were not statistically significant (Paffenbarger et al 1987; Garfinkel and Stellman 1988).

2.3.5 Non-insulin-dependant diabetes mellitus

Regular physical activity lowers the risk of developing non-insulin-dependent diabetes mellitus (NIDDM). Considerable evidence supports a relationship between physical inactivity and NIDDM (Kriska and Bennett 1992; King and Kriska 1992; Zimmet 1992; Kriska, Blair and Pereira 1994). Early suggestions of a relationship emerged from the observation that societies that had discontinued their traditional lifestyles (which presumably included large amounts of regular physical activity) experienced major increases in the prevalence of NIDDM (West 1978). Additional evidence for the importance of lifestyle was provided by comparison studies demonstrating that groups of people who migrated to a more technologically advanced environment had higher prevalences of NIDDM than their ethnic counterparts who remained in their native land (Hara, Kawase, Yamakido and Nishimoto 1983; Ravussin, Bennet, Valencia, Schulz and Esparza 1994) and that rural dwellers had a lower prevalence of diabetes than their urban counterparts (Cruz -Vidal 1979; Zimmet, Faaiuso, Ainuu, Whitehouse, Milne and DeBoer 1981; Taylor, Bennett, LeGonidec, Lacoste, Combe and Joffres 1983; King, Taylor, Zimmet, Pargeter, Raper and Berike 1984).

Many cross-sectional studies have found physical inactivity to be significantly associated with NIDDM (Taylor et al. 1983; King et al. 1984; Taylor, Ram, Zimmet, Raper and Ringrose 1984; Chen and Lowenstein 1986; Frish, Wyshack, Albright, Albright and Schiff 1986; Holbrook, Barrett-Connor and Wingard 1989; Dowse, Zimmet, Gareeboo, Alberti, Tuomilehto and Finch 1991; Ramaiya, Swai, McLarty and Alberti 1991; Kriska, Gregg, Utter, Knowler, Narayan and Bennet 1993.) Cross-sectional studies that have examined the relationship between physical activity and glucose intolerance in persons without diabetes have generally found that after a meal, glucose levels (Lindgärde and Saltin 1981; Cederholm and Wibell 1985; Wang, Ho, Tang, Wang, Chen and Reven 1989; Schranz, Tuomilehto, Marti, Jarrett, Grabauskas and Vassallo 1991; Kriska, LaPorte, Pettitt, Charles, Nelson and Kuller 1993) and insulin values (Lindgärde and Saltin 1981; Wang et al. 1989; McKeigue, Pierpoint, Ferrie and Marmot 1992; Feskens, Loeber and Kromhout 1994; Regensteiner, Shetterly, Mayer, Eckel, Haskell and Baxter 1995) were significantly higher in less active than in more active persons.

2.3.6 Osteoarthritis

Regular physical activity is necessary for maintaining normal muscle strength, joint structure, and joint function. In the range recommended for health, physical activity is not associated with joint damage or development of osteoarthritis and may be beneficial for many people with arthritis. Competitive athletics may be associated with the development of osteoarthritis later in life, but sports-related injuries are the likely cause.

Whether an active lifestyle offers protection against the development of osteoarthritis is not known, but studies have examined the risk of developing it in relation to specific athletic pursuits. Cross-sectional studies have associated competitive - as opposed to recreational running at high levels and for long periods with the development of osteoarthritis seen on x-rays (Martí and Minder 1989; Kujala, Kaprio and Sarna 1994; Kujala, Kettunen, Paananen, Aalto , Battie and Impivaara 1995). On the other hand, both cross-sectional and cohort studies have suggested that persons who engage in recreational running over long periods of time have no more risk of developing osteoarthritis of the knee or hip than sedentary persons (Panush and Lane 1994; Lane 1995; Panush, Hanson, Caldwell, Longley, Stork and Thoburn 1995;).



2.3.7 Osteoporosis

Weight-bearing physical activity is essential for normal skeletal development during childhood and adolescence and for achieving and maintaining peak bone mass in young adults. It is unclear whether resistance- or endurance-type physical activity can reduce the accelerated rate of bone loss in postmenopausal women in the absence of estrogen replacement therapy. In both men and women, the development of osteoporosis may be related to three factors: a deficient level of peak bone mass at physical maturity, failure to maintain this peak bone mass during the third and fourth decades of life, and the bone loss that begins during the fourth or fifth decade of life. Physical activity may positively affect all three of these factors. Physical activity may play a substantial role in the development of bone mass during childhood and

adolescence and in the maintenance of skeletal mass as a young adult. This inference is partly based on findings that athletic young adults have a higher density of bone mineral than sedentary young adults (Grimston, Willows and Hanley 1993; Conroy, Kraemer, Maresh, Fleck, Stone and Fry 1993; Nichols, Sanborn, Bonnick, Ben-Ezra, Gench and DiMarco 1994; Kirchner, Lewis and O'Connor 1996), on reports that athletes have a differential density of bones according to the sport for which they train (Heinonen, Oja, Kannus, Sievanen, Haapasalo, Manttari and Vuori 1995; Robinson, Snow-Harter, Taaffe, Gillis, Shaw, Marcus 1995) and on evidence that increase in bone mass in university students is related to higher levels of physical activity (Recker, Davies, Hinders, Heaney, Stegman and Kimmel 1992).

2.3.8 Obesity



Low levels of activity, resulting in fewer kilocalories used than consumed, contribute to the high prevalence of obesity in the United States. Physical activity may favourably affect body fat distribution. The relationship between physical activity and obesity in children is still under investigation. Some studies comparing obese and non-obese children have shown higher physical activity levels in non-obese children (Johnson, Burke and Mayer 1956; Bullen, Reed and Mayer 1964); others have shown little or no relationship (Stefanik, Heald and Mayer 1959; Bradfield, Paulos and Grossman 1971). Somewhat inconsistent results have also been seen in cross-sectional studies, with several finding lower BMIs or skin fold measure among children with higher levels of physical activity or fitness (Tell and Vellar 1988; Wolf, Gortmaker, Cheung, Gray, Herzog and Colditz 1993; Obarzanek, Schreiber, Crawford,

Goldman, Barrier, Frederick 1994) and some smaller studies finding no association (Sallis, Patterson, McKenzie and Nader 1998). More recently, two longitudinal studies have reported inverse relationships between physical activity and triceps skin fold measures (Moore, Nguyen, Rothman, Cupples, Ellison 1995) and BMI (Klesges, Klesges, Eck and Shelton 1995) in young children.

2.4 CURRENT PHYSICAL ACTIVITY AND FITNESS LEVELS IN SOUTH AFRICA

Physical inactivity has become a major public health problem, contributing to the chronic, non-communicable disease epidemic. Physical activity is necessary to maintain good emotional and physical health as well as to prevent disease. Individual behaviours which feature recommended levels of physical activity, especially if practised from childhood, can improve self-esteem and reduce the risk of obesity, which is closely associated with diabetes and certain types of cancer, anxiety, stress, high blood pressure and elevated cholesterol, which contribute to heart disease and stroke (Scully, Kremer, Meade Graham and Dudgeon 1998, Centres for Disease Control and Prevention 2000, Sallis 2000,).

The serious problem of obesity will now be discussed. WHO recognises obesity as a global epidemic. More than 1.5 billion people worldwide are overweight. In South Africa, 29% of men and 57% of women are overweight. In Africa, obesity has become a major cause of illness, existing side by side with malnutrition. The problem is exacerbated by the strong link between obesity, type 2 diabetes and

other diseases of lifestyle. This puts immense pressure on our health system, yet many of these diseases can be prevented. This problem was emphasised by the Deputy Minister of Health Mrs Nozizwe Madlala-Routledge, who said: "We are looking at a ticking bomb of chronic diseases" (Budget Speech 2005). The 2002 South African National Youth Risk Behaviour Survey provided significant data on levels of physical activity among adolescents in the nine provinces of South Africa. The data is discussed below.

2.4.1 Adolescents participating in sufficient vigorous physical activity

The national average for learners who had participated in sufficient vigorous activity in the week preceding the survey was 44.6%. Significantly more males (57.1%) than females (34.7%) had participated in sufficient vigorous physical activity. Significantly fewer "Coloured" learners (38.8%) participated in sufficient vigorous physical activity than "White" learners (56.7%). "Coloured" female learners (24.8%) had a significantly lower prevalence than "White" female learners (50.3%). Grade 11 learners (38.6%) had a significantly lower prevalence of learners who had participated in sufficient vigorous physical activity when compared to Grade 8 (46.9%) and Grade 9 (48.3%) learners. Learners aged 13 years or under (50%) had a significantly higher prevalence than learners aged 19 years or over (39.8%). The Free State (52.0%) had the highest provincial prevalence of learners who participated in sufficient vigorous physical activity, while KwaZulu-Natal (38.35) had the lowest. In a study conducted by Frantz (2004) it was found that adolescents within the Belhar community spent 87% of the week in sedentary activities. In addition

8% of the week was spent on light activities, about 2% in moderate activities and about 2.6% in vigorous activities.

2.4.2 Adolescents participating in sufficient moderate physical activity

Nationally 33.5% of learners had engaged in sufficient moderate activity in the week preceding the survey, with male learners (57.1%) showing a significantly higher prevalence than female learners (34.7%). There was no significant difference in participation in moderate physical activity among male learners in the different “race” groups, but “Coloured” female learners (25.4%) had a significantly lower prevalence of engaging in sufficient moderate physical activity than “Black” females (35.0%). Significantly more Grade 10 (36.7%) than Grade 8 learners (29.9%) participated in sufficient moderate physical activity. There was significant variation by age.



2.4.3 Insufficient or no physical activity

Nationally 37.5% of learners had participated in sufficient or no physical activity. Significantly more females (43.0%) than males (30.5%) had participated in insufficient or no physical activity. This higher prevalence of insufficient or no physical activity for females compared with males was significant within the “Black” and “Coloured” groups. Significantly more “Coloured” learners (45.6%) had participated in insufficient or no physical activity compared to “Black” (34.1%) and “White” learners (33.0%). Gauteng (31.2%) had the lowest provincial prevalence of learners who had participated

in insufficient or no physical activity, while the Northern Cape (46.2%) had the highest.

2.5 EFFECTIVE PHYSICAL ACTIVITY INTERVENTION PROGRAMMES

The Worldwide Audit on the state and status of PE in 1999 provides a clear picture of the threat under which the school subject seems to be on a worldwide scale. A number of initiatives were launched in various countries to provide quality PE programmes in schools, but in SA sport is regarded as an important component for the overall development and upliftment of previously disadvantaged communities (Van Deenter 2002). To ensure favourable medal counts at elite sports competitions the limited funds available have to be allocated, bearing these national priorities in mind. Against this backdrop the sports delivery network finds it economically and politically ‘profitable’ to promote elite sport at the expense of PE and ‘sport for all’ community projects (Burnett and Hollander 1999). Attempts were made to reinstate PE as a school subject with full status, but in the Revised National Curriculum Statement (Grades R-9) of 2002 it is one focus (physical development and movement) among four other foci in the Life Orientation (LO) learning area.

Taking the initiatives and health status of children worldwide into account, Hardman (2002) and Chernushenko (2003) wonder whether reports on quality PE programmes in schools and communities are just not lip service. The key concept to serve the mutual best interest of physical and health education as well as sport, is partnerships. The challenge for PE is to embrace initiatives at

school, local community, national and international levels. Stakeholders need to stipulate detailed strategies to obtain short- and long-term objectives regarding health habits and physical activity patterns for the youth.

In response to the World Summit on PE a number of articles were published regarding developments in the field of PE. Internationally, several initiatives have taken place. The European PE Association (EUPEA) is presently investigating ways to develop the quality of PE in a more proactive way by seeking more extended and mutually productive associations between the sport and education sectors. Developing in-service networks to support teachers in the development of quality PE remains one of the key issues to be addressed (Fisher 2001). In 2001 the Professional Development Board for PE (PDB-PE) was established in England to assure the high quality of the Continuing Professional Development (CPD) of all PE teachers (Gilliver 2003).

In 2000 in England a few secondary schools were designated as Specialist Sports Colleges. The goal was to give priority to PE and school sport on the school curriculum. As these schools were at the forefront of developments in PE and sport, all of them would work with other schools to share their expertise, resources and good practice. This would ensure that in a particular area, a 'family of schools' work together to provide training and support for teachers in secondary and primary schools and to maximise opportunities for children. By 2006, 400 such schools will have been established in England (Gilliver 2003).

This partnership model comprises a Partnership Development Manager (PDM) who manages the local partnership, a School Sport Co-ordinator (SSCO) who co-ordinates school sport in the family of schools and a Primary Link Teacher (PLT) who implements the agreed-upon programme in their schools. It is anticipated that by 2006 there will be at least 600 schemes involving 3000 SSCOs and 18000 PTLs. This initiative is funded by the Lottery Fund (Gilliver 2003).

The US Congress approved a bill for the year 2001 which included a five million dollar grant for the PE for Progress Act (PEP). The American Alliance for Health, PE, Recreation and Dance (AAHPERD), the National Association for Sport and PE (NASPE), the State and District AAHPERD Associations, the Sporting Goods Manufacturers Association and the American Heart Association sponsored the original bill. The PEP Act authorises the secretary of Education to award grants to initiate, expand or improve PE programmes for learners from kindergarten up to Grade 12 (Feingold 2001). In the USA the Presidents Council on Physical Fitness and Sports (PCPFS), consisting of private citizens appointed by the President of the USA, promotes physical activity and fitness by motivating Americans of all ages to be active. The Council was established in 1956. The PCPFS works with scholars and professionals in various programmes such as The Presidents Challenge Physical Fitness Award, Healthy People 2000/2010, The Presidential Sports Award and the PCPFS Research Digest (Spain 2000).

The Canadian Association for Health, PE, Recreation and Dance (CAHPERD), in partnership with Canadian non-profit organisations such as the Commonwealth Games Association of Canada has been involved in the Commonwealth Sport Development Programme, funded by Canada's International Development Agency for a number of years. The Canadian Sport Leadership Corps is a new development. The programme funds 9-12 PE graduates, or recently retired national athletes (with tertiary qualifications), to work in developing countries for up to one year (Higgs 2001).

In future all primary schools in the Netherlands will have specialist PE teachers and in secondary schools learners will be able to choose PE as an optional examination subject apart from the regular lessons. However in the technical and vocational training section for 16 to 20-year-olds, PE has come under much pressure (Stegeman 2003). In Austria a number of positive examples of the ways in which the provision and delivery of PE takes place exists.

Within the South African context history reveals that the low institutional priority of PE, in short, can be attributed to three problem areas: The availability of qualified PE teachers is a major problem in especially former black schools. In the past facilities were allocated along racial lines with the result that in former Black schools, PE was taught irregularly or not at all due to a lack of the most basic educational facilities. The non-examination status of PE made it much less of a priority when it came to the provision of qualified teachers, material and resources and learners never took the subject

seriously (Walter 1994; George 1995; Kloppers and Jansen 1996; Amusa 1999; CEPD/EPU 1999; Van Deventer 1999). Under the new dispensation sport is recognised as an important component for the overall development and upliftment of previously disadvantaged communities. International aid was received from England and Australia to accomplish this. In September 1994 the United Kingdom-South Africa Sports Initiative was launched to contribute to a sustainable and equitable sports development system in these communities. The whole process was monitored in a study conducted by Burnett and Hollander (1999). The results indicate that the absence of telephones, fax facilities and transport placed severe limitations on the implementation of the programmes. This placed constraints on the delivery of sport volunteers. Instead, employed people with access to resources were recruited as volunteers who found it difficult to carry a double burden. The communities involved, expected to have social problems addressed, but it became clear that only national sports interests were served (Burnett and Hollander 1999). For the new government it is important to present a representative racial picture in high profile sports, while emphasising the redistribution of resources and broadening the base of youth participation. However, to ensure favourable medal counts at elite sports competitions, the limited funds have to be allocated with these national priorities in mind. Against this backdrop the sports delivery network finds it more economically and politically 'profitable' to promote elite sports at the expense of PE and 'sports for all' community projects (Burnett and Hollander 1999). The same happened in Australia prior to the 2000 Sydney Olympic Games. The trend was funding in support of a small and elite number of performers in a narrow

range of sports (Kirk 1997). A similar situation was found in England (Talbot 1999). Talbot's (1999) main concern was that the role PE played in schools would ultimately be filled by sports agencies.

The current state of affairs is that PE specialists are no longer being appointed at schools. This means that generalist teachers, who have neither knowledge nor understanding of PE, might be required to teach LO (Hardman and Marshall 2001). Another area of concern is the fact that the development of learning programmes is the responsibility of schools and teachers (DoE, 2002a). This could entail that the PE focus of LO is ignored (CEPD/EPU 1999) or that widespread variations in the actual delivery of PE will occur. Another factor is that educational rationalisation gave rise to larger classes with the result that teachers in the Foundation Phase (Grades R-3) has less time to spend on learners' motor development or on designing movement programmes (Nel 1999). PE as a focus of LO is compulsory for all schools, but due to its low priority no implementation and monitoring strategies are in place to ensure delivery. It is therefore becoming more difficult to practise PE in historically disadvantaged schools, since the shortage of qualified teachers and proper facilities is not being addressed (CEPD/EPU, 1999).

It is clear that the goals set by many national and international policies and actions cannot be met because the time allocated to PE in the curriculum, as well as the resources (including human resources), for teaching quality PE are inadequate in most countries. It seems that the importance of PE is simply ignored by policy-and decision-makers and other concerned groups who have

no knowledge of PE and its benefits for the present and future health and well-being of young people (ICSSPE 1999). No matter how strong the research-based evidence is of the value and benefits of quality school PE, it cannot be assumed that developing countries will give high priority to PE in their education policies (Darlison 2001). The dilemma for these countries in funding and delivering PE is found within the parameters of limited resources, high expectations, diverse objectives and political priorities to compete for global recognition (Burnett and Hollander 1999). However, there is reluctance in the developing world to acknowledge the contribution PE and sport can make to economic and social development (Kidd 2001). The challenges facing PE include the need to embrace strategic initiatives at school, local community, national and international levels (Hardman 2002, Van Deventer 2002). These initiatives could have global trans-national or cross-cultural applicability as long as they are suitably adapted to meet with local circumstances. Hardman (2002) emphasises that partnership is the key word for future directions in the mutual best interests of physical and health education and sport in and out of schools.

2.6 PHYSICAL EDUCATION IN SOUTH AFRICAN SCHOOLS

According to the First South African National Youth Risk Behaviour Survey (2002), coordinated efforts between all departments of government are required to further reduce physical inactivity and promote physical activity. It is believed that schools can help to counter the alarming trend of physical inactivity among learners through quality PE programmes, including

recreation and sports. However, data suggest that PE is being marginalised in schools, particularly in the higher grades. The overarching goal of PE programmes should be to prepare learners to adopt active lifestyles and to discourage sedentary habits. Therefore the content of the PE programme must be meaningful, and sufficient time must be provided for the daily physical activity that learners need as well as for instruction related to achieving and maintaining physical fitness.

The recognised coordinating body for the organisation of school sport is the United School Sports Association of South Africa (USSASA). USSASA's functions include the following:

- implementation of government policy on sport and recreation at school level;
- talent identification, maximising participation, co-ordinating intra- and inter-school competitions, coaching and development programmes for teachers, giving input to the PE curriculum and sharing facilities within the community;
- making representations to macrobodies and relevant government departments with respect to school sport;
- liaising with national and provincial federations with respect to junior and youth sport specifically; and
- liaising with its international parent body, the International School Sport Federation (ISSF).

The Ministry of Sport and Recreation was established on 1 July 1994. In 1997 it presented to the public of South Africa through the White Paper, the first official policy on sport and recreation since its establishment. According to the Ministry the impact of sport and recreation extends beyond the confines of participation. It is felt in many other spheres of life like health, education, economy, crime prevention, nation-building and international relations. Recognising the persuasive influence of sport and recreation on all aspects of society, the Ministry and Department of Sport and Recreation agreed on eight priorities which form the basis of the White Paper.

Priority four in this White Paper is to motivate the community to develop active lifestyles and to channel those with talent for development into the competitive areas of sport. The fundamental objectives are:

- to recruit and encourage youth and adults to participate in physical activities;
- to motivate the population to develop physically active lifestyles; and
- to mobilise non-participants and convert them to becoming participants in physical activity.

According to the Ministry, the document is aimed at encouraging creativity on the part of the readers to devise specific programmes that will collectively give meaning to the slogan; “Getting the nation to play”.

2.7 CURRENT GOVERNMENT POLICY

Umthente uhlaba usamil is an Nguni idiom which means that engaging in risk behaviour while still in the youthful stages of life had consequences and was dangerous (The First South African National Youth Risk Behaviour Survey 2002). These consequences had an impact on health (disease), social roles (school failure), personal development (depression/suicide) and preparation for adulthood (limited work skills). According to the First South African National Youth Risk Behaviour Survey (2002), chronic diseases of lifestyle result in morbidity and sometimes mortality, and the risk factors associated with chronic diseases of lifestyle simultaneously result in many of the social and educational problems that confront the nation, including failure to complete high school, unemployment and crime.



South Africa is an upper-middle-income developing country, with a mix of First World and Third World Economies, and a large gap between rich and poor. These extremes of wealth and poverty are due to *inter alia* 350 years of colonialism and apartheid. Almost 78% of the population is “Black/African” and the prevalence of poverty is higher among the “Black/African” population with 72% of the poor living in rural areas.

South Africa with 11 official languages and a variety of cultures, has rich cultural traditions (May 2000). Almost 12 million children are enrolled in schools and they account for 28% of the total population Central Statistical Services (1997). The South African Schools Act 84 of 1996 makes schooling

compulsory for all 7 to 15 -year olds Government Gazette (1996). South African schools therefore facilitate access to a large number of young people. Furthermore, schools in South Africa provide a relatively stable environment that can influence the lives of a wide array of people, such as learners, educators, parents and the community. In addition, many schools have the infrastructure to support health promotion interventions, making them ideal centres for community development.

Since 1994 the South African Government has undertaken several international legislative and country level policy initiatives to promote the health and well-being of young people. For example, at an international level, there was the signing of the World Summit Declaration and the ratification of the Convention on the Rights of the Child (United Nations Childrens' Foundation 2003), and of the framework Convention for Tobacco Control (WHO 2003). At a country level, the National Plan of Action for Children is a further illustration of existing commitments to improving the health of the youth in South Africa (National Programme of Action Steering Committee 1996). In particular, the Ministry of Education has also launched a five-year plan, the Trisano programme, to transform the education and training system from one of segregation to one of equal opportunity for all South Africans (Department of Education 2001-2002). This programme spans both the educational and health needs of learners to include sexuality, gender, substance misuse and HIV and AIDS.

Coinciding with the democratic transition affecting all sectors of society, South Africa is also undergoing an epidemiological transition. This is characterised by a triple burden of disease, namely infectious diseases underpinned by poverty and underdevelopment, chronic diseases associated with urbanisation and industrialisation, and intentional and unintentional injuries that are closely associated with high levels of violence. The growing HIV/AIDS and tuberculosis (TB) epidemics exacerbate this burden of disease. Furthermore, the top ten risks in the global burden of diseases, namely underweight, unsafe sex, high blood pressure, tobacco consumption, alcohol consumption, unsafe water, sanitation and hygiene, iron deficiency, indoor smoke from solid fuels, high cholesterol and obesity, have links to both poverty and industrialisation, which co-exist in South Africa (World Health Report 2002).



Historically, public health decisions in South Africa focused mainly on reducing mortality rates. This can be problematic because such decisions miss important changes in risks for disease as well as changes in disease profiles, which precede mortality rate increases by decades: the time from which risk behaviours start to occur in a few individuals in a population to the time when changes in death rates become obvious, to ill health and disability. For example, the lag between exposure to risk and disease manifestation as in the case of smoking behaviour and lung cancer is 15 to 25 years. The Youth Risk Behaviour Survey was therefore an initiative by the Department of Health in conjunction with the Department of Education and the Medical Research Council of South Africa that aimed to provide data to help estimate

the extent of future potential epidemics and contribute to the development of evidence based interventions.

In her 2005 Budget speech the South African Deputy Minister of Health, Mrs Nozizwe Madlala-Routledge, said the following: "The youth, Madam Speaker, must rise to the occasion and take action to mobilise and forge partnerships with government and business to reverse this worrying trend. We have created youth friendly centres and by the end of 2004/05 had accredited 3369 healthcare centres for voluntary counseling and testing, mainly at primary health care level. Whether it is mental illness, diabetes, heart disease or HIV, it is best to know your status and to get appropriate treatment on time. We call on our people to use these facilities that we have provided. Obesity has psychological implications that make overweight individuals prey to false claims about quick weight loss products. These products are widely marketed as fat trappers, fat burners or starch blockers, with personal testimonials that do not accurately reflect the actual experience of users or any basis in scientific evidence. The department has resolved to alert the consumers to these dubious products and assist consumers with appropriate weight loss and dietary advice and pass legislation preventing the marketing of unsubstantiated weight loss products. The only effective and scientific method of weight loss is a calorie restricted diet and adequate exercise. Our focus in promoting healthy lifestyles aims at prevention of such diseases as hypertension and obesity. As I said in my budget speech last year, I will work with members of parliament to mobilise our communities to adopt healthy lifestyles. In this regard, I am in negotiations with the Sports Science Institute

of South Africa to develop a programme for members of parliament and the public service. Madam Speaker, most chronic illnesses can be managed and prevented at our clinics and the major focus now must be on prevention and identifying people at risk of developing these diseases. In doing this, long-term care for chronic illnesses and diseases should get the same attention as acute and curative care.”

2.8 PROMOTING PHYSICAL ACTIVITY: THE NEW IMPERATIVE FOR PUBLIC HEALTH

Research has clearly shown that NCD'S have their roots in unhealthy lifestyles or adverse physical and social environments. Risk factors like unhealthy nutrition over prolonged periods, smoking, physical inactivity, excessive use of alcohol and psychosocial stress are among the major lifestyle issues. While there is firm knowledge on “what should be done?” for the prevention of these diseases, the key question at present is “how should it be done?”

How can existing knowledge of NCD'S best be applied for effective prevention in real-life situations? Carefully planned community programmes are an important component of the strategy to help solve this problem. The huge gap between our knowledge about what needs to be done and the everyday situation of most people in the developing countries is due to several obstacles - cultural, political, psychological, economic and others - that prevent making healthy changes. The aim of community programmes is

therefore to build a bridge to help individuals and communities to overcome these obstacles. Since major NCD'S epidemics are due to unhealthy lifestyles, which often arise during periods of economic transition, a significant reduction in NCD'S rates should be possible by promoting general changes in the known NCD'S lifestyle.

In recent years there has been an increased awareness of the need for theory-driven research on the process for health behaviour change. A number of behaviour change theories have been applied to the promotion of physical activity with promising results for example the Social Cognitive Theory, Behaviour Modification, the Transtheoretical Model and the Social Marketing theory (Goodman 1998).



An underlying premise of community health promotion is that well planned local initiatives can produce desired social and health results. Community health promotion is founded on democratic principles, and citizen participation is integral to community health promotion if community members are to take ownership for local health concerns.

The South African government has recently begun initiatives promoting physical activity in certain target populations. In April 1999, the first set of national guidelines incorporating physical activity was released by the Department of Health, targeting older adults, and there are several national campaigns aimed at increasing awareness regarding physical activity and health, such as National Wellness Day. However, these initiatives lack a

broad-based infrastructure for implementation, as well as financial support and community awareness for sustainability. Furthermore, the effectiveness of these social marketing campaigns for increasing awareness regarding physical activity on a community level or for increasing the adoption of physical activity on an individual level has not been measured (Phillip, Sparling, Neville, Lambert and Haskell (2000).

A health promoting school is one in which all members work with available resources to promote the well-being of the entire school community. The health-promoting school model is one of the few models that demonstrates inter-sectoral collaboration and the integration of environmental policy, e.g. with health policy. The promotion of physical activity is to be one of the primary interventions through which health promotion takes place (Phillip et al. 2000)



CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

This chapter describes the research setting in which the study was based. It also describes the methods used in the study by which the physiological and anthropometric measurements were done, the implementation of the physical activity programme and the focus-group discussions. The study design, study population, sampling method and instrumentation are described. The data-collection procedure and method of data analysis are also explained. The ethical issues relating to the study are discussed.



3.2 RESEARCH SETTING

The study was conducted in a school within the Belhar community. Belhar is a community in the Western Cape within the Tygerberg substructure in Cape Town. Belhar consists of four main sections, namely Old Belhar, Extensions 13 and 14, and the Self-Help section. Besides these four main sections of Belhar, the community has an informal settlement situated just outside of Belhar. The Belhar community consists of 46 562 residents (52% female; 47.6% male) of which 6 181 (13.3%) fall into the category of ages 10-18 years (RSA Census 2001). The community includes people ranging from low to high socio-economic groups. Lack of recreational facilities in the area forces children to join gangs, and their boredom motivates the development of

destructive health risk behaviours such as alcohol and drug abuse. A study by Bradshaw et al. (2003), revealed that the top five causes for death for persons in this area were ischaemic heart disease (11%), homicide (8%), diabetes mellitus (7%), stroke (6.6%) and hypertensive heart disease (6%). Thus it can be said that NCD'S accounted for approximately 30% of deaths in the Belhar community.

3.3 RESEARCH METHODS

This was a study utilising both quantitative and qualitative research methods. Neuman (2000) indicated that methods of triangulation adopted in a study would make study findings more informative and comprehensive. Therefore in this study, the quantitative part assessed the anthropometric measurements of weight, height, BMI and skin folds and the physiological measurements of blood pressure and heart rate of the learners prior to the physical activity programme.

The qualitative part comprised four focus-group discussions. Two of the focus -group discussions were conducted with learners in the school pre-intervention, one focus -group discussion was with learners who participated in the intervention programme and the last focus-group discussion was with teachers who were involved with coaching sport or teaching PE in the school. The first two focus -group discussions conducted pre-intervention was utilised to formulate the physical activity programme.

The physical activity intervention programme utilised sports and activities which the learners said they enjoyed, thereby allowing learners to take ownership of the programme. Learners also decided upon an adequate time to run the programme. The physical activity programme was conducted three times a week for one hour per session and lasted for three months. The focus -group discussion conducted with the teachers was utilised to obtain the educators' view-point as to the plight that faces them as teachers having to teach sport in a previously disadvantaged school. Teachers also commented on the barriers to the re-instatement of PE within South African schools and made some recommendations that would facilitate this process. A qualitative approach was adopted in order to access meaning and understanding of the learners and teachers informally.



The same objective measures were then utilised postintervention to determine the effect of a short-term physical activity programme on variables such as weight, blood pressure and pulse rate. Postintervention testing was done on learners who had participated in the physical activity programme as well as on a sample of learners who had previously had baseline measurements done but had not participated in the physical activity programme.

3.4 RESEARCH SUBJECTS AND SAMPLING

3.4.1 Quantitative part of the study: research subjects and sampling

It was estimated that there were approximately 3 500 learners in the four high schools within the Belhar district. One high school was conveniently selected to participate in study due to the presence of an indoor facility present at the school. This would allow for the programme to be run irrespective of poor weather conditions and also ensured the safety of the learners. The total student population of this school was 1 200 learners. Assuming an obesity and hypertension prevalence of 15% and accepting a margin error of about 5% with a 95% confidence level, the needed sample size was calculated to be approximately 525. This represents approximately 20% of the 13-18 year age group in the Belhar community. The study sample consisted of learners from Grades 8 -11, as the Grade 12 learners were busy preparing for the matriculation examinations when the research was being conducted and were therefore excluded from the study. The initial study sample was 1000 learners as this number excluded the learners in Grade 12.

Classes were randomly selected from four hats (representing grades 8 to 11) which contained all the relevant classes and a draw was done to select the classes to be tested. The selected classes were brought to the testing venue on the basis of availability during class time. This indicated a form of cluster sampling as the subjects were selected in groups. Due to the start of the June examinations, some classes were not able to attend the testing and therefore

had to be excluded from the study. They were, however, allowed to attend the physical activity programme if they wished to do so. This left the study sample at 600 learners. On analysis of data capture sheets some errors were noted and those learners therefore had to be excluded from the study, leaving the study sample at 581 learners. Learners in the selected school were informed about the programme that would be running in their school.

The intervention group consisted of 53 learners who were willing to participate in the physical activity programme and who fitted the inclusion criteria. Learners who participated in the physical activity programme and a sample of 53 learners who had previously been measured but had not participated in the physical activity programme were then measured post-intervention.



Learners in the non-intervention group were randomly selected. Every ninth person on the list who was measured pre-intervention but who did not participate in the programme was measured post-intervention. This gave a comparative sample of 53 learners of the non-intervention group.

3.4.2 Inclusion Criteria

All learners who had consented to participate in the study (Appendix B), who had passed the physical activity readiness questionnaire (Appendix C) and who had obtained parental consent (Appendix D) were to be included in the study.

3.4.3 Qualitative part of the study: research subjects and sampling

The sample consisted of learners from Grades 8-11 and teachers from the participating school. Four separate focus-group discussions were held. One focus-group discussion was held for Grade 8 and 9 learners, and one for Grade 10 and 11 learners. Learners were randomly selected to participate in the focus-group discussions. Grades and sexes were separated, so as to group all Grade 8 and 9 boys and girls separately. Learners' names were placed in a hat and names were then drawn. Both focus-group discussions for the learners consisted of five learners from each grade with five girls and five boys participating thus indicating that stratified random sampling according to gender had been done. Each group discussion therefore comprised ten learners.



Another focus-group discussion was held for learners who participated in the intervention programme, post-intervention. Purposive sampling was done to select learners to participate in the second focus-group based on their commitment to the programme (learners who were committed and of those who were not as committed formed part of the focus-group).

A focus-group discussion was held with teachers in the school coaching sport, teaching PE or LO. The teachers were purposively selected to participate in the study. All teachers who fitted the criteria made themselves available to participate in the focus-group discussion.

3.5 DATA COLLECTION METHODS

The researcher and trained research assistants collected the data for this study. The data was collected during the second and third school terms, depending on the availability of the school learners and research assistants. Research assistants were biokinetics students from the University of the Western Cape who had experience in obtaining such measurements. Measurement techniques were demonstrated by the head of the Biokinetics Department in accordance with the American College of Sports Medicine Guidelines for Exercise Prescription and Testing to ensure uniformity and accuracy.

Third-year students from the Physiotherapy Department at the University of the Western Cape assisted with conducting the exercise classes. These students were students that were attending a community block within the Belhar community and were used to ensure sustainability of the programme.

3.5.1 Data collection tools

Quantitative data were captured on a self-administered data capture sheet. The learners' age, grade and gender were captured on the administered data capture sheet (Appendix A). It was also used to record the pre- and post-intervention measurements of the learners' anthropometric measurements of weight, height, BMI and skin folds and physiological measurements of pulse rate and blood pressure.

Four focus-group discussions took place. Two of the focus -group discussions were conducted with learners from Grade 8-11. One focus-group discussion was conducted with learners who had participated in the intervention programme and one with teachers in the school involved with coaching sport or teaching PE and LO. The focus-group discussion conducted with the learners pre-intervention was used to determine the types of activities the learners would be interested in participating in and these activities were included in the intervention programme. Learners also decided upon a convenient time for the intervention programme.

The focus-group discussion conducted with the teachers was utilised to provide an insight into the plight that faces teachers within the schooling system with regard to the challenges that face them in teaching sport at a disadvantaged school. It was also used to determine the barriers that would be incurred should physical activity be re-instated into South African schools. Teachers also made some recommendations that would facilitate this process. Focus-group discussions were conducted with the use of a focus -group discussion guide (Appendices E, F and G). According to Hennink and Diamond (1999), focus -groups are a tool for collecting qualitative data from group discussions. When conducting the focus-group discussion, a moderator follows a predetermined interview guide to direct discussions among approximately five to 12 people with the purpose of collecting in-depth qualitative information about a group's perceptions, attitudes, and experiences on a defined topic. Learners should be typical of the intended population.

3.5.2 Quantitative data procedures

Data was captured on a data capture sheet. Data capture sheets were handed to learners to complete basic demographic data such as age, gender and grade. Baseline anthropometrical measurements were completed by the research and research assistants. Prior to the commencement of the study the Physical Activity Readiness Questionnaire (Arriax et al. 1992) was administered. This was to ensure all participants in the intervention programme were medically fit to participate in the study. The anthropometric measurements for all learners participating in the study (from Grade 8 to Grade 11) were taken. These entailed weight, height, and skin folds as well as the physiological measurements of pulse rate and blood pressure. The BMI was then calculated using the weight and height measurements. This data was used to determine the number of learners who were overweight or at risk of becoming overweight as well the number of learners who had high blood pressure or were at risk of developing high blood pressure. A talk outlining the importance of physical activity as well as the aims and objectives of the study was then given at the school. All learners from Grades 8 to 11 were then invited to participate in the programme. Learners who had participated in the physical activity programme and a sample of the learners who had previously been measured but had not participated in the physical activity programme were then measured post-intervention. Research assistants were familiarised with the data capture sheet as well as with the physical activity readiness questionnaire prior to the commencement of the study. The procedure for the measurements at various stations is described in Appendix H.

The BMI was calculated using the formula weight in kilograms divided by height in metres squared. All measurements were taken twice to ensure reliability, and an average of the two readings was used. During the post-intervention re-assessment the same methods were utilised to determine the effect of the physical activity programme on the baseline measurements. Pre- and post-intervention data were entered from the data capture sheet, coded and entered into Microsoft Excel 2003.

3.5.3 Qualitative Data Procedure

Focus-group discussions were held in a quiet venue to ensure that there were no external influences. Pre-determined question guidelines were jotted down by the researcher. A background to the study was explained to learners and teachers on four separate occasions before the discussion was commenced. All four focus-group discussions were recorded on audio tape with permission of both the learners and the teachers. Two hours of tape-recorded interviews were obtained and transcribed verbatim to produce a manuscript. The data was further analysed after the transcripts had been re-examined, and emergent clusters and themes were identified. These themes were then coded and classified, and major categories of themes were highlighted.

3.6 CLASSIFICATION OF RELEVANT VARIABLES

3.6.1 Recommended exercise dosage

Current recommendations for participation in physical activity are based on the United States Centres for Disease Control and Prevention (1996) guidelines to accumulate 30 minutes or more of moderate-intensity physical activity on most, but preferably all days of the week. This recommendation emphasises the benefits of moderate intensity physical activity and of physical activity that can be accumulated in relatively short bouts. Adults, who engage in moderate intensity physical activity, in other words enough to expend 200 calories per day, can expect many of the health benefits attributed to physical activity in the prevention of CDL (Centres for Disease Control and Prevention 1996). To expend these calories about 30 minutes of moderate intensity physical activity should be accumulated during the course of the day. One way to meet this requirement is to walk briskly for two miles. Other examples of moderate intensity physical activities that are working at 3.0-6.0 METs or burning 4-7 kcal/min include walking briskly at 3-4 mph, swimming with moderate effort, conditioning exercises and racket sports.

3.6.2 Classification of blood pressure

The classification of hypertension in children and adolescents is as follows: normal blood pressure is classified as <90th percentile for systolic blood pressure or diastolic blood pressure, the percentile being for the gender, age

and height measured on at least three occasions. Pre-hypertension is the 90th to <95th percentile, or if blood pressure exceeds 120/80mmHG even if it is <90th percentile up to <95th percentile. When systolic and diastolic blood pressures fall into different categories, the higher category should be selected to classify the individual's blood pressure status (American College of Sports Medicine 2000).

3.6.3 Classification of pulse rate

Heart rate is classified as indicated in Table 3.1 below.

Table 3.1 Classification of heart rate

Beats per minute	Classification
<72	Good
72-78	Average
>79	Poor

3.6.4 Classification of obesity

According to Himes and Dietz (1994), it is recommended to classify the BMI for age at or above the 95th percentile as overweight and between the 85th and 95th percentile as at risk or overweight. According to the World Health Organisation Expert Committee on Physical Status the cut off for underweight is a BMI less than the 5th percentile (WHO 1996).

3.6.5 Classification of percentage body fat

To measure skin folds the 3-Site formula was selected as prescribed by the American College of Sports Medicine (2000):

Men = (chest, abdomen, thigh)

Women = (triceps, suprailiac, thigh)

The body density was calculated according to the following formulae:

Males (chest, abdomen, thigh)

Body density = $1.10938 - 0.0008267 \text{ (Sum of 3 skin folds)} + 0.0000016 \text{ (sum of 3 skin folds)}^2 - 0.0002574 \text{ (age)}$

Females (triceps, suprailiac, thigh)

Body density= $1.0994921 - 0.0009929 \text{ (Sum of 3 skin folds)} + 0.0000023 \text{ (sum of 3 skin folds)}^2 - 0.0001392 \text{ (age)}$



Table 3.2 describes the body fat percentage according to the American College of Sports Medicine (2002).

Table 3.2 Classification of body fat percentage

Percentile	Classification
90 th	Well above average
70 th	Above average
50 th	Average
10 th	Below average

3.7 RELIABILITY AND VALIDITY

All measurements were taken three times to ensure reliability. Research assistants were trained prior to commencement of the study. Research assistants were biokinetics students from the University of the Western Cape who had experience in obtaining such measurements. Measurement techniques were revised by the head of the Biokinetics Department in accordance with the American College of Sports Medicine Guidelines for Exercise Prescription and Testing to ensure uniformity and accuracy. Intra-rater reliability for skin fold and blood pressure measurements was tested amongst research assistants prior to the commencement of the study. The results, using the intraclass correlation co-efficient, for systolic blood pressure, diastolic blood pressure and skin fold measurements showed a Chronbach's alpha of 0.836, 0.786 and 0.991 respectively.

Triangulation methods made the results more reliable. Neuman (2000) indicated that the two methods have different complementary strengths, and a study using both methods is fuller or more comprehensive. In addition, triangulation allows researchers to be more confident of their results (De Vos 2002). Integrating the two methods provides a general picture of the problem. Qualitative research may facilitate the interpretation of relationships between variables, whereas quantitative research readily allows the researcher to establish relationships among variables, but is often weak when it comes to exploring the reasons for those relationships (Punch 1998).

3.8 CREDIBILITY AND TRUSTWORTHINESS

In the qualitative part of the study, to enhance credibility and trustworthiness, the following procedures were followed: Firstly, involvement of learners from different grades as well as the teachers in the school increased the trustworthiness and credibility of the research. De Vos (2002) states that data from different sources could be used to corroborate, elaborate or illuminate the research in question. Designing a study in which multiple informants are used can also greatly strengthen the study's usefulness for other settings.

Secondly, the focus-group discussion was conducted in English and Afrikaans to accommodate all the learners and teachers who participated. A detailed description of participants and settings was provided and, as indicated by Creswell (1998), with such detailed description the researcher enables the readers to transfer information to other settings and to determine whether the findings can be transferred. In addition, the discussions were audio-recorded to ensure accuracy in data collection.

Thirdly, notes were made on news print throughout the focus-group discussion. This highlighted important points and themes so that participants could view that what they were saying was being documented accordingly. This allowed the participants to view the findings in order to verify the researcher's credibility and interpretation thereof (Creswell 1998; Mellion and Tovin 2002).

3.9 DATA ANALYSIS

3.9.1 Quantitative data analysis

All responses were coded into numerical format for the management of the nominal data. These were captured and analysed, using appropriate software programme for statistical analysis Excel and the Statistical Package for Social Sciences (SPSS). Descriptive and inferential statistical methods were used to explore relationships between the different nominal and numeric variables. The chi-square test was used to explore relationships between nominal data and numeric data and the t-test was used to determine statistical significance between groups (independent t-test) and within groups (paired sample t-test).

The data were described with the aid of tables and graphs.



3.9.2 Qualitative data analysis

The qualitative analysis started with a verbatim transcription of the interviews. Thereafter the emphasis was placed on extracting meaningful ideas from the different participants' opinions, and on discovering emerging themes. Once the thematic analysis of the data had been completed, the data was discussed with some of the learners as well as with researchers in the field. This was to ensure plausibility and authenticity pertaining to the reliability and trustworthiness of the research process (Carpenter and Hammell 2000).

3.10 ETHICAL CONSIDERATIONS

The researcher obtained clearance for the study from the Senate Higher Degrees Committee of the University of the Western Cape. Permission to conduct the study was obtained from the Western Cape Department of Education (Appendix I). Once permission had been granted, the school principal had been contacted to request permission to conduct the study within the school (Appendix J). A letter was sent home with the learners who were involved in the study, notifying their parents of the nature of the study and requesting permission for the pupils to participate in the study. Participation was voluntary and permission was granted by written consent of the parents. All learners would remain anonymous and information obtained is for the use of the study only. Once the study was completed written feedback in the form of a report was given to the school involved as to the outcome of the study. The participants were assured of anonymity and the right to withdraw from the study at any time. Information obtained was handled with confidentiality and the results of the study would be made available to participants and the school involved. There was no obvious risk to participants included in the study. The Modified Physical Activity Readiness Questionnaire (PAR-Q) (Arraix et al.1992), was administered prior to the commencement of the project. This was to ensure that any learners with medical problems are identified and a written consent letter from a medical practitioner was to be obtained prior to participation in the project. Counselling was made available to any students failing the PAR-Q to deal with any emotions that arose. This was organised by the researcher with the school psychologist and principal.

CHAPTER FOUR

RESULTS OF BASELINE QUANTITATIVE AND QUALITATIVE INVESTIGATIONS

4.1 INTRODUCTION

In this chapter the bio-demographic data and anthropometric measurements of the study population are described. In addition, the learners' views on NCD'S, risk factors for NCD'S, availability of exercise facilities within the school, current physical activity programmes, the efficiency thereof and the activities in which the learners were interested in participating, are presented.



4.2 BIO-DEMOGRAPHIC DATA OF THE LEARNERS

Six hundred learners were included in the study, but 19 learners withdrew from the study, leaving 581 learners for the first part of the study. The mean age for the learners was 14.92 years with a standard deviation of 1.42 years. The majority of the learners who participated in the study were female (54%). Table 4.1 presents the bio-demographic data of the participants.

TABLE 4.1 BIO-DEMOGRAPHIC DATA OF THE LEARNERS (N=581)

VARIABLE	N	%
AGE		
13	108	18.6
14	157	27.0
15	140	24.1
16	108	18.6
17/18	68	11.7
GENDER		
Male	266	45.8
Female	315	54.2
GRADE		
8	153	26.3
9	219	37.7
10	96	16.5
11	113	19.4

4.3 ANTHROPOMETRIC AND PHYSIOLOGICAL MEASUREMENTS OF LEARNERS

In Table 4.2 the anthropometric and physiological measurements are presented as means. The mean weight for the total number of learners was 55.2 (13.3). The minimum weight was 28 kg and the maximum was 132 kg.

**TABLE 4.2 MEAN ANTHROPOMETRIC AND PHYSIOLOGICAL
MEASUREMENTS OF LEARNERS (N = 581)**

VARIABLE	MEAN	SD	RANGE
WEIGHT (kg)	55.2	13.3	28 – 132
HEIGHT (m)	1.6	0.8	1.3 – 1.9
*BMI (kg/m ²)	20.9	4.9	13.3 – 62.7
% BODY FAT	24.8	15.1	3.8 – 75.1
*SBP (mmHg)	112.7	13.1	81 – 168
*DBP (mmHg)	69.7	9.8	43 – 106
PULSE RATE	81.1	12.4	52 – 120

*BMI = body mass index

*SBP = systolic blood pressure

*DBP = diastolic blood pressure



Table 4.3 presents the anthropometric and physiological measurements according to gender. There was a statistically significant difference between males and females with respect to systolic blood pressure, diastolic blood pressure, pulse rate, sum of skin folds, percentage body fat, height and BMI ($p=0.00$).

TABLE 4.3 MEAN ANTHROPOMETRIC AND PHYSIOLOGICAL MEASUREMENTS OF LEARNERS ACCORDING TO GENDER (N=581)

GENDER	MALE		FEMALE	
	(n=266)		(n=315)	
VARIABLE	MEAN	SD	MEAN	SD
WEIGHT (kg)	55.7	13	54.8	13.5
HEIGHT (m)	1.7	0.1	1.6	0.1
*BMI (kg/m²)	20.1	4.6	21.6	5.1
%BODY FAT	12.9	8.1	34.9	12.0
*SBP (mmHg)	115.0	13.5	110.8	12.5
*DBP(mmHg)	70.7	10.4	68.8	9.3
PULSE RATE	78	11.3	83.7	12.8

*BMI = body mass index

*SBP = systolic blood pressure

*DBP = diastolic blood pressure



Table 4.4 presents the mean anthropometric and physiological measurements of the learners according to age. There was a statistically significant relationship between age and weight, height, systolic blood pressure, percentage body fat and pulse rate ($p=0.00$). Diastolic blood pressure and age were not found to be statistically significant with $p=0.193$.

TABLE 4.4 MEAN ANTHROPOMETRIC AND PHYSIOLOGICAL MEASUREMENTS OF LEARNERS ACCORDING TO AGE (N=581)

AGE	13 (n=108)	14 (n=157)	15 (n=140)	16 (n=108)	17/18 (n=88)
VARIABLE	MEAN(SD)	MEAN(SD)	MEAN(SD)	MEAN(SD)	MEAN(SD)
WEIGHT (kg)	51.4 (12.5)	51.8 11.1	57.6(14.5)	57.7(13.6)	60.6(12.5)
HEIGHT (m)	1.6(0.1)	1.6(0.1)	1.6(0.1)	1.6(0.1)	1.7(0.1)
*BMI (kg/m ²)	20.6(4.4)	20.0(4.0)	21.4(6.2)	21.4(4.9)	21.6 (4.8)
%BODY FAT	24.4(12.5)	22.7(14.9)	24.9(14.7)	29.2(17.1)	23.5(16.3)
*SBP(mmHg)	109.4(12.4)	110(4.0)	115.6(13.4)	114.4(11.1)	115.7(13.3)
*DBP(mmHg)	70.3(10.9)	68.3(12.6)	69.8(10.1)	69.8(8.0)	71.7(9.7)
PULSE RATE	84.6(13.1)	81.8(31.2)	82.1(12.6)	78.7(11.6)	75.9(9.7)

*BMI = body mass index

*SBP = systolic blood pressure

*DBP = diastolic blood pressure



4.4 OBESITY, HYPERTENSION, PULSE RATE AND PERCENTAGE BODY FAT CLASSIFICATION (N=581)

4.4.1 Obesity classification

Among the 581 participants, 76% were classified as having normal BMI, 5% were underweight and 19% were at risk for obesity. Figures 4.1 and 4.2 illustrate the BMI classification of the learners according to age and gender respectively.

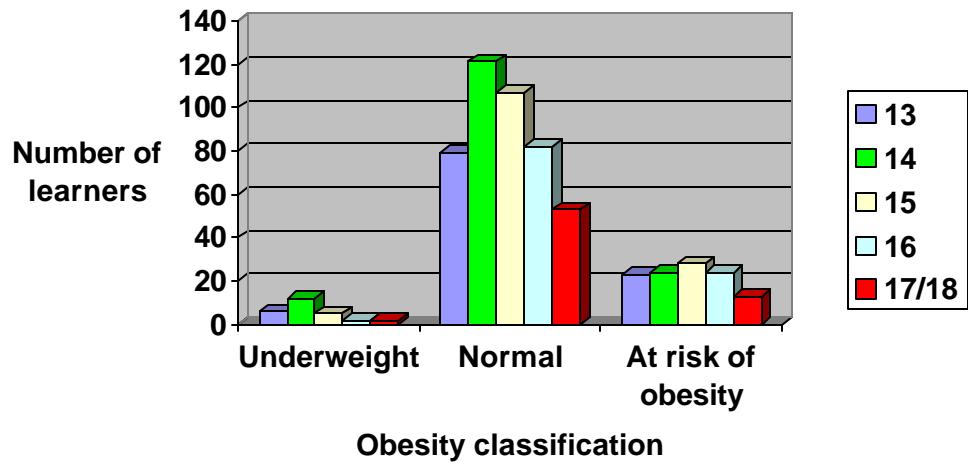


FIGURE 4.1 OBESITY CLASSIFICATIONS ACCORDING TO AGE

The association between the BMI and age was not found to be statistically significant ($p=0.33$). The association between the BMI and gender was found to be statistically significant ($p=0.00$).

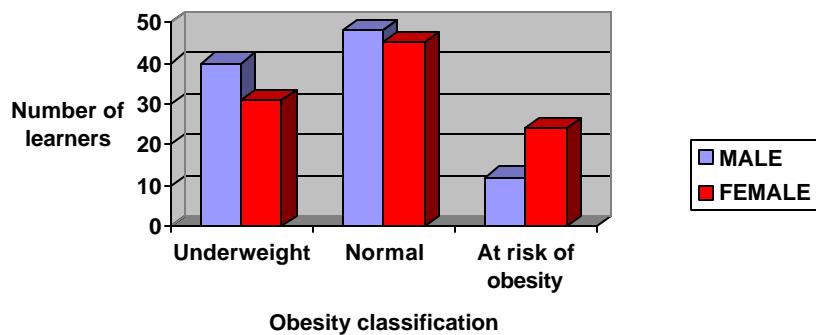


FIGURE 4.2 OBESITY CLASSIFICATIONS ACCORDING TO GENDER

4.4.2 Blood pressure classification

According to the blood pressure classification, 10.6 % of the learners were at risk for hypertension, based on the systolic blood pressure. Of all the learners, 6.2% were at risk for hypertension, based on the diastolic blood pressure.

Figure 4.3 represents the percentage of learners who were at risk for hypertension, based on a combination of their diastolic and systolic blood pressure. The association between systolic blood pressure and age as well as gender was found to be statistically significant, with $p=0.003$ and $p=0.000$ respectively. The association between diastolic blood pressure and age as well as gender was not found to be statistically significant, with $p=.06$ and $p=0.16$ respectively. The association between pulse rate classification and gender as well as age was found to be statistically significant, with $p=0.000$.

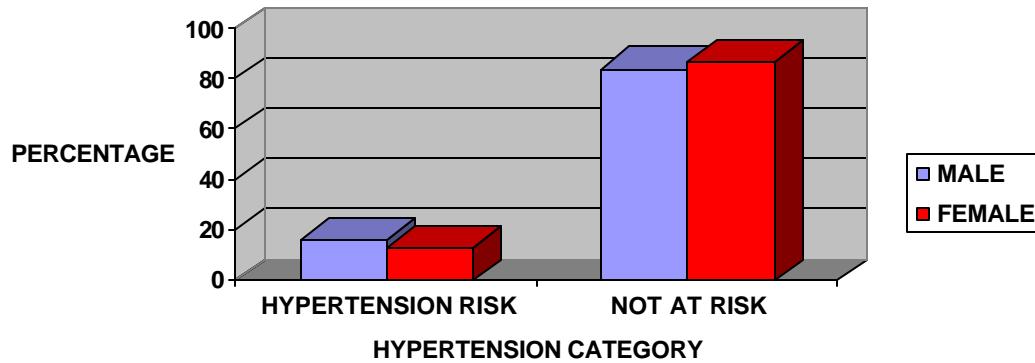


FIGURE 4.3 AT RISK FOR HYPERTENSION LEARNERS (N=581)

4.4.3 Skin fold and percentage body fat

According to the classification of percentage of body fat, 16% of the learners were classified as overweight. Figure 4.4 shows the classification of the learners based on BMI measurements and percentage body fat in the categories of underweight, normal and overweight.

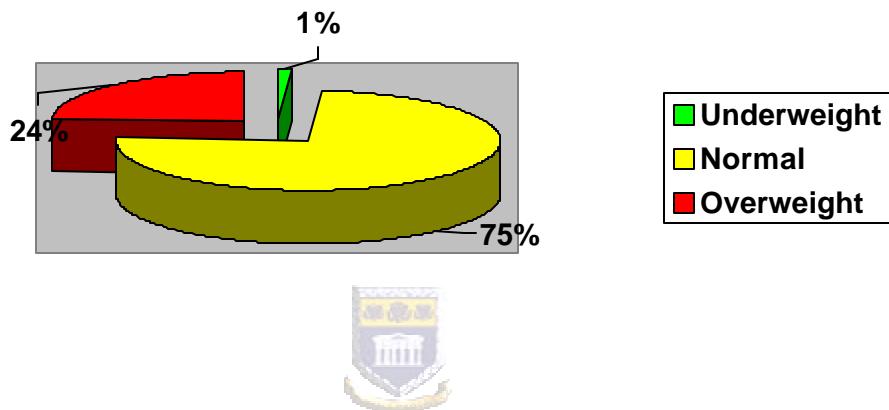


FIGURE 4.4 FAT CLASSIFICATION OF LEARNERS

4.5 PRE-INTERVENTION ANALYSIS OF THE INTERVENTION GROUP AND THE NON-INTERVENTION GROUP

Fifty-three learners initially participated in the intervention programme and 53 learners, who were initially measured but who did not participate in the intervention programme, were selected to be measured as a control group. The mean age for the intervention group was 14.6 years with a standard deviation of 1.3 and for the non-intervention group it was 13.9 years with a standard deviation of 1.3. Both the intervention and non-intervention groups consisted of 21 male learners and 32 female learners.

4.5.1 Anthropometric and physiological measurements of the intervention and non-intervention groups

Table 4.5 describes the mean anthropometrical and physiological measurements for the intervention group and the non-intervention group. The mean weight for the intervention group (n=53) is 55kg with a standard deviation of 14.2 kg and the non-intervention group (n=53) is 54kg with a standard deviation of 12.3 kg.

TABLE 4.5 MEAN ANTHROPOMETRIC AND PHYSIOLOGICAL MEASUREMENTS OF LEARNERS IN THE INTERVENTION GROUP AND THE NON-INTERVENTION GROUP

INTERVENTION GROUP (n=53)			NON- INTERVENTION GROUP (n=53)	
VARIABLE	MEAN	SD	MEAN	SD
WEIGHT (kg)	55.0	14.2	53.3	12.2
HEIGHT (m)	1.6	0.1	1.6	0.1
*BMI (kg/m ²)	21.1	4.5	21.0	4.2
%BODY FAT	24.9	12.7	26.2	13.3
*SBP(mmHg)	111.5	14.4	111.1	12.1
*DBP(mmHg)	70.0	7.9	72.7	10.5
PULSE RATE	79.7	13.4	83.4	16

*BMI= body mass index

*SBP = systolic blood pressure

*DBP = diastolic blood pressure

4.5.2 Anthropometric and physiological measurements of the intervention and non-intervention groups according to age

In Tables 4.6 and 4.7 the mean anthropometric and physiological measurements according to age are described. In the intervention group learners aged 16 had the highest standard deviation of 18.5 kg, whilst in the non-intervention group learners aged 15 had the highest standard deviation of 30.7 kg.

TABLE 4.6 MEAN ANTHROPOMETRIC AND PHYSIOLOGICAL MEASUREMENTS FOR THE INTERVENTION GROUP ACCORDING TO AGE (N=53)

AGE	13	14	15	16	17/18
	(n=15)	(n=9)	(n=11)	(n=12)	(n=4)
VARIABLE	MEAN(SD)	MEAN(SD)	MEAN(SD)	MEAN(SD)	MEAN(SD)
Weight (kg)	46.4(9.3)	53(8.1)	61(15.6)	59.2(18.5)	62.8(7.1)
Height (m)	1.6(0.1)	1.6(0.1)	1.6(0.1)	1.6(0.1)	1.7(0.1)
*BMI(kg/m²)	19(3.2)	20.6(2.2)	22.3(4.0)	22.5(7.0)	23(1.6)
%BODY FAT	18.4(8.6)	23.7(9.2)	27.1(9.7)	29.6(17.2)	32.4(17.9)
*SBP(mmHg)	106(13.4)	112.8(11.3)	120.4(17.1)	111.9(13.7)	103.1(9.3)
*DBP(mmHg)	68.2(9.1)	71.8(6.2)	74.5(7.1)	69.5(7.1)	62.2(4.6)
PULSE RATE	77.1(10.1)	83.8(11.5)	83.4(15.8)	75.8(14.4)	81.8(18.7)

*BMI= body mass index

*SBP = systolic blood pressure

*DBP = diastolic blood pressure

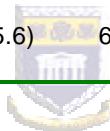
TABLE 4.7 MEAN ANTHROPOMETRIC AND PHYSIOLOGICAL MEASUREMENTS FOR THE NON-INTERVENTION GROUP ACCORDING TO AGE (N=53)

AGE	13 (n=30)	14 (n=12)	15 (n=3)	16 (n=7)	17/18 (n=3)
VARIABLE	MEAN(SD)	MEAN(SD)	MEAN(SD)	MEAN(SD)	MEAN(SD)
Weight (kg)	51.7(11.2)	51.5(10.3)	55.7(30.7)	62.8(10.0)	51.7(2.1)
Height (m)	1.6(0.1)	1.6(0.1)	1.5(0.1)	1.7(0.1)	1.7(0.1)
*BMI(kg/m ²)	21.3(3.9)	20.3(3.8)	23.1(10.8)	21.8(3.2)	18.6(0.9)
%body fat	25.6(8.4)	24.8(14.4)	38.7(31.6)	27.3(19.3)	23.3(13.9)
*SBP(mmHg)	109.6(11.9)	107.4(13.3)	122.2(9.6)	120(8.5)	109.2(6.3)
*DBP(mmHg)	72.4(11.9)	71(9.1)	79.5(9.8)	73.1(8.6)	76.1(5.6)
PULSE RATE	88.8(16.3)	79.5(15.6)	69.8(8.1)	75.5(13.9)	76.7(2.3)

*BMI= body mass index

*SBP = systolic blood pressure

*DBP = diastolic blood pressure



4.5.3 Anthropometrical and physiological measurements of the intervention and non-intervention groups according to gender

Table 4.8 describes the anthropometrical and physiological measurements for the intervention group (n=53) and the non-intervention (n=53) group according to gender. The mean weight for males in the intervention group was 54.5 kg and the mean weight for males in the non-intervention group was 52.7 kg. The females in the intervention group had a mean weight of 55.3 kg and females in the non-intervention group weighed 53.7 kg.

TABLE 4.8 MEAN ANTHROPOMETRICAL AND PHYSIOLOGICAL MEASUREMENTS FOR THE INTERVENTION GROUP (N=53) AND THE NON-INTERVENTION GROUP (N=53) ACCORDING TO GENDER

GENDER	MALE *IG	MALE *NG	FEMALE *IG	FEMALE *NG
VARIABLE	MEAN(SD)	MEAN(SD)	MEAN(SD)	MEAN(SD)
WEIGHT (kg)	54.5(17.4)	52.8(10.6)	55.3(11.8)	53.7(13.4)
HEIGHT (m)	1.6(0.1)	1.6(0.1)	1.6(0.1)	1.6(0.1)
*BMI (kg/m²)	19.8(4.5)	19.9(3.5)	22.0(4.3)	21.9(4.5)
%BODY FAT	14.7(9.3)	17.5(9.1)	32.2(9.4)	32.5(12.3)
*SBP (mmHg)	111.1(13.5)	112.2(11.1)	111.7(15.2)	110.4(12.9)
*DBP(mmHg)	68.8(8.4)	72.5(11.7)	70.9(7.5)	73.0(12.9)
PULSE RATE	76.5(12.7)	80.2(15.5)	81.9(13.6)	85.6(16.2)

***BMI = body mass index**
***SBP = systolic blood pressure**
***DBP = diastolic blood pressure**
***IG= intervention group**
***NG= non-intervention group**



Within the intervention group 18% were overweight and within the non-intervention 22% were classified as being overweight according to BMI. Within the intervention group 8.4% were classified as being hypertensive and 10.8% were classified as being hypertensive within the non-intervention group. Based on the BMI classification and percentage body fat, 24% were classified as overweight within the intervention group and 26% were classified as being overweight within the non-intervention group (Fig.4.5).

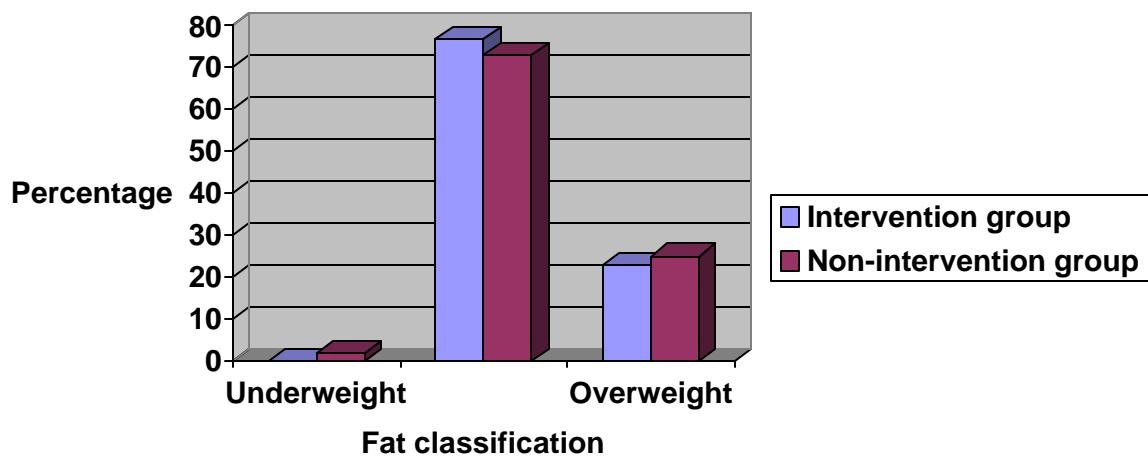


FIGURE 4.5 FAT CLASSIFICATIONS BASED ON PERCENTAGE BODY

FAT

4.6 PRE-INTERVENTION QUALITATIVE DATA



The two focus-group discussions had 10 participants from Grades 8 and 9 (five male and five female) and 10 participants from Grades 10 and 11 (five male and five female). The participants were relaxed and eager to participate.

4.6.1 Views of learners on physical activity

Learners labelled physical activity as “sports”, “exercise” and “fitness”.

Learners also regarded physical activity as a way of improving mental health.

This view is reflected in the following quote: “Those people who are physically active think more clearly than others.” The learners reported that determination and perseverance were most important when participating in physical activity. They viewed people who were physically active as having

more leadership qualities than those who were not active. Learners also expressed the view that physical activity helps one to be more positive and to socialise and interact with people. The major barriers to physical activity that emerged from the discussion were a lack of facilities and staff. This was reflected by the learners in the following quotes: "... but there aren't a lot of sports, because our school doesn't accommodate a lot of sports..."; "Our teachers always have, they say they have little time on them and they can't spend time on sport." Learners were aware of the benefits of physical activity. They responded by saying that physical activity helps to "build muscle", "...it helps to keep your body in shape", and "it encourages you to eat healthy". Learners were also aware of some of the diseases that could be prevented if one is physically active. Diseases identified by the learners included cancer, diabetes, hypertension and heart disease. Learners were also aware that diseases affected one later on in life, "... like when you grow up, you're an old man you get heart disease and stuff like that." Responses from learners varied with regard to the required amount of physical activity in which an individual should participate. "Three days a week," "two days a week" and "four days a week," were some of the responses. However, some learners were aware that an individual should be physically active on most days of the week.

The most common activities identified by the learners to be included in the programme, with some learners naming more than one activity, were rugby (12), netball (8), aerobics (7), swimming (11), cricket (2) and hockey (1). A time most appropriate for the learners to be available for the programme was

also decided upon. All learners unanimously agreed that after school, “half past two to half past three” was the most convenient time to attend the physical activity programme.

Chapter four highlights the activities identified by the learners and therefore chapter five will include the results of the intervention group compared to the non-intervention group based on the effects of the physical activity intervention programme.



CHAPTER FIVE

POST-INTERVENTION QUANTITATIVE RESULTS

5.1 INTRODUCTION

The intervention programme was administered three times a week for one hour of moderate to vigorous physical activity over a period of three months. Attendance was irregular with not one of the learners attending all the sessions offered. Data presented includes the anthropometrical and physiological measurements of the intervention group and the non-intervention group post-intervention.



5.2 ANTHROPOMETRICAL AND PHYSIOLOGICAL MEASUREMENTS

POST-INTERVENTION

Tables 5.1 and 5.2 illustrate the comparison between the intervention and non-intervention groups before and after the intervention programme according to gender.

Within the male intervention group the mean weight increased from 54.5 kg to 57.5 kg. In the female intervention group the mean weight of 55.3 kg dropped to 53.7 kg. Within the intervention group according to the Pearson Chi Square the difference in weight according to gender was statistically significant ($p=0.05$).

**TABLE 5.1 COMPARISON OF INTERVENTION GROUP FOLLOWING
INTERVENTION PROGRAMME ACCORDING TO GENDER**

GENDER	MALE PRE	MALE POST	FEMALE PRE	FEMALE POST
VARIABLE	MEAN(SD)	MEAN(SD)	MEAN(SD)	MEAN(SD)
WEIGHT (kg)	54.5(17.4)	57.5(18.3)	55.3(11.8)	53.7(13.4)
HEIGHT (m)	1.6(0.1)	1.7(0.1)	1.6(0.1)	1.6(0.1)
*BMI (kg/m²)	19.8(4.5)	20.2(4.4)	22.0(4.3)	21.9(4.5)
% BODY FAT	14.7(9.3)	17.5(9.1)	32.2(9.4)	32.5(12.3)
*SBP(mmHg)	111.1(13.5)	112.2(11.1)	111.7(15.2)	110.4(12.9)
*DBP(mmHg)	68.8(8.4)	72.5(11.7)	70.9(7.5)	73.0(12.9)
PULSE RATE	76.5(12.7)	80.2(15.5)	81.9(13.6)	85.6(16.2)



In the non-intervention group the mean weight of both the female and the male group increased from 52.8 kg to 54.9 kg and from 53.7 kg to 56.4 kg respectively. Within the non-intervention group 30.2% of the learners decreased their weight, 5.7% of the learners had no change and 64.2% of the learners increased their weight.

TABLE 5.2 COMPARISON OF NON-INTERVENTION GROUP FOLLOWING INTERVENTION PROGRAMME ACCORDING TO GENDER

GENDER	MALE PRE-	MALE POST-	FEMALE PRE-	FEMALE POST -
VARIABLE	MEAN(SD)	MEAN(SD)	MEAN(SD)	MEAN(SD)
WEIGHT (kg)	52.8(10.6)	54.9(11.8)	53.7(13.4)	56.4(12.9)
HEIGHT (m)	1.6(0.1)	1.6(0.1)	1.6(0.1)	1.6(0.1)
*BMI (kg/m²)	19.9(3.5)	20.7(3.7)	21.9(4.5)	22.6(4.3)
% BODY FAT	17.5(9.1)	13.8(11.7)	32.5(12.3)	29.8(10.7)
*SBP(mmHg)	112.2(11.1)	117(14.8)	110.4(12.9)	110.3(11.5)
*DBP(mmHg)	72.5(11.7)	74.7(18.7)	73.0(12.9)	74.8(13.7)
PULSE RATE	80.2(15.5)	74.4(12.2)	85.6(16.2)	81.8(11.2)

5.2.1 ANALYSIS OF BMI CLASS PRE AND POST-INTERVENTION

Within the intervention group 17.6% of the learners were classified as overweight prior to the intervention. Post-intervention this number dropped to 13.2%. Of the total number of learners in the intervention group, 9.4% decreased their BMI, 86.8% had no change and 3.8% increased their BMI. In comparison, within the non-intervention group, 21.8% of the learners were classified as overweight prior to the intervention, and post-intervention this number increased to 32.1%. In the non-intervention group 13.2% of the learners decreased their BMI, 56.6% had no change and 30.2% increased their BMI. Figure 5.1 illustrates the effect of physical activity on BMI within the intervention group and the non-intervention group.

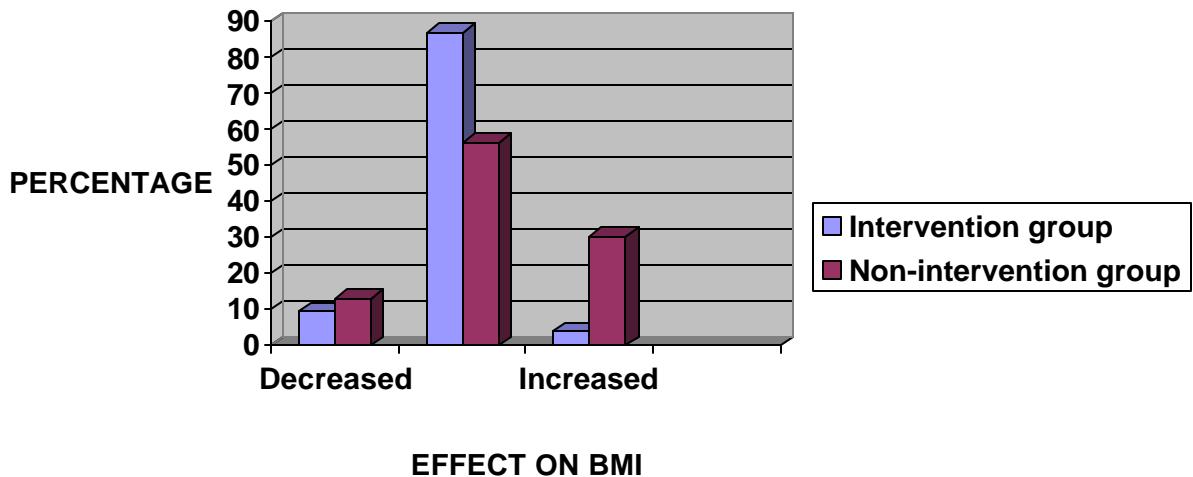


FIGURE 5.1 EFFECT OF PHYSICAL ACTIVITY ON BMI AMONG LEARNERS

5.2.2 ANALYSIS OF HIGH BLOOD PRESSURE TENDENCY PRE- AND POST-INTERVENTION

Within the intervention group, 8.4% were classified as having high blood pressure, based on the combined systolic and diastolic blood pressure readings. Following the intervention, approximately 23% of the initial high blood pressure group moved from being classified as having high blood pressure to being within the normal range, 68% had no change and 9% moved to having high blood pressure tendencies. Within the non-intervention group, 10.8% were classified as having high blood pressure initially. Of this group, 30.2% moved from being classified as having high blood pressure to being within normal range, 5.7% had no change and 64.2% moved toward having a higher blood pressure. Figure 5.2 illustrates the effect of physical

activity on blood pressure within the intervention group and non-intervention groups.

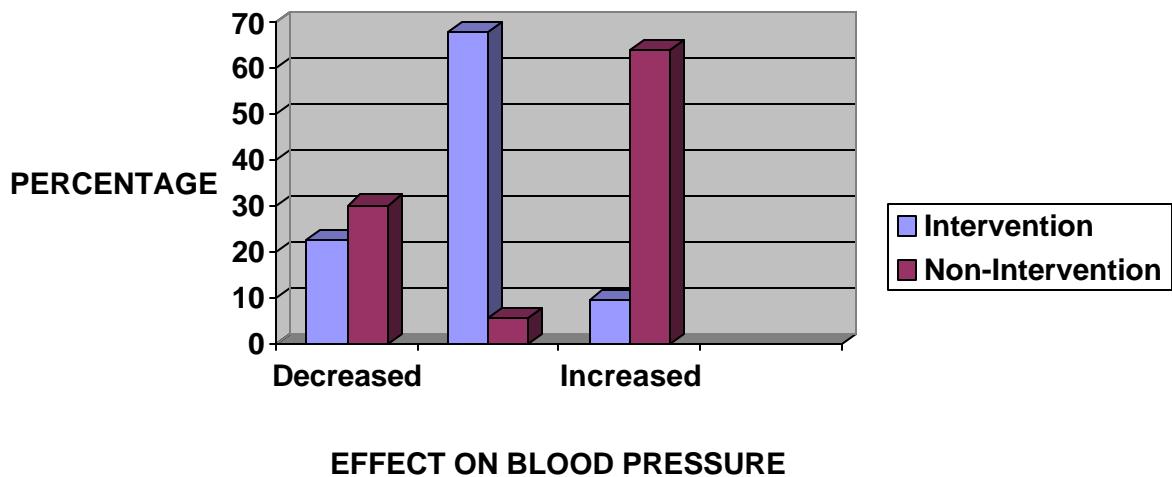
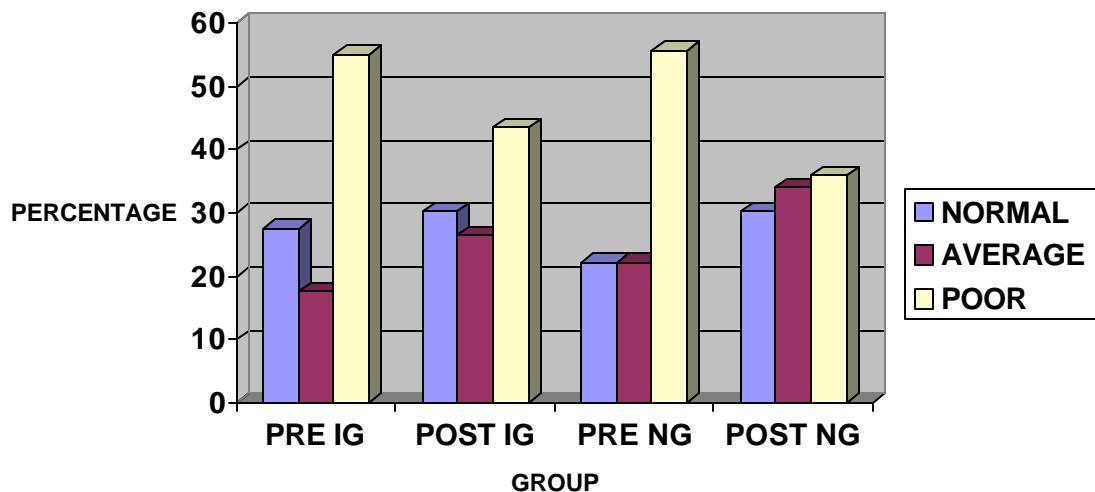


FIGURE 5.2 EFFECT OF PHYSICAL ACTIVITY ON BLOOD PRESSURE



5.2.3 ANALYSIS OF PULSE RATE PRE- AND POST -INTERVENTION

Analysis of the baseline data of the intervention group revealed that 27.5% of the learners were classified as normal, 17.6% as average and 54.9% as poor. Post-intervention 30.2% were classified as normal, 26.4% as average and 43.4% as poor. Within the non-intervention group, baseline data classified 22.2% of the learners as normal, 22.2% as average and 55.6% as poor. Post-intervention learners within the non-intervention group reflected 30.2% as being normal, 34.0% as average and 35.8% as poor. Figure 5.3 presents the effect of physical activity on pulse rate.



* Pre IG =Pre-intervention group
 * Post IG =Post -intervention group
 * Pre NG =Pre-non-intervention group
 * Post NG =Post-non-intervention group

FIGURE 5.3 EFFECT OF PHYSICAL ACTIVITY ON PULSE RATE



5.2.4 ANALYSIS OF FAT CLASS PRE- AND POST-INTERVENTION

Within the intervention group baseline data classified 0% of the learners as underweight, 86.3% as normal and 13.7% as overweight. Post-intervention 67.9% of learners were classified as normal and 32.1% as overweight. Within the non-intervention group 1.8% was classified as underweight, 87.3% as normal and 10.9% as overweight. Post-intervention 3.8% of the learners were classified as underweight, 60.4% as normal and 35.8% as overweight. Figure 5.4 presents the effect of the physical activity programme on fat classification.

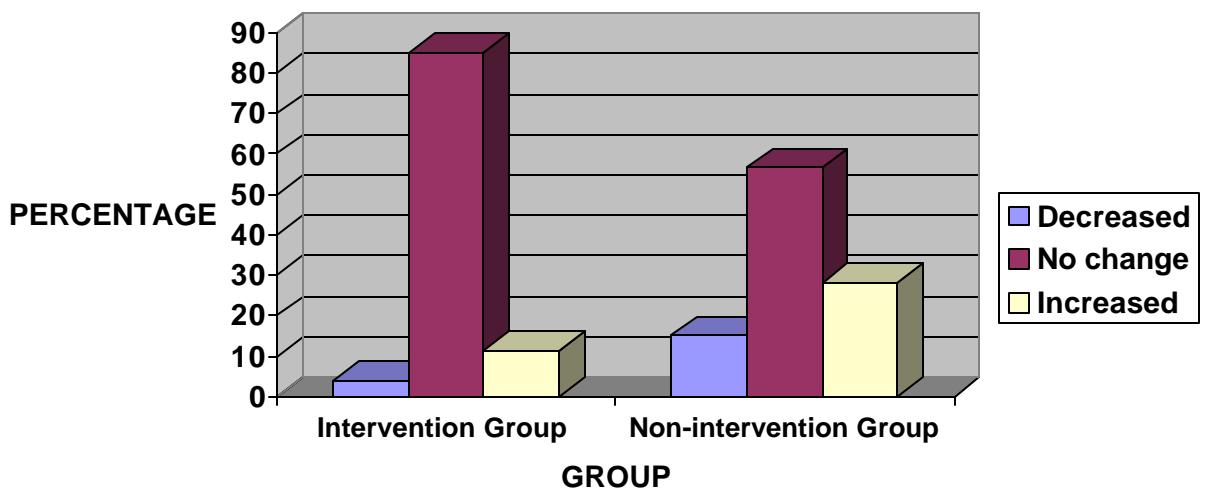


FIGURE 5.4 EFFECT OF PHYSICAL ACTIVITY ON FAT CLASS

Using the paired sample t-test within the intervention group, it was found that both SBP and DBP were statistically significantly influenced by the intervention programme, $p= 0.03$ and 0.01 respectively. However, the ttest also showed that the changes that occurred in weight and BMI were not statistically significant, $p=0.18$ and 0.50 respectively.

However, within the non-intervention group the paired sample t-test showed a statistically significant change with regard to weight and BMI, $p=0.00$ and $p=0.00$ respectively.

The independent ttest was done to compare the results of the intervention group and non-intervention group. A statistically significant change was found for only the diastolic blood pressure with $p=0.02$.

The effects of the physical activity programme were highlighted in this chapter and the results will be discussed and compared to other studies in the next chapter.



CHAPTER SIX

QUANTITATIVE DATA DISCUSSION

6.1 INTRODUCTION

The first objective of this study was to assess the prevalence of learners at risk for developing obesity and hypertension in young people at a local school in the Belhar community. The second objective was to monitor the impact of physical activity on weight, blood pressure, body mass index (BMI) and body fat classifications among adolescents in a local Belhar school through a school-based intervention programme. This chapter discusses the findings of the current study and compares them with similar studies. The limitations of the study are also discussed.



6.2 PREVALENCE OF OVERWEIGHT, HYPERTENSION AND FAT PERCENTAGE AMONG YOUNG PEOPLE

According to Heath, Pratt, Warren and Kann (1994), risk factors associated with cardiovascular disease are known to establish themselves during childhood and continue into adulthood. Risk factors commonly identified for cardiovascular disease include obesity, hypertension and high percentage body fat. In the current study of the total population of 581 learners initially measured, 19% tended towards obesity and 16% were classified as overweight, based on their BMI and percentage body fat based on the initial baseline measurements taken of 581 learners.

The prevalence of obesity in South Africa is similar to that in developed countries such as the USA, which had an obesity rate of 18% in 1998 (Mokad, Serdula and Dietz 1999). However, according to Pescatello and Van Heest (2000), the overweight and obese American population has increased to approximately 50%. According to Story, Evans, Fabsitz, Clay, Rock and Broussard (1999), the prevalence of obesity among American Indian communities ranged from 15% to 39%. Pescatello and Van Heest (2000) further concluded that an obesity epidemic is spreading throughout the industrialised world with negative health effects. In a South African study by Kruger, Venter, Voster and Margetts (2002) it was reported that there was an overweight prevalence of 25% and an obese prevalence of 28%. In addition, Puoane, Steyn, Bradshaw, Laubscher, Fourie, Lambert and Mbananga (2002) reported an overweight prevalence of 29% among South African males older than 15 years and 57% for South African women. These alarming trends are becoming evident and could lead to an obesity epidemic in South Africa if health risk behaviours are ignored.

Hypertension is also a major public health problem worldwide. In the current study, 14% of the 581 learners initially measured were at risk for hypertension. This finding can be compared to those in a study conducted by Al-Sendi, Shetty, Musaiger and Myatt (2003) in which 14% of the adolescents in the study were classified as having high blood pressure. Hypertension is common among the black population of Africa. Studies in South Africa have shown that 25% of adult Zulu speakers in Durban Seedat (1999) and 20.7% to 28% of apparently healthy Tswana-speaking people in the North-West

Province were hypertensive. Lauer and Clarke (1989) reported that the most important determinant of childhood blood pressure is obesity. Longitudinal studies have shown that children who increase in relative body size also increase their blood pressure relative to that of their peers, and, conversely, those who have decreased body size also have decreased blood pressure levels. The high prevalence of obesity in children suggests that the prevalence of obesity is also likely to be high in the community because obesity tends to occur in families. In adults, obesity is clearly associated with atherosclerotic heart disease, hypertension, and diabetes mellitus. The identification of high-risk family clusters would be simple to implement if school children were used as index cases. It is therefore imperative that health promoters target the communities to combat this rising epidemic. According to Sallis and Patrick (1994), obese and hypertensive adolescents can decrease their blood pressure through physical training, especially if they lose weight.

6.3 EFFECTS OF A SHORT -TERM PHYSICAL ACTIVITY INTERVENTION PROGRAMME

Lauer and Clarke (1989) emphasised that children who have been identified as having high blood pressure are at greater risk of becoming hypertensive adults. It is thus essential that the effects of physical activity on blood pressure in young people be examined. Sallis and Patrick (1994) support this statement and add that in order to lower blood pressure, physical activity must

be performed frequently, at least three to five times per week at a moderate to high intensity.

In the current study the intervention programme was aimed at a frequency of three times per week for a duration of three months. However, learners did not always participate in the programme as regularly as they should have. Despite this, there were some significant changes amongst the participating learners when compared to the learners who did not participate in the intervention programme.

An analysis of the combined BMI and percentage body fat indicated that only 3.8% of learners within the intervention group decreased for this classification. However, in comparison with the non-intervention group, of which only 56.6% maintained their initial measurement within the variable, 84.9% of learners within the intervention group maintained their classification. Of the learners within the non-intervention group 28.3% increased for this classification in comparison with the intervention group, of which only 11.3% increased for this classification. It is reasonable to believe that there is a causal relationship between a low physical activity level and the risk of getting fat and unfit; however, both these traits have a strong genetic component and nutrition plays a key role, at least in the aetiology of obesity. It has often been claimed that physical activity protects against weight gain by increased caloric expenditure. Theoretically, it is possible for people who are obese to lose weight and maintain weight loss by caloric restriction, but keeping the weight off long-term without increased activity is seldom possible (Nielsen, Lars and Anderson 2003).

An analysis of the participants' blood pressure revealed that only 22.6% of learners' blood pressure had decreased. Of the learners in the intervention group, 67% maintained their blood pressure. This is in contrast with the non-intervention group where 66% of learners maintained their blood pressure. It is interesting to note that only 9.4% of the intervention group increased their blood pressure whereas 13.2% of the non-intervention group increased their blood pressure. Nielsen et al. (2003) stated that previous studies on blood pressure have reported a non-linear association between fitness and blood pressure. In a longitudinal study conducted by Liu, Ruth, Flack, Jones -Webb, Burke, Peter, Savage, Stephen and Hulley (1996), data confirms that there are, at most, very small differences in blood pressure when participants are young. Reported differences increased over time as participants aged.



The most significant finding in this study is that although the intervention group did not have a high rate of change within variables from pre-intervention to post-intervention, when comparing the group to the non-intervention group there is a significant difference between variables for learners who were able to maintain their initial baseline measurement. There is also a large difference between the number of learners in the intervention group and the non-intervention groups who increased within variables from the initial baseline measurement.

Living in a third-world country undergoing vast transition, mankind is constantly advancing technologically. It is imperative that we do not forget that

the human species was designed for movement. Should we continue to lead sedentary lives, so shall the rise of NCD'S increase and continue to plague our communities. It is imperative that intervention programmes continually be developed to curb this rising epidemic.

6.4 LIMITATIONS AND STRENGTHS OF THE STUDY

It is important to note the limitations of the study. Firstly, although this was a school-based intervention programme which is widely indicated by literature, there are also constraints to implementing school-based programmes. These constraints were experienced during this study. They included availability of learners for the study as well as not having prescribed time for the intervention programme.



Secondly, the implementation programme was conducted for three months only. An intervention over a longer period of time could have resulted in more significant changes.

Thirdly, the study was not able to minimise confounders such as diet and additional exercise classes that learners who participated in the intervention may have participated in, as the researcher acknowledges that diet impacts on both weight loss and hypertension.

Despite the limitations, the study had several strengths. The response rate for the baseline data was high. All research assistants were trained biokinetics

students who were familiar with obtaining the physiological and anthropometric measurements. In addition, the intervention group had only seven dropouts with all the others continuing for the duration of the intervention programme. The study also utilised qualitative findings to obtain the views of stakeholders such as the learners and teachers with regard to the programme.

Chapter six discussed the quantitative data and presents the limitations of the study. Chapter seven presents the qualitative results and discussion of the focus -group discussions conducted post-intervention.



CHAPTER SEVEN

QUALITATIVE POST- INTERVENTION RESULTS AND DISCUSSION

7.1 INTRODUCTION

Two weeks after the intervention programme, two focus -group discussions were held. The first focus-group discussion was conducted with 10 learners (five males and five females) who participated in the physical activity intervention programme. The aim of this focus-group discussion was to determine which factors facilitated participation in the intervention programme and also to determine what hindered learners' participation. The focus-group discussion was also utilised to gain input from the learners to assess the current physical intervention programme and to get some recommendations as to how future programmes could be improved. The second focus-group discussion was conducted with four teachers in the school (one female teacher and three male teachers). These teachers either taught PE or were involved with coaching sport in the school. The aim of this focus-group discussion was to determine the teachers' views on the current state of PE within schools: whether it should be re-implemented and if so, how they thought it should be re-implemented. The focus-group discussion also assessed the challenges that face teachers teaching sport in a previously disadvantaged school. It was also utilised to ascertain the teachers' views on the physical activity intervention programme, to determine how they thought it assisted them as teachers in teaching sport at school and how they believed a

physical activity programme could help to facilitate the re-implementation of PE within the school system. The participants were relaxed and felt free to express their views. Three main themes emerged from the learners' focus-group discussions: barriers to participation as identified by the learners, benefits to participation in the physical activity programme as identified by the learners and future recommendations for physical activity intervention programmes.

7.2 BARRIERS TO PARTICIPATION IN THE INTERVENTION PROGRAMME AS IDENTIFIED BY LEARNERS

Barriers are factors that inhibit people in their actions, thus preventing them from participating in activities they would normally like to involve themselves in. Different people experience different barriers, since the environment in which a person operates often determines the barriers. The focus-group discussion revealed that the learners in the participating school experienced the following barriers: a lack of time, duties at home, fears for their safety, and a lack of parental support. The verbatim quotes below best describe the barriers that were identified.

Time: In the group discussion the learners were asked what made it difficult for them to participate in the physical activity programme. With regard to time common responses were:

- "... like if we had a lot of homework then we can't make it."

- "...school tasks then we have to go to the library so we can't make it, our school doesn't have enough books".

Whaley and Ebbeck (1997) indicated that time was a major barrier to participation in activities. The majority of the participants in this study also identified the lack of time as a barrier, and when participants were asked to explain what time as a constraint meant to them, some of the responses were:

- "It's a question of priorities" and
- "I'm too busy with other things."

The home environment: The home environment also influenced learners' participation:

- "I have to cook supper and clean the house then I can't come."
- "I have to look after my little sister till my mother comes home, I can't stay after school."
- "I must go to my house and clean and do the washing and cook supper."



Parents' support: Parents lacked understanding of the benefits of physical activity and this impacted negatively on the learners' participation in the programme:

- "My mother would *skei* (scold me) and say, "Why are you running on the field when there is so much to do at home?"
- "It is at a bad time and our parents think we are lying..."

Safety: Fear for their personal safety also influenced learners' participation:

- "There is no-one for me to walk home with."
- "I don't like walking home without my friends."
- "My mother says I must walk home with my brother."

Young people's ability to participate in physical activity programmes is influenced by various factors. The above-mentioned problems are real barriers that the young people experienced and they highlight the need for a holistic approach to introducing intervention programmes. The barriers identified are similar to those identified in studies by Mitchell (1996) and Mulvihill, Rivers and Aggleton (2000). The barriers that were highlighted emphasise the need to understand not only individual beliefs and expectations but also the beliefs and expectations of the communities from which the learners come.



7.3 BENEFITS TO PARTICIPATION IN THE PHYSICAL ACTIVITY PROGRAMME IDENTIFIED BY LEARNERS

The main benefits of the physical activity intervention programme that emerged from the discussion was that it improved fitness, provided skills, encouraged team work, encouraged positive feelings, reduced fatigue, maintained weight and provided some recreation after school hours. These benefits are discussed below.

Improves fitness: Learners who participated in the intervention programme reported that the intervention programme made them realise how unfit they were and therefore motivated them to participate more in order to improve their fitness:

- “The programme made me realise how unfit we actually are...”

Provides skills: The intervention programme included ball skills as a type of activity complemented by cardiovascular exercise. Learners viewed the programme in a positive light, saying that the programme gave them skills that would act as a catalyst in their effort to get fit:

- “It gave me some skills that I can continue practising to get myself more fit and stronger.”



Encourages team work: The learners felt that participating in the programme as a group taught them team work and instilled a sense of belonging within them:

- “The activities you made us do like running in a line together at the same time takes team work and we haven’t done things like that before.”

- “In sport you are not one person so you must learn to work together.”

Engenders positive feelings: The learners described the positive feelings that they had experienced while they were part of the intervention programme. They described feelings of self-worth, a sense of belonging and a sense of enjoyment:

- "We want more sport in our school because it makes us feel like we want to belong to something."
- "Not many people were prepared to come spend so much time with us."
- "The dancing and the music was fun for me."

Provides physiological benefits: Learners reported that they felt less fatigued and were feeling healthier. They reported that exercising had produced a good feeling:

- "Ja, and it makes me feel good to exercise then I'm not so tired and getting fat."

Provides recreation: The intervention programme provided a recreational facility within a community where recreational facilities are minimal. The learners reported that it had given them something to do:

- "I love to dance but I can't pay money to go to someone so the aerobics and the dancing and the music were fun that's why I came."
- "It gave me something else to do other than school work....it was so nice for me."

The benefits identified by the learners included physical, mental and psychological benefits. Although the manner in which the learners articulated the issues may differ, the findings are similar to those identified in the study by Mulvihill et al. (2000) and O'Dea (2003). From the current study it was observed that learners were eager to participate in the intervention

programme and that they valued the fact that it had been started. However, it was evident that there were definite barriers that prevented their consistent participation.

7.4 LEARNERS' RECOMMENDATIONS FOR FUTURE INTERVENTION PROGRAMMES

The discussion with the learners invited comments as to how the intervention programme could be improved as well as recommendations for future intervention programmes. All learners in the discussion unanimously agreed that the intervention programme should be included into the school day. This was clear from the following quotes:

- "I think if it was in school more children will want to come and then it will be easier."
- "Like if it was a part of the school day then a lot of us would come."
- "It would nice break from lessons and then we can participate together."



Learners also suggested that an intervention programme could be incorporated into the PE class to facilitate more participation and interaction between learners and the facilitator. One learner responded:

- "Because now why the boys only exercise for half the PE lesson and then the girls. Like if there were more people like you then they each take a group and we can exercise for longer during that lesson."

The learners also said having the intervention programme as part of PE would allow for varied activities as the groups would be smaller:

- “Have it as a part of PE is so boring all we do is run around the field.”
- “We need change; we do the same things all the time!”

PE at schools is on the agenda of the Department of Education in South Africa. It is clear that the learners feel that PE and physical activity should be an integral part of their education. According to Seefeldt and Vogel (1986), quality PE programmes are needed to increase the physical competence, health-related fitness, self-esteem and enjoyment of physical activity for all learners.

7.5 RE-INSTATEMENT OF PHYSICAL EDUCATION IN SCHOOLS



The policy-makers of the Department of Education are currently looking at re-introducing PE into schools. However, according to Travill (1997), in South African schools and especially schools in previously disadvantaged areas, during restructuring, PE teachers were the first to go. The statement posed to the group was that the Minister of Education had made the following statement: ‘PE must be re-introduced into schools’ and thus ‘How do they as teachers feel about this? There were mixed feelings regarding the statement as all teachers realised that PE was an important part of a child’s education and agreed that it should be re-introduced. However, he was aware that there were definite barriers to the smooth re-implementation of PE in the current school system. Teachers had mixed feelings about ideas that arose with

regard to the re-implementation of PE. The barriers as perceived by the teachers are discussed below and possible recommendations are made for implementation to succeed.

Perceived barriers to the implementation of PE were numerous. These barriers included a lack of time within the school timetable, problems with the availability of the school staff, sourcing of additional staff, access to funds, a mind-shift on the part of the learners as well as of the management and staff of the school, inadequate space and equipment and finally, a lack of foresight from the Department of Education.

Teachers reported that a vacuum had been created for many years and that children were not used to sport being compulsory in schools, therefore the learners would have to make a mind-shift before they would be willing to participate in PE:

- "This vacuum exists for many years, it is difficult to get the learners to accept that there is compulsory sport so you are sitting with a situation where you must almost threaten them to do something so you can evaluate them."

Facilities within disadvantaged schools are limited and therefore they are cannot accommodate a wide variety of sports:

- "It's difficult in a school set-up like this because although we have a hall, it's not a hall because you cannot do any sport in it, it's not conducive for ball games like basketball or anything requiring space."

Teachers also retorted that the Department of Education creates barriers to PE by not creating facilities that are conducive to sport within the school. The department places more emphasis on academic performance, and with the new curriculum there will be even less focus on sport:

- “You have got the full academic programme...the minister also said he wants maths literacy and all those other little things incorporated into schools. I think the emphasis is moving away from sport and has pushed sport into more private institutions.”
- “There is little time in the school timetable as it is for PE”

Teachers generally felt that the increasing workload placed on teachers as well as the fact that teachers have to fulfil multiple roles within the school does not make it viable for PE to be re-instated within the school at present. Teachers also felt that employing additional staff currently is not feasible due to a lack of finances:

- “The rich schools that can afford it, they can employ PE teachers. We don't have the money or the resources to employ PE teachers.”

PE as a focus area of LO is compulsory for all schools, but due to its low priority no implementation and monitoring strategies are in place to ensure delivery. It is therefore becoming more difficult to practise PE in historically disadvantaged schools, since the shortage of qualified teachers and proper facilities is not being addressed (CEPD/EPU 1999).

Teachers emphasised that there were numerous benefits to physical activity.

Teachers acknowledged that sport encourages discipline, improves fine motor control and ball skills and stimulates the brain. Teachers noted that learners were more disciplined when they participated in sport:

- “Sport is needed within the school because it instils discipline within the children, and they know if they misbehave they won’t be allowed to do something they love.”

Teachers also said that they had noticed that children who play sport outside of the PE class had improved fine motor skills and better ball skills:

- “... and you find that their ball skills and their fine motor skills are not developed because they are not used to handling a ball except for a little bit of throwing around, those children that participate in sport you can recognise them they are more skilled.”



During the discussion teachers outlined some recommendations that would facilitate the re-implementation of PE. One teacher said that he sees the learners three times a week. If they cut down on the life skills lessons he could only have two periods of LO instead of three and then a PE teacher could be hired to teach the PE. This would ensure that learners were physically active at least once a week. According to one teacher:

- “... if we do have qualified PE teachers in the schools then it is possible to introduce it in our schools.”

Some teachers within the school felt that PE should be reinstated but that it should be conducted differently. They felt that PE should become an examination-based subject with a theoretical component and a practical component. This suggestion created some tension among the teachers. Some teachers felt that PE teachers were earning the same salary, yet all they were doing was standing on the side of a field:

- "... because I'm teaching like crazy in my classroom but my colleague whose like salary is the same he's just standing and observing the learners playing, that's the unfairness about it!"

On the other hand, the PE teachers felt that having PE as an examination subject would not be feasible:

- "I'm one teacher who must teach PE for the whole school. How must I still plan an exam and mark for the whole school?"

Teachers were then presented with a question:

- "If you received support from an outside institution like U.W.C and they ran an intervention programme similar to the one that was conducted within the school by me how this would assist you?"

The PE teachers responded by saying that the programme would alleviate some of the pressure that was on him:

- "It also takes a little pressure off the teacher."

However, the teachers emphasised that it would be difficult to fit it into the timetable. This was still an issue even if an outside institution could facilitate the process. One teacher also emphasised that by supporting the programme in whatever way possible, the learners by participating in the programme and the staff by being more flexible with moving lessons around and assisting, the school management would have to “buy in” to the programme if the programme was to succeed:

- “The only problem is that the learners need to want to participate and the teachers and management need to support you by being more flexible with lesson time.”

If a change is to be brought about in the approach to PE in South Africa, all those involved need to realise that they cannot work in isolation. To achieve the desired objectives – whether they are health promotion or social development – efforts must be combined and co-ordinated (Spain 2000; Darlison 2001). A concerted effort by the different stakeholders is needed, particularly to form a collective perspective (Hills 2001). The biggest professional challenge is to get all the stakeholders involved and to harness the combined strengths of all the professionals, policy-makers and those from other sectors for the common good (Hills 2001). Physical activity is not contentious; it has few, if any, opponents; it is a highly cost-effective public health and social intervention (Darlison 2001). South Africa needs a structured, cost-effective approach to PE and health education that stipulates national objectives and detailed strategies to obtain these objectives to aid long-term health promotion. Dietary habits, as well as physical activity

patterns for young children, should be addressed through short- and long-term objectives (De Klerk 2002).

The results and discussion of the qualitative data have been presented in this chapter. Chapter eight will offer a summary of the study, conclusion and recommendations based on the study.



CHAPTER EIGHT

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

8.1 INTRODUCTION

In this chapter a summary and conclusion of the study are provided. The recommendations emerging from the study are presented as well as future activities in this area.

8.2 SUMMARY

The purpose of the current study was to determine the effect of a short-term physical activity programme on weight, body mass index (BMI) and blood pressure. The study specifically investigates how anthropometric measurements of weight, BMI and percentage body fat, as well as physiological measurements of blood pressure and pulse rate can be influenced by a short-term physical activity programme. The researcher took into account the learners' views when drawing up the physical activity programme. Post-intervention the learners discussed the benefits of the physical activity intervention programme and possible recommendations for the future. In addition, a focus-group discussion was held with teachers in the school to obtain their views on the physical activity programme and on the reinstatement of PE in South African schools.

The motivation for the study was that South African communities are undergoing transition. In this time of change, the communities are still fighting against communicable diseases but they are increasingly becoming susceptible to NCD'S. Our bodies were designed for movement, and our ancestors had to be physically active to perform their daily tasks. With the advance of technology upon us and unhealthy food in abundance, we are moving more and more towards a lifestyle of convenience. Poor choice of lifestyle, such as physical inactivity, can result in chronic diseases of lifestyle. Few intervention programmes within the South African context exist to combat this rising epidemic.

A local high school in Belhar, Cape Town, was used as the research setting, and the range of the sample population was 13 to 18 years for the pre-and post-intervention groups. The focus-group discussion conducted with the teachers included all teachers in the school that either taught PE or were involved with coaching sport within the school. Baseline measurements were initially taken of 581 learners in the school to determine the prevalence of learners in the school at risk for developing obesity and hypertension. A total of 53 learners then completed the three-month intervention programme and availed them for post-intervention re-evaluation. At the same time, 53 learners who had initially been measured but who did not participate in the intervention programme, were randomly selected as a comparative group. A focus-group guide was utilised to obtain learners' recommendations for the physical activity programme. Post-intervention the focus-group discussion guide was used to obtain the learners' viewpoints around the intervention programme as

well as the teachers' viewpoints on physical activity. Descriptive and inferential statistical analyses were used for the learners' pre- and post-intervention data, whereas themes were formed from the views and opinions of participants in the focus-group discussion.

Among the 581 participants, 76% were classified as having a normal BMI, 5% were underweight and 19% were at risk for obesity. Pre-intervention, within the intervention group, 18% of the learners were classified as being overweight, and within the non-intervention group 22% were classified as being overweight according to BMI. Within the intervention group 8.4% were classified as being hypertensive and 10.8% were classified as being hypertensive within the non-intervention group. Within the intervention group, there was a decrease from 18% to 13% post-intervention of the learners classified as overweight according to BMI. In comparison, the non-intervention group had 22% of the learners previously classified as overweight, and post-intervention this number rose to 32%. The main findings of this study are however that on comparison of the intervention and non-intervention groups, post-intervention, there were a significant number of learners who maintained their initial measurement within a variable. Few learners within the intervention group increased from their initial baseline measurement within a variable whereas this was more significant within the non-intervention group.

Post-intervention the main themes that emerged from the focus-group discussion conducted with the learners were: barriers to participation in the intervention programme identified by learners, benefits to participation in the

physical activity programme identified by learners and learners' recommendations for future intervention programmes. One of the main recommendations highlighted by the learners was that physical activity as part of PE should definitely be included in the school programme as part of the school day.

During the focus-group discussion with teachers, the plight facing those having to teach physical activity within a previously disadvantaged school was highlighted. The benefits of physical activity and re-introducing PE at schools were pointed out, but they were overshadowed by the many constraints currently facing teachers in schools. Teachers also made some recommendations that they felt would facilitate PE being re-instated in South African schools. One of the main recommendations made by the teachers was that more PE teachers need to be trained and re-employed within the schooling system. One PE teacher cannot cope with teaching a whole school. This is especially true of the situation in a co-ed school where the girls and boys want to be separated for PE.

8.3 CONCLUSION

The results of this study indicate that a relatively high percentage of adolescents are at risk for obesity and hypertension within the relevant local school. This study sample compares favourably to other populations in the world where obesity and hypertension have been identified as public health concerns. The short-term physical activity programme was beneficial in

attempting to reduce weight, blood pressure, BMI and body fat percentage and succeeded in maintaining the current status quo over a three-month period among those learners who participated in the intervention programme. Those learners who did not participate in the physical activity programme had a higher increase from their baseline measurements among the variables than the intervention group. This predisposes them to CDLs that are related to physical inactivity, such as cardiovascular diseases, Type 2 diabetes mellitus, osteoporosis, cancer and osteoarthritis. The impact of increased CDLs will result in a future health burden in a country which is already crippled by poverty, communicable diseases and HIV/AIDS, similar to other developing countries.

Lack of equipment, facilities and appropriate sport types were highlighted as a few of the barriers to participation in physical activity. The intervention programme clearly indicated that if an effort is made to provide learners with activities that interest them, they would be more willing to participate. The concept of community participation and community ownership of the intervention clearly contributed to the successful implementation of the programme over three months. However, it also became clear that the learner participation would have been more viable if all the factors influencing the learner had been viewed holistically.

Teachers within the school emphasised that more PE teachers need to be trained and re-employed within schools should PE be re-instated as a subject within South African schools. A lack of facilities within the school also poses a

barrier to the re-instatement of PE within schools. Some teachers maintained that PE should be re-instated as an exam subject as they felt that there was an unequal distribution of work load between teachers teaching PE and teachers teaching academic subjects. This raised some conflict as PE teachers felt that they were already being overworked. Teachers asserted that a mind-shift is required by learners, staff and management if PE is to find a place within the South African school system.

8.4 RECOMMENDATIONS

Based on the findings of the study, the following recommendations are divided into short-term recommendations and long-term recommendations.



8.4.1 Short-term recommendations

1. The physical activity intervention programme should be continued under the auspices of the University of the Western Cape thus encouraging a relationship between the university and schools.

2. Primary-care providers, particularly physiotherapists and dieticians, have the potential to play an important role in increasing the awareness of health-related risk behaviours such as physical inactivity, poor diet and overeating and therefore should be included into the programme. This service can be provided by the

physiotherapy and dietetics departments at the University of the Western Cape.

3. A larger group of learners should be encouraged to participate in a similar intervention programme and other variables should be included such as attention span and discipline.
4. Co-operation from teachers and parents should be encouraged at the beginning of the intervention to address some of the confounders that could not be addressed in this study.

8.4.2 Long-term recommendations



1. The school environment should be targeted for intervention programmes. A large number of adolescents would be accessible; in addition the school is a good access point to the community as parents, teachers and the Department of Education can be targeted. The school environment would also provide a venue for the programme.
2. Parents should be targeted to improve their knowledge of physical activity programmes and enlighten them about NCD'S. Parents could be invited to attend talks held at the school which address issues such as nutrition and the effects of health risk behaviours that lead to NCD'S.

3. A combined physical activity programme can be initiated to include the learners, parents and teachers. This would build comradeship between the parents, teachers, learners and the community. This would also encourage the parents to be supportive of the children who participate in a physical activity programme.
4. Staff and management within the school need to “buy” into the concept of physical activity as part of the curriculum if an intervention programme is to succeed. A paradigm shift is required on their part to recognise the importance of physical activity.
5. Other stakeholders such as the Department of Education could provide incentives for schools promoting physical activity programmes and include health promoting organisations.
6. More physical activity teachers need to be trained if PE is to find a place within South African schools. In a co-ed school one PE teacher is not adequate. Boys and girls are not willing to participate in activities together so you have to split one period in order to accommodate all the learners, providing inadequate participation time.
7. The community also needs to be more involved when implementing a physical activity programme. A meeting should be held inviting community members to come and listen to a briefing of the project.

Stake-holders within the community can then be targeted to resource the required necessities for the programme. Volunteers from the community can also be obtained to help run the intervention programme. The programme needs to then shift to becoming a community initiative and therefore will be self sustainable.

8. At national level, physical activity intervention programmes needs to become an issue for the Department of Education, Department of Sports and Recreation and the Department of Health. Collaboration between the departments is required to develop policies around physical activity and PE within the school. The school needs to be supported in terms of facilities, staff and financial backing. By instilling a policy and not supporting the school to implement it, you create a negative attitude towards it as well as frustration.
9. Medical professionals such as physiotherapists, psychologists and dieticians can be invited to the schools to target the learners as well as the parents. They can educate the learners, staff and parents on an aspect of physical activity relating to their chosen profession. Thereby encouraging a more holistic approach to the physical activity programme.
10. It is also important to publicise physical activity and the benefits of physical activity. Much of our current media promotes fast food and activities of a sedentary nature like movies. Marketing a leisure-time

activities campaign and other physical activity programmes through the media (newspapers and magazines, internet, television and radio) is worthwhile.

11. Health-education programmes should be implemented in schools from primary level to ensure that teachers and learners acquire knowledge about physical activity and its benefits and the related health risks of physical inactivity. Emphasis will also need to be placed on attitudes, motor skills, behavioural skills and the confidence to adapt and maintain healthy lifestyles.
12. Continuous evaluation of these and other physical activity programmes is essential before it is possible to identify the most successful and cost-effective ways of promoting physical activity and ways of adhering to physical activity in the long term. In addition, cohort studies are needed to determine if physical-activity uptake is being continued and maintained.
13. A longitudinal study using a relatively larger sample of the same cohort and using a more holistic nature for example taking the learners nutrition into account should be done to ascertain the influence of certain factors such as socio-economic, demographic factors and some barriers identified in the study, on the level of participation in physical activity. It will also help to establish the relationship between physical inactivity and chronic diseases of lifestyle.

14. The prevalence of obesity and hypertension may differ amongst adolescents in different communities and in different parts of the country. More studies in these areas should be carried out, to obtain adequate information about the prevalence of obesity and hypertension as well as the effect of physical activity on anthropometric and physiological measurements amongst adolescents in South Africa.

This final chapter summarised, and outlined relevant points of the current study. It made recommendations for future actions, including the development of a future research on physical activity.



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APPENDIX A

Demographic Data Capture Sheet

Date: _____

Name: _____

Age: _____

WHAT IS YOUR GENDER

1. ? MALE

2. ? FEMALE

WHAT GRADE ARE YOU IN?



1. ? 8

2. ? 9

3. ? 10

4. ? 11

5. ? 12

Arthro pometry

Weight: (kg)

Height:(m)

Blood Pressure:

Reading	1	2	Average
	mmHG	mmHG	mmHG



Pulse Rate:

Reading	1	2	Average

Skinfold	1.	2.	Average
Biceps			
Triceps			
Subscapular			
Suprailliac			
Calf			
Thigh			
Abdominal			

Results	
Sum of skinfolds	(mm)
% body fat	(%)

Estimated fat mass	(kg)
Lean muscle mass	(kg)



APPENDIX B

5 May 2005

Dear learner

Re: Short term physical activity programme

A research project is currently being undertaken to determine the impact of physical activity on obesity and hypertension through a school based intervention programme. The principal researcher is Miss Tanushree Pillay, a student in the Department of Physiotherapy, University of the Western Cape. The researcher mentioned above and trained research assistants will conduct the physical activity programme.

The objectives of the project are to determine the prevalence of obesity and hypertension in a local Belhar High School and to determine the impact of physical activity on obesity and hypertension through a school based intervention programme.

You are expected to complete a questionnaire and all testing done will be non-invasive. Strict confidentiality will be observed regarding all information that you give. You have the voluntary right to consent or withdraw from the study at any time. Please complete the section below if you consent and return it to the school.

Yours Sincerely

Tanushree Pillay
(Student)

Dr. Jose Frantz
(Supervisor)

I _____ hereby agree to be included in the research project.

Signature

Date

Modified Physical Activity Readiness Questionnaire (PAR-Q)

Name		Date	
DOB	Age	Home Phone	Work Phone

Regular exercise associated with many health benefits, yet any change of activity may increase the risk of injury. Completion of this questionnaire is a first step when planning to increase the amount of physical activity in your life. Please read each question carefully and answer every question honestly:

Yes	No	1) Has a physician ever said you have a heart condition and you should only do physical activity recommended by a physician?
Yes	No	2) When you do physical activity, do you feel pain in your chest?
Yes	No	3) When you were not doing physical activity, have you had chest pain in the past month?
Yes	No	4) Do you ever lose consciousness or do you lose your balance because of dizziness?
Yes	No	5) Do you have a joint or bone problem that may be made worse by a change in your physical activity?
Yes	No	6) Is a physician currently prescribing medications for your blood pressure or heart condition?
Yes	No	7) Are you pregnant?
Yes	No	8) Do you have insulin dependent diabetes?
Yes	No	9) Are you 69 years of age or older and not used to being very active?
Yes	No	10) Do you know of any other reason you should not exercise or increase your physical activity?

If you answered yes to any of the above questions, talk with your doctor by BEFORE you become more physically active. Tell your doctor your intent to exercise and to which questions you answer yes.

If you honestly answered no to all questions you can be reasonably positive that you can safely increase your level of physical activity **gradually**.

If your health changes so you then answer yes to any of the above questions, seek guidance from a physician.

Participant signature	Date
-----------------------	------

APPENDIX D

5 May 2005

Dear parent/guardian

Re: Short term physical activity programme

A research project is currently being undertaken to determine the impact of physical activity on obesity and hypertension through a school based intervention programme. The principal researcher is Miss Tanushree Pillay, a student in the Department of Physiotherapy, University of the Western Cape. The researcher mentioned above and trained research assistants will conduct the physical activity programme.

The objectives of the project are to determine the prevalence of obesity and hypertension in a local Belhar High School and to determine the impact of physical activity on obesity and hypertension through a school based intervention programme.

The child is expected to complete a questionnaire and all testing done will be non-invasive. Strict confidentiality will be observed regarding all information from your child. You as a parent have the voluntary right to consent or withdraw your child from the study at any time. Please complete the section below if you give consent and return it to the school.

Yours Sincerely

Tanushree Pillay

(Student)

Dr. Jose Frantz

(Supervisor)

I _____ (parent/guardian) hereby give permission for
_____ (child's name) to be included in the research project.

Signature

Date

Appendix E

Focus-Group Discussion Guide 1 and 2

- When you think of physical activity what comes to mind?
- What does it mean to be physically active?
- Do you know what the benefits of physical activity are?
- Do you think physical activity is important?
- What types of physical activity are better and why?
- How much physical activity should you participate in?

- Are you physically active?
- What types of physical activity are available to you?
- What types of physical activity do you enjoy?
- If a physical activity programme was offered to you what types of activities would you be interested in doing?
- What time of the day is most convenient for you to participate in a physical activity programme?
- Do you know what is hypertension?
- Do you know what is obesity?
- Do you know what happens if you are not physically active?

APPENDIX F

FOCUS-GROUP DISCUSSION GUIDE 3 POST INTERVENTION

- Welcome to all of you. I would just like to thank you all firstly for participating in the exercise programme. It has been a wonderful experience for me to have had the opportunity to meet all. I have learned a lot from the experiences you have shared with me. The purpose of today's discussion is to do an evaluation of the programme with you. Just to find out how you have found the programme and to get some suggestions from you as to how we can better the programme for next time.

You have all participated in the programme. Some of you were more regular than others. In particular the rugby boys were more available than the girls were. Tell me what allowed you or even motivated you to participate.



- What are some of the things that made it difficult for you to come?

Okay now you have told me some of the things that made it easier for you to come and what made it difficult for you to come. You also told me what you enjoyed and how the programme helped you. Now I want you to tell me how I can make the programme better or how we can fit exercise into your school to make it easier for you to participate.

APPENDIX G

Focus -Group Discussion Guide Four.

Teachers

- So, just a bit of background of what we are doing. I'm busy with the department of education's policy's at the moment on P.E and life orientation at schools, and what we found was that there was a mandate on physical education that was launched sometime ago and afterwards a meeting was held all the other countries had made some attempt to move towards more funding of teachers that were doing physical education or sports in schools but the South African policies were pretty much none existent and there were two instances where funding had come from Australia and funding had come from England but the money was not handled in the way in which the programmes that could benefit South Africa that was then blamed on a lack of facilities and telecommunications and things like that. So now what we want to do is see how us as tertiary educational institutions can help with schools to launch physical educational programmes so the first thing that I'm going to say to you is that rather the statement that was made by the minister of education that P.E must be included in the schools. Before I get a response from you, because this is going to be a discussion more than anything else I just want you to say your name, and what you teach and then if you are involved in physical education then say you are involved in physical education and if you coach a sport say that you are involved in coaching sports. No names or anything will be

mentioned in the actual documents but it is just that for me to say that people who are involved in sport did make decent comments.

- So now we are going to have a general discussion anyone can comment.
- In terms of the learners then what are some of the things that you think they would benefit from if they were more physically active? How do you think it would facilitate or stimulate, or what type of qualities do you think it would bring out in the learner's if they were more physically active. How do you think sport influences pupils.
- If you look at your school as it currently stands you feel there is enough experience and skills to carry out a physical education programme.
- What would you say if a tertiary institution like UWC came to you and said or say the biokinetics department came to you and said this is the equipment we have available to you and these are the skilled people we have to help you would that then assist you in establishing a physical activity programme?
- What do you think is the way forward?
- What do you think of sport based programmes like the one I'm doing coming into the school.

APPENDIX H

Testing Procedure for Anthropometric and Physiological Measurements

STATION ONE

Resting heart rate and blood pressure measurements

The resting heart rate and resting blood pressure were recorded using a calibrated, automatic sphygmomanometer equipped with a pulse-monitoring device in the cuff.

Procedure

- The subject must sit for at least 5 minutes prior to testing.
- The right arm must be bare and resting at an angle of 45 degrees on a table with palm up.
- A cuff of appropriate size must be wrapped firmly around the upper arm at heart level
- The start button must then be pressed and the cuff inflated.
- Once maximum inflation is reached the cuff will automatically deflate and the resting blood pressure as well as the resting pulse rate must be recorded.
- Blood pressure reading must be done twice at one minute intervals.

STATION TWO

Weight

Weight was measured using an electronic digital scale.

Procedure

- Ask learners to remove shoes and socks as well as all excess clothing.
- The weight of the subject must be measured in kilograms.



STATION THREE

Height

A tape measure was taped against a wall with tape measure 10cm above the ground level. The measurement from the floor to highest point on the head was measured.

Procedure

- The subject's height must be recorded in centimetres. The subject must remove his/her shoes, stand feet together and arms by the sides. The subject must stand with heels, buttocks and upper back against the wall.

STATION FOUR

Skin fold measurements



The skin fold was measured using a skin fold calliper, and this measurement was chosen as a measure of adiposity among children because of its high correlation with percentage of body fat (Cortmaker 1990). For males, the areas measured included the chest, abdomen and thigh. For females , areas measured included the triceps, supra iliac and thigh.

Procedure

- Measurements must be taken on the right side of the body with the participant in standing.
- Skin fold sites must be carefully identified, measured and marked.
- Skin folds are measured using the 3-site formula.
- Boys = biceps, chest and thigh.

- Girls = triceps, supra iliac and thigh.
- With calipers in the right hand, grasp the skin fold with the thumb and the index finger of the left hand.
- Place the caliper halfway between the crest and the base of the fold.
- Gently and fully release the caliper pressure.
- Maintain the pinch while reading the dial.
- Take duplicate measures at each site.
- Re-measure if 1st and 2nd reading are not within 1-2mm.
- Record the average score.



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IFoni
Faks
Fax **(021) 425-7445**
IFeksi

Verwysing
Reference **20050525-0038**
ISalathiso



Wes-Kaap Onderwysdepartement

Western Cape Education Department

ISebe leMfundu leNtshona Koloni

Miss Tanushree Pillay
Department of Physiotherapy
University of the Western Cape
Private Bag X17
BELLVILLE
7535

Dear Miss T. Pillay

RESEARCH PROPOSAL: THE IMPACT OF PHYSICAL ACTIVITY ON OBESITY AND HYPERTENSION THROUGH A SCHOOL BASED INTERVENTION PROGRAMME

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **25th May 2005 to 23rd September 2005**.
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December 2005).
7. Should you wish to extend the period of your survey, please contact Dr R. Cornelissen at the contact numbers above quoting the reference number.
8. A photocopy of this letter is submitted to the Principal where the intended research is to be conducted.
9. Your research will be limited to the following school: **Excelsior High**.
10. A brief summary of the content, findings and recommendations is provided to the Director: Education Research.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

**The Director: Education Research
Western Cape Education Department
Private Bag X9114
CAPE TOWN
8000**

We wish you success in your research.

Kind regards.

MELD ASSEBLEIEF VERWYSINGSNOMMERS IN ALLE KORRESPONDENSIE / PLEASE QUOTE REFERENCE NUMBERS IN ALL CORRESPONDENCE /
NCEDA UBHALE IINOMBOLO ZESALATHISO KUYO YONKE IMBALELWANO

GRAND CENTRAL TOWERS, LAER-PARLEMENTSTRAAT, PRIVAATSAK X9114, KAAPSTAD 8000
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Signed: Ronald S. Cornelissen
for: **HEAD: EDUCATION**
DATE: 25th May 2005

APPENDIX J

5 May 2005

The Principal
School

Dear Mr. Vraagom

Re: Short term physical activity programme

A research project is currently being undertaken to determine the impact of physical activity on obesity and hypertension through a school based intervention programme. The principal researcher is Miss Tanushree Pillay, a student in the Department of Physiotherapy, University of the Western Cape.

The objectives of the project are to determine the prevalence of obesity and hypertension in a local Belhar High School and to determine the impact of physical activity on obesity and hypertension through a school based intervention programme.

We hereby wish to request permission from your school for your participation in the above mentioned project. The results will be made available to you as soon as they have been analysed. The co-operation from both the teachers and the learners will be appreciated. Once again, thank you and we hope that we will receive a positive response from your school.

Yours Sincerely

Tanushree Pillay
(Student)

Dr. Jose Frantz
(Supervisor)