

PHYSICAL INACTIVITY AMONG HIGH SCHOOL LEARNERS IN BELHAR – A PUBLIC HEALTH CONCERN

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ABSTRACT

For many decades, the World Health Organisation (WHO) had highlighted the growing importance of chronic non-communicable diseases in developed and developing countries, with an increase in lifestyle-related diseases. Physical inactivity has been identified as one of the risk factors, in addition to other leading risk factors like diet, and the use of tobacco and alcohol, contributing to the occurrence of non-communicable diseases like cardiovascular diseases, cancers, obesity and type 2 diabetes mellitus. Based on the researcher's observations while living in Belhar community for more than ten years, it was hypothesized that the level of physical inactivity among adolescents could become a public health problem in the future if not addressed immediately.

Therefore, the study aimed to assess the daily habitual physical activity patterns of learners in the four high schools in the Belhar community through a 24-hour recall over a period of 7 consecutive days. This was used to determine the physical activity levels of the learners. In addition, the study assessed some of the components of health-related fitness of the learners. The study also explored the views of the learners on their participation in physical activities. The whole study was divided into 4 parts involving qualitative and quantitative research procedures. The study population for both the qualitative and quantitative studies was made up of the four high schools in the Belhar community. The cross-sectional data of physical activity levels showed that about 32% of the high school learners(n=951) in this community were physically inactive. In most of the

components for health-related fitness, it was found that more than 50% of the inactive learners were not able to meet the norms for various health-related fitness tests. In addition, 23% of the physically inactive learners were overweight and 15% showed signs of hypertension. The study also showed that the physically inactive learners were more likely to participate in health risk behaviours such as smoking and drinking. When the learners were questioned about their views on physical activity participation, a number of barriers to participation in high levels of physical activity were identified. The barriers identified could be classified into four main themes, namely physical, psychosocial, environmental and financial. The feelings of self-consciousness about the body and their view that they had too little time due to homework and housework were common among the older girls. Financial constraints were a common barrier for both boys and girls. In addition, issues concerning vandalism, bullying and lack of discipline were also raised specifically around physical education/activity at schools. The outcome of this study thus suggests that the problem of physical inactivity in the Belhar community should be of great concern as it places the learners at a higher risk of developing chronic diseases of lifestyle, as they grow older. The personal, social and economic costs of the chronic diseases of lifestyle with accompanying disability as well as possible loss in the quality of life may be high. If all of these are coupled with the rising threat of HIV/aids, the combined impact may be devastating on the nation, unless effective preventive and promotive strategies are put in place.

DECLARATION

I declare that “**Physical inactivity among high school learners in Belhar – a public health concern**” is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

JM Frantz

Signature

November 2004

Witnesses:

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DEDICATION

I dedicate this thesis to my husband for his continuous support and understanding through the good and bad times of my study, and to my three sons Jody, Leigh and Alex who were prepared to make the sacrifice over the past four years. May God bless you.

In addition I would like to say to my parents, Joe and Sally Dantu, this achievement is the reaping of the seeds you have sown. May God bless you.

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CHAPTER ONE

INTRODUCTION

Positive health requires knowledge of man's primary constitution and the powers of various foods, both those natural to them and those resulting from human skill. But eating alone is not enough for health; there must be exercise of which the effects must be known. If there is any deficiency in food or exercise, the body will fall sick (Hippocrates 480 BC)

1.1 BACKGROUND

Public health is the science and art of promoting, protecting and improving health and well-being through organised efforts of society (McPherson 2001). This implies a wide-ranging, inter-sectoral approach bringing together many actors. Public health goes well beyond the health care sector, although health care, and especially the public health service, contributes by assessing health needs, identifying effective responses and co-ordinating actions of those who can contribute to these responses. To be effective, those contributing to public health must act as advocates for the health of the population and should have the capacity to promote healthy public policies. These healthy public policies should address the social, environmental and economic determinants of health.

For many countries in Africa and Asia, the mid-20th century saw dramatic improvements brought about by technological advances, increased literacy, access to safe water, sanitation and housing, and better understanding of human behaviour. However, at the turn of the century, political unrest, environmental

disaster, declining economic performance, weak public health infrastructure, changing population dynamics, the advent of HIV/Aids and the impact of globalisation have all had a great impact on the livelihoods and welfare of poor people (Macfarlane, Racelis and Muli-Musiime 2000). International labels such as “developing”, “least developed”, “underdeveloped” and “third world” have long been used to describe groupings of countries in which most people are poor. There is a danger, however, that the labels associated with debt, disease and death tend to disguise the multitudes of differences in tradition, lifestyle and local economy – all of which contribute to the character of people’s health and public health situations. The core functions of public health practice include: monitoring population health and the determinants of health; prevention and control of disease, injury and disability; health promotion; and the protection of the environment.

For centuries infectious diseases were the main cause of death worldwide. However, non-communicable diseases (NCD) are currently the leading causes of death and disability worldwide, while infectious diseases remain a major cause of death in the developing world (Alberti 2001). Over the past two decades, any advances against infection have been reversed by the rise of HIV-related disorders. Life expectancy in many countries, particularly sub-Saharan Africa, has fallen dramatically. According to the World Health Organisation (2000a), communicable diseases along with nutritional deficiencies continue to take a heavy and largely avoidable toll. In 1990, over 17 million deaths were due to

communicable diseases with more than 16.5 million in developing countries, mainly India and sub-Saharan Africa. According to Unwin, Setel, Rashid, Mugusi, Mbanya, Kitange, Hayes, Edwards, Aspray and Alberti (2001), communicable diseases will remain the predominant health problem for the populations in sub-Saharan Africa for the next 10 – 20 years. Against this gloomy background, non-communicable diseases are emerging as major problems as well.

Disease rates from non-communicable conditions are accelerating globally, advancing across regions and social classes. The World Health Report (2000) estimated that non-communicable diseases accounted for 60% of global mortality and 43% of the global burden of disease in 1999. Non-communicable diseases continued to account every year for almost one quarter of deaths worldwide. According to the World Health Organisation (WHO/7 2003), the most prominent non-communicable diseases are cardiovascular disease, followed by cancer. This is reflected in Table 1.1 from the WHO (2001) statistics.

Alberti (2001) indicates that diabetes and cardiovascular disease are the main chronic diseases to have reached alarming proportions recently. At a World Health Organisation (WHO) meeting held in May 2003, it was stated that cardiovascular disease, cancers, diabetes, respiratory disease, obesity and other non-communicable diseases account for 59% of the 56.5 million global deaths annually (WHO 2003a). In the study conducted by Murray and Lopez (1996) on the burden of disease it was found that the whole non-communicable disease

cluster has become a major problem in the middle-income countries such as South Africa, Mauritius and Botswana, with ischaemic heart disease taking the lead. The study further revealed that many more people died of non-communicable disease in the developing world than in the developed world ~ 18.7 million against 9.4 million. The picture now in many countries is one of epidemiological transition from infectious diseases to non-communicable diseases.

TABLE 1.1 MOST COMMON NON-COMMUNICABLE DISEASES ESTIMATED PER 100 000 FOR W.H.O. WORLD REGIONS AND SOUTH AFRICA 2000

NCDs	Africa	Europe	America	South Africa
Cardiovascular diseases	1797	3023	1941	2328
Cancer	1067	1045	1307	1184
Diabetes Mellitus	113	264	421	390
Neuropsychiatric Conditions including stroke, depression	2417	3055	4065	1611
Respiratory disorders	1199	1088	980	1618

Source: WHO 2001

Non-communicable diseases have been recognised as a growing concern since the early 1990's. Experts of the WHO expressed their concern over the potential perils of inadequate attention to the prevention of non-communicable diseases both in developed and especially in developing countries (Marshall 2004; WHO

1996). The report stated that there was a widespread misconception that the problem of non-communicable diseases was not relevant to the developing world but that it was a burden of affluent societies only. The concern then expressed by the World Health Organisation was supported by figures, which indicated that of the 39 million deaths that occurred in 1993, more than 10 million had been caused by major non-communicable diseases. The non-communicable diseases commonly referred to as the “disease of affluence” had become “disease of urbanisation”. This myth is refuted by the fact that in 1990, of the 6.3 million people who died of heart disease, 57% were in the developing region (WHO 2000a) and of the 4.4 million people that died of stroke, 68% were in developing countries.

According to Booth, Gordon, Carlson and Hamilton (2000), chronic disease conditions cause great human suffering and cost nearly $\frac{2}{3}$ of a trillion dollars in health care expenses and lost productivity in America in 1990. The authors further estimated that this figure might now be approaching 1 trillion dollars. In Canada, approximately 3% of the total direct health care costs i.e. over \$2 billion can be attributed to physical inactivity (Katzmarzyk, Malina, Song and Bouchard 1998). These estimates are from developed countries. What is the impact of these conditions on developing countries such as South Africa? In 1998, the World Health Assembly of the WHO adopted a major resolution on non-communicable diseases. The resolution called on the WHO and other interested

parties to address the global social and economic burden of non-communicable diseases (WHO 1998).

Unwin et al. (2001) supported the concern of the WHO and stated that by 2020, non-communicable diseases could be the greatest cause of death in all regions. According to the global burden of disease study it was estimated that age-specific death rates from non-communicable diseases in adults were higher in sub-Saharan Africa than in any established economy (Murray and Lopez 1996). The WHO recently admitted that a vast body of knowledge exists about the risk factors for non-communicable diseases but that most of the data is from developed countries (WHO 2003b). From the report, the top 10 risk factors globally and regionally in terms of the burden of disease account for more than one third of deaths worldwide. The differences in leading risk factors between developed and developing countries are highlighted in Table 1.2.

Many of the risk factors for these diseases are due to lifestyle and are preventable. Common risk factors for these diseases include smoking, physical inactivity, obesity and poor diet. The risk of non-communicable diseases in developing countries is inextricably linked to economic and cultural globalisation. The World Health Report (2002) identified 5 out of the 10 leading global disease burden risk factors as high blood pressure, high cholesterol, obesity, physical inactivity and unhealthy diet. Together with alcohol and tobacco use, these preventable risks play a key role in the development of chronic diseases. Figure

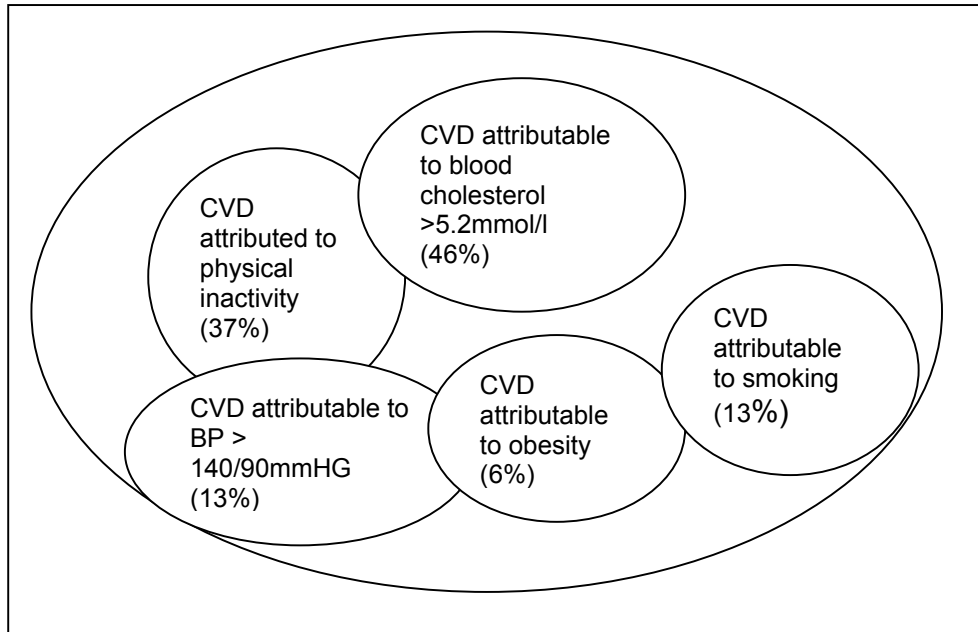
1.1 represents an estimation of how much each risk factor contributes to cardiovascular disease.

TABLE 1.2 LEADING RISK FACTORS AS CAUSES OF BURDEN AND DISEASE IN DEVELOPING AND DEVELOPED COUNTRIES

Developing countries (e.g. South Africa, Brazil) High mortality rates	Developing countries (e.g. South Africa; Brazil) Low mortality rates	Developed countries (e.g. America; Australia)
1 Underweight	1 Alcohol	1 Tobacco
2 Unsafe sex	2 Blood pressure	2 Blood pressure
3 Unsafe water	3. Tobacco	3 Alcohol
4 Indoor smoke	4. Underweight	4 Cholesterol
5 Zinc deficiency	5. Body mass index	5 Body mass index
6 Iron deficiency	6. Cholesterol	6 Low fruit & veg. intake
7 Vitamin A deficiency	7. Low fruit & veg. intake	7 Physical inactivity
8 Blood pressure	8. Indoor smoke	8 Illicit drugs
9 Tobacco	9 Iron deficiency	9 Unsafe sex
10 Cholesterol	10 Unsafe water	10 Iron deficiency
11 Alcohol	11 Unsafe sex	11 Lead exposure
12 Low fruit & veg. intake	12 Lead exposure	12 Childhood sexual abuse

Adapted from WHO/NMH/CCS/03.01

**FIGURE 1.1 DEATH FROM CARDIOVASCULAR DISEASE (CVD):
RELATED RISK FACTORS**



Source: Heart and Stroke Statistics – 2003 Update

The burden of chronic diseases is a key impediment to social and economic progress. Population growth as well as rapid economic and political changes in some parts of the world contributes to the amplification and spread of the disease. According to Canon (2001), life expectancy at birth has greatly increased in economically developed countries. It is sometimes thought that the chronic diseases of lifestyle (CDL) are a price to pay for longevity but scientific evidence shows that most chronic diseases are caused principally by pathogenic environmental pressures. World Bank and WHO studies projected steep rises in the incidence of chronic diseases of lifestyle in developing countries (Centre for Disease Control and Prevention 2003). Factors contributing to increases in

prevalence of chronic diseases of lifestyle include unhealthy lifestyle habits, increasing life expectancy and ageing of the population, increasing urbanisation as well as psychosocial factors. This is backed by studies conducted in Taiwan, China and Mauritius (Cockram 2000), which closely linked socio-economic status, increasing age, obesity and physical inactivity as contributing factors to chronic diseases of lifestyle. The author further observed that rising prevalence rates of chronic diseases of lifestyle appear to be closely associated with westernisation, urbanisation and mechanisation. In his study in India, Gupta (2000) found that the increase in chronic diseases of lifestyle was due to sociological changes of acculturation, urbanisation and affluence, resulting in poor dietary intake and unhealthy lifestyle behaviours. The author highlighted that when focusing on prevention of risk factors the target groups should be children, adolescents, family units, the under-privileged and high-risk groups.

In order to prevent the epidemic of chronic diseases of lifestyle, both the immediate and root causes of these diseases must be identified (Canon 2001). Physical inactivity is one of the immediate causes of chronic diseases, coupled with tobacco use, malnutrition and urbanisation. However, populations do not become inactive mainly because of individual choices (Canon 2001). This view is supported by the World Health Report (2002), which revealed that the picture taking shape from research gives an intriguing insight into the current causes of disease and death and the factors underlying them. The World Health Report revealed how the lifestyles of whole populations are changing around the world,

and the impact of these changes on the health of individuals, families, communities and whole populations. Some of the root causes of physical inactivity included sedentary jobs, households organised around the television set and computer games, the shift from participant to spectator sports, cities that make life difficult without private cars and urban planning and crime rates that make cycling and walking dangerous.

Urbanisation has led to pathogenic transformation of food, social changes and sedentary lifestyles. Mbanya (2001) conducted a study in Cameroon and found that high incidence of risk factors for cardiac diseases were found among poor or illiterate people. Bradshaw, Groenewald, Laubscher, Nannan, Nojilana, Norman, Pieterse and Schneider (2003) state that South Africa is faced with a quadruple burden of disease, a combination of poverty-related infectious diseases, lifestyle-related non-communicable diseases, and violence-related traumas. Three of the main factors that contribute to the development of non-communicable diseases in South Africa are obesity, hypertension and inactivity (Bradshaw and Steyn 2001).

In the context of public health, population measurements of risk factors can be used to describe the possible distribution of future disease in a population rather than predicting the health of a specific individual. Knowledge of these risk factors can be applied to shift population distributions of the factors in a positive direction. The World Health Report (2002) highlights this quadruple burden of disease that Bradshaw et al. (2003) refer to when it emphasises that risk factors

(high blood pressure, high blood cholesterol, tobacco and alcohol use, and obesity and physical inactivity) more commonly associated with wealthy societies and diseases linked to them are becoming prevalent in the developing world, thus adding to the burden of infectious diseases.

As non-communicable diseases are progressively becoming a major public health problem, it has become important to highlight the differences between developed and developing countries. It is interesting to note that even though physical inactivity has identified its place as one of the leading risk factors in the developed world (WHO 2001), physical inactivity is not listed among the first ten risk factors in the developing world (WHO 2001). However, physical inactivity has shown a strong causal relationship to mortality from coronary heart disease, non-insulin dependent diabetes mellitus and colon cancer, and is a significant contributor to the pathology of stroke, hypertension, breast cancer, obesity, osteoporosis, and falls in the elderly, and depressive disorders (WHO 2001; National Institute of Health 1995; Centre for Disease Control and Prevention 2001). For many years physical inactivity has been the most neglected area of risk factors for heart disease, while cessation of smoking and weight loss/diet were often more emphasised. However, there is substantial evidence that physical inactivity may in fact be one of the most important risk factors for heart disease. Besides its many other benefits, physical activity may have a significant role to play in reducing all cause mortality.

From a public health perspective, interest in physical activity lies in its relationship to ill health and disease (Powell and Blair 1994). According to Colditz (1999), physical inactivity is a health risk behaviour that results in high morbidity and mortality rates in many countries and adversely increases the national health expenditure of that country. Studies conducted by Stofan, DiPietro, Davis, Kohl and Blair (1998) and Gregory, Gallo and Armenian (2001) indicated that physical inactivity is a public health burden that influences even other measures of the quality of life. Burdens that are related either directly or indirectly to physical inactivity include cost of health care, impairment and disability, poor physical and mental function, as well as impaired emotional well-being (Dietz 1996; Powell and Blair 1994).

In order to address these risk factors, effective prevention programmes need to be in place. However, South Africa faces challenges that have been created by a lack of co-ordination in the efforts of different government agencies. These government agencies include the Department of Education, Department of Sports and Recreation and the Department of Health. Governments at national and provincial level need to plan to control the emerging non-communicable disease epidemic. Governments are facing serious challenges in health care due to the rising trends in non-communicable diseases as a result of demographic and epidemiological changes, as well as economic globalisation. The burden of non-communicable diseases in sub-Saharan Africa is already substantial, and patients with these conditions make significant demands on health resources.

Epidemiological data from two African countries suggested that the prevalence of non-communicable diseases such as diabetes and hypertension have increased tremendously over the past five years (Edwards, Unwin and Mugusi 2000; Fourie and Steyn 1995). The burden of non-communicable diseases is likely to increase hugely over the coming decades. This increase is driven by the ageing population and changing lifestyles. One may well ask whether we as health professionals and government authorities are adequately prepared to tackle the double burden of communicable and non-communicable diseases in South Africa.

The insufficient amount of physical activity in children and adolescents is having a disturbing effect in terms of health. The percentage of children that are overweight continues to increase in industrialised countries, reaching 10% to 25%, depending on the methods and evaluation criteria used (Bar-Or 1994; Limbert, Crawford and McCargar 1994; Stephens and Craig 1990; Troiano, Flegal, Kuczmarski, Campbell and Johnson 1995; Troiano and Flegal 1998). Juvenile obesity has become the primary chronic disorder in pediatrics and now represents a public health problem due to its high prevalence and negative physical, psychological and social consequences. With regard to the development of cardiovascular disease, children at the age of 12 years show at least one risk factor among the following: obesity, high blood pressure, tobacco consumption, sedentariness or dyslipidemia - (Baranowski, Bouchard, Bar-Or, Bricker, Heath, Kimm, Malina, Obarzanek, Pate, Strong, Truman and

Washington 1992). Many have several risk factors, thereby predisposing themselves to an early development of arteriosclerosis.

Data from health surveys suggest an increase in the prevalence of overweight and obesity during the last few decades. This phenomenon has been observed in several industrialised countries. In North America, for example, the proportion of young people with excess weight has been increasing for the last 20 years and varies from 10 to 25% depending on the source (Bar-Or 1994; Limbert et al. 1994; Troiano et al. 1995; Troiano and Flegal 1998). If the situation continues to deteriorate, societies will be confronted with serious health problems in the future. Thus we can see that children are demonstrating risk factors for non-communicable diseases, which include high BMI (obesity), high blood pressure and physical inactivity.

Interventions focusing on prevention of risk factors require country-specific or population-specific data on risk factors so that priorities can be appropriately set. In 2000, the WHO 53rd World Health Assembly passed a resolution on the *Prevention and Control of Non-communicable Diseases* in their efforts to reduce the toll of morbidity, disability and premature mortality related to NCDs (WHO 2000b). The global strategy was threefold:

1. To map the emerging epidemics of non-communicable diseases and to analyse their social, economic, behavioural and political determinants to provide guidance for policy, legislation and finance;

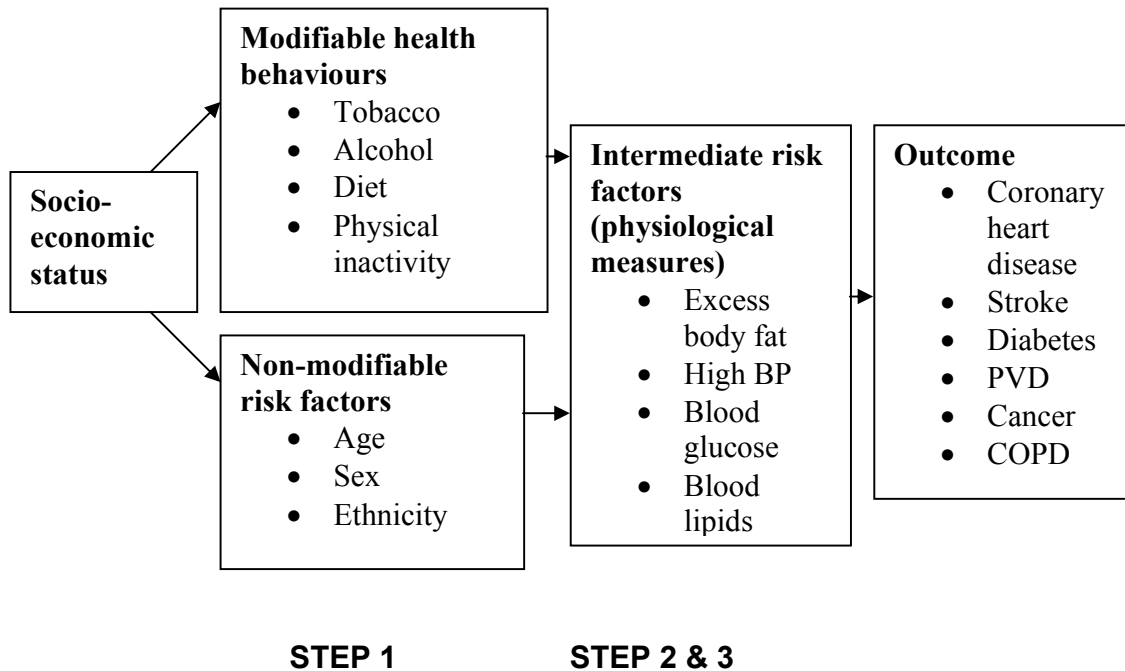
2. To reduce the level of exposure of individuals and populations to the common risk factors for non-communicable diseases;
3. To strengthen health-care for people with non-communicable diseases.

WHO introduced the STEPwise approach to monitor the emergence of non-communicable diseases (WHO 2003b). The STEPS approach is based on sequential levels of surveillance of different aspects of non-communicable diseases and allows for flexibility and integration at each step. Within this approach, the most common non-communicable diseases and their established behavioural and physiological risk factors that meet criteria for surveillance are identified as illustrated in Figure 1.2.

Figure 1.2 suggests that socio-economic status influences modifiable health behaviours, which influence intermediate risk factors. The risk factors strongly influence the outcome. The figure thus shows that if primary prevention is carried out and modifies the status of modifiable health behaviours, the outcome will also be different and disease burden will decrease. The key feature of the STEPS framework is the distinction between the different levels of risk factor assessment:

- Self report questionnaire (Step 1)
- Objective information by physical measurements (Step 2)
- Objective information by blood samples for biochemical analysis (Step 3)

FIGURE 1.2 BEHAVIOURAL RISK FACTORS, INTERMEDIATE RISK FACTORS AND THEIR OUTCOMES



Source: WHO 2003b

Based on this model, the self-report questionnaire for this study sought data on basic socio-demographic status as well as information regarding health risk behaviours (such as smoking, drinking, physical activity/inactivity, nutrition). Objective physical measurements in Step 2 included measurements such as weight, height, BMI, skinfold, blood pressure and pulse rate. Step 3 required further analyses and needed blood samples for blood lipid measurements. Step 3 is of a biochemical nature and is therefore not recommended by the WHO in less well-resourced settings unless low-cost technology is used.

In accordance with the initiative of the WHO to promote physical activity as essential for health and well-being, and within the framework of addressing the immediate causes of chronic diseases of lifestyle, as well as adopting the global surveillance strategy of the WHO to monitor risk factors for chronic diseases of lifestyle, this study focuses on evaluating the level of physical inactivity in high school learners. The outcome of the surveillance will assist in developing appropriate interventions within a school/community setting to reduce the chances of chronic diseases of lifestyle developing.

With physical inactivity identified as a major public health problem in many countries, policy makers have influenced the adoption of legislation that encouraged physical activity programmes (Blair, Booth, Gyarfas, Iwane, Marti, Matsudo, Morrow, Noakes and Shephard 1996). These legislations and policies have strategies that endeavour to change social values and norms to enhance participation in physical activity. In South Africa, a national policy framework on sport and recreation, tagged “Getting the nation to play”, was developed at the onset of the democratic dispensation in 1994 (Frantz, Phillips and Amosun 2000). The first phase of the framework (1995-1999), tagged “Mobilising the nation to play” was to lay the foundation for mass participation in physical activities. One of the eight priorities for the first phase was to motivate local communities to develop active lifestyles. Based on personal observations, the researcher is of the opinion that the laudable objectives of the framework are

being compromised, particularly among adolescents in the local community where the researcher has lived for about 20 years.

1.2 OBJECTIVES OF THE STUDY

Therefore the objectives of this study were to:

1. determine the patterns of the daily habitual lifestyles of high school learners in a local community, Belhar;
2. determine the profile of physically active and physically inactive high school learners in Belhar;
3. assess the factors that may influence physically inactive lifestyles and participation in health risk behaviours among high school learners;
4. determine the knowledge of and attitudes and barriers to participation in physical activity among high school learners;
5. determine the perceptions of the learners on promotion of physical activity;
6. assess the health-related fitness components in the learners.

In this way the study will be partially addressing the requirements of Step 1 and Step 2 of the STEPS framework that was adopted by the WHO to monitor non-communicable diseases.

1.3 SIGNIFICANCE OF THE STUDY

The Ottawa Charter (1986) stated:

Health is created and lived by people within the settings of their everyday life; where they learn, work, play and love. Health is created by caring for oneself and others, by being able to make decisions and have control over one's life circumstances and by ensuring that the society one lives in creates conditions that allow the attainment of health by all its members.

The WHO identified physical inactivity as a threatening public health issue worldwide. Preliminary data from the studies conducted by the WHO on risk factors suggested that physical inactivity is one of the 10 leading global causes of death and disability (World Health Report 2002; WHO 2003b). To address the growing concern regarding the burden of chronic diseases, the WHO through its Global Strategy on Diet, Physical Activity and Health mandated the World Health Assembly (WHA) to put in place strategies to combat the rise of these non-communicable diseases. In 2003, the WHO launched the STEPwise framework to assist in the surveillance of non-communicable diseases. The STEPS approach encourages a focus on obtaining data to established risk factors that determine the major disease burden. The current study falls within the framework of the STEPwise surveillance system launched by the World Health Organisation and thus will assist in contributing towards this core data collection process.

Sawyer and Bowes (1999) stated that in medical circles, the perspective on adolescents and their health is that adolescence is the healthiest period, and this is supported by the fact that mortality and morbidity rates are low for this group in comparison to other groups. However, the contribution of adolescent health risk behaviour to the burden of disease in adulthood has become significant. These health risk behaviours do not occur in isolation, but understanding the patterns of these behaviours will assist in providing opportunities for primary prevention and early intervention strategies.

The impact of these diseases influences physiotherapy services as they are indicated in the prevention and rehabilitation process. Physiotherapy is the skilled use of physiologically based movement techniques supplemented when necessary by massage, electrotherapy, and other physical means for the prevention and treatment of injury and disease. The physiotherapists' role in public health promotion, disease prevention and education in primary health care thus comes into effect. Based on the initiatives of the WHO and the public health concerns worldwide, it is of importance that in our role as preventative therapists, we attempt to assist government in formulating guidelines or policies regarding risk factors for non-communicable diseases based on population-based studies. This study was therefore conducted to provide valuable information to government and act as a resource that could influence policy within the health and education sectors.

1.4 DESCRIPTION OF TERMS

Exercise: Exercise is physical activity that is planned and repetitive with the goal of improving physical fitness (American Academy of Pediatrics Committee on Sports Medicine and Fitness, 1994).

Habitual physical activity: Habitual physical activity is physical activity participated in on a daily basis by a person that could have cardiovascular effects, including domestic activities.

Health-related physical fitness: Health-related physical fitness is difficult to define, but its components are cardio-respiratory endurance, muscular endurance, muscular strength, flexibility, and body composition (American Academy of Paediatrics Committee on Sports Medicine and Fitness, 1994).

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

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.

Physical fitness: Physical fitness is defined as a set of attributes that allow the body to respond or adapt to the demands of stress or physical activity (Caspersen, Powell and Christenson 1985).

Physical inactivity: A person is classified as being physically inactive if

1. s/he reports no leisure-time physical activity;
2. s/he reports activity for less than 20min/occasion for less than 3 times per week; or
3. s/he reports activity for more than 20min/occasion but for less than 3 times per week (CDC 1996)

Public health: Public health is the science and art of promoting and improving health and well-being through organised efforts of society (McPherson 2001)

1.5 ABBREVIATIONS:

The following abbreviations have been used in this thesis:

BMI:	Body Mass Index
BTT:	Birth to Twenty Study
CDL:	Chronic Diseases of Lifestyle
CHD:	Chronic Heart Disease
CDC:	Center for Disease Control and Prevention
IOC:	International Olympic Committee
LBP:	Low Back Pain
NCD:	Non-communicable Diseases
RDP:	Reconstruction and Development Programme
UNESCO:	United Nations Educational, Scientific and Cultural Organisation
UNICEF:	United Nations Children's Fund
WHA:	World Health Assembly
WHO:	World Health Organisation
WHR:	Waist-Hip Ratio

1.6 OUTLINE OF THE THESIS

The thesis is divided into eight chapters. Chapters 1-3 deal with the background to the study, the literature reviewed for the study and the methods used in this study. From Chapters 4-7, each chapter attempts to address a research question as listed below.

Question 1: What was the extent of the problem of physical inactivity in the Belhar community among high school learners?

Question 2: What were the factors that influenced physical inactivity among the high school learners in the Belhar community?

Question 3: What were the knowledge, attitudes and barriers to participation in physical activity among high school learners in the Belhar community?

Question 4: What were the levels of health-related physical fitness among high school learners in the Belhar community?

Chapter 8 is an overall discussion of the study and draws conclusions based on the study. It also attempts to make recommendations based on the study as well as recommendations for future research.

CHAPTER TWO

LITERATURE REVIEW

“Increasing sedentary lifestyle combined with the growing use of technology in daily life is causing higher levels of inactivity among persons of all ages. Sedentary lifestyle leads to a widening physical activity gap, an imbalance between the need and realization of physical activity that is necessary for the attainment and maintenance of good health and functional activity. This gap can be avoided by providing knowledge, services, opportunities and environments favouring choice of physically active lifestyles” (WHO 1999)

2.1 INTRODUCTION

In this chapter literature is reviewed that is relevant to understanding the current physically inactive lifestyle led by many around the world. Studies focusing on physical inactivity among youth are reviewed as well as benefits of physical activity participation and factors that determine levels of participation. Theories underlying physical activity participation are also reviewed. In addition, the current guidelines for physical activity participation for youth worldwide are discussed. The chapter concludes by looking at the association between physical activity and physical fitness.

2.2 PHYSICALLY ACTIVE TO PHYSICALLY INACTIVE – AN EVOLUTION PROCESS

Archeologists working in conjunction with medical anthropologists have established that our ancestors up to the beginning of the Industrial Revolution incorporated strenuous physical activity as a normal part of their lives. According to Eaton, Konner and Shostak (1988), physical capability was not just a grim

necessity for success at gathering food and providing shelter and safety. It was enjoyed as an integral component of religious, social and cultural expression. However, much seems to have changed over the years.

Sallis (1995) reflected on this matter in the following way:

“We aspire to idleness. In ancient times what did the kings do? They didn’t work in the fields, they sat around and had people feed them. They were the original couch potatoes. With the Industrial Revolution we have taken the lifestyle of the king to the peasants, and not only the sedentary lifestyle but the diseases that accompany it such as obesity, heart disease, diabetes and cancer.”

A social revolution has transformed our society from one in which regular daily physical activity was the norm to a population where a sedentary lifestyle is commonplace. Eaton and Eaton (2003) stated that before the domestication of draft animals and the development of mills powered by wind or water, the activities of human ancestors, like those of all other free-living organisms, were entirely dependent on individual physical exertion. The circumstances of humans in the 21st century are different from those of the remote past.

2.2.1 The Industrial Revolution

Until the industrial revolution in the early 1800s, strenuous physical activity was an integral part of the daily life in work as well as in religious, social and cultural expression. Sallis (1995) indicated that this was no longer the case

“The past 200 years of the industrial revolution have been about creating labour-saving devices to make sure we can go through the day without physical activity and we have been very successful in that.”

With the diminished work-related physical activity, healers and philosophers today have questioned whether long life and health could be maintained with a decreased level of exercise (American Academy of Anti-Aging Medicine 2003). As people continue to live longer, more attention needs to be placed on the quality of life in one’s later years. According to Canon (2001), labour saving devices has replaced the work our bodies need for survival. We now have the ability to live longer but with much less opportunity for physical activity.

2.2.2 The Agricultural Revolution

According to Braidwood (1960), before the agricultural revolution most people spent their waking moments actively seeking for their next meal. The adoption of an agricultural way of life represented an improvement in the human condition thus forming the very foundation of “civilisation” and modernisation. Farming people thus worked less hard because of mechanized farming, they had more spare time and they enjoyed better health than their forbearers initially. However, Cohen (1997) began to question the “improvement” in lifestyle and the quality of life post-dating the agricultural transition. According to Kelly (1995), agricultural populations had become more concentrated and the accompanying sedentism had specific health consequences. Increased morbidity was due to

nutritional changes as well as to increasing infectious diseases exacerbated by overpopulation in areas. Larsen (1995) indicated that a disease such as osteoarthritis, which was one of the key biological concomitants of physical activity, was on the decrease. This suggested that the body was undergoing less wear and tear due to more sedentary lifestyles. In a later paper, Larsen (1998) indicated that the impact of the transition from foraging to farming on human health and well-being was an overall decline in health owing to a shift to poor quality diet and associated lifestyle changes brought on by increasing sedentism and population crowding.

2.2.3 The Electronic Revolution

In addition to the agricultural revolution and industrial revolution, we also had the electronic revolution. With the advent of the electronic revolution, children now remain glued to television sets, electronic games, videos and digital video decoders (DVD) and little time are devoted to outdoor activities. The electronic revolution, which started in about 1947 with the advent of transistors and with mini-computers in 1959, highlighted the issue of sedentism (McLuhan and Staines 2003). This phenomenon was relatively recent, having been introduced by the agricultural revolution. At this stage people were, however, still involved in toiling, planting and harvesting, which required physical effort. With the coming of the industrial revolution and the advent of machines and motor vehicles, physical activity began to decline. Now, with the introduction of the electronic revolution, an increasing number of people spend more and more time sitting very still,

working with computers, which causes additional problems. The human body was not designed for long periods of sitting. The increase in conditions such as repetitive strain injuries, neck and shoulder stiffness, and lower back pain, are all conditions that indicate that something is wrong.

2.2.4 Current status

By 1953, almost 60% of American children failed to meet minimum standards of health compared to about 10% in Europe (American Academy of Anti-Aging Medicine 2003). This situation continued and worldwide it became essential to prescribe recommendations for physical activity for children, youth and adults. According to the American Academy of Anti-Aging Medicine (2003) exercise is an intervention that will help maintain and enhance functional ability as chronological age increases. Thus, without exercise, the aging process can take a severe toll, especially for those whose lifestyle is sedentary.

Half of the world's population will soon be residing in urban areas. Globalisation will change the urban physical and social environment, with consequent changes in diet and physical activity, which will affect the health of all urban people. Popkin (1999) stated that increasing urbanisation in the developing world brought a remarkably rapid shift toward a high incidence of obesity and non-communicable diseases such as diabetes and coronary problems. Urban physical activity patterns and new technologies in work increased obesity levels, as urban work now requires less physical exertion and allowed more leisure. The

WHO (1999) recognised that the great potential of physical activity for health, functional capacity and well-being of individuals and communities was being lost. Acknowledging the loss, the WHO and various stakeholders attempted to put in place policies and programmes to meet the needs of different populations and to offer them opportunities. The WHO thus launched the Global Initiative on Active Living in 1997 and called on various international partners such as United Nations Educational, Scientific and Cultural Organisation (UNESCO), International Olympic Committee (IOC) and interested countries to co-operate and participate actively in the implementation of this programme. The main partners contributing to this initiative were the Swiss Agency for Development and Co-operation; Center for Disease Control and Prevention, Atlanta, USA; the UK Institute for Health Promotion Research; the Health Education Authority, London; Ministry of Culture, Denmark; and the Federal Department of Health, Canada.

2.3 PREVALENCE OF PHYSICAL INACTIVITY IN SELECTED COUNTRIES

Physical inactivity was identified as a major public health problem in 2000 as physical activity levels of people of all ages tended to decrease (CDC 2001). The Centre for Disease and Control (CDC 2001) reported that of the youths in America aged 12 and 13 years, 69% were regularly active. However, the number dropped to 38% for young people between the ages of 18-21 years. A physically inactive child is more likely to become a physically inactive adult, which could lead to chronic diseases of lifestyle (Frantz, Phillips and Amosun 2003). National

health objectives in countries such as the United States of America and South Africa call for all people to increase their participation in physical activity. Patterns of inactivity, also known as sedentism, begin early in life, making the promotion of physical activity among children imperative (Summerfield 1998). The prevalence of physical inactivity among youth worldwide has increased.

2.3.1 Prevalence of physical inactivity in Canada

Children and youth between the ages of 5 and 19 years comprise almost 25% of the Canadian population. In Ottawa, Canada, it was found that more than 67% of young children did not meet the average physical activity guidelines to achieve optimal growth and development (Canadian Fitness and Lifestyle Research Institute 1998). The study confirmed that physical inactivity had become a major health risk confronting Canadians, and that physically inactive Canadians would become a priority for government action. According to Vail (2001), the following concerns were raised about inactive young people in Canada:

- Two-thirds of the children and youth were not active enough to lay a foundation for health and well-being;
- Over 80% of the children were driven to school by bus or private transport and only 5% of them cycled to school;
- Forty percent of the children already had at least one risk factor for heart disease – reduced fitness due to an inactive lifestyle;
- Twenty-five percent of the children were overweight.

The levels of physical inactivity for Canadian children and youth are increasing. If no significant interventions are made, the impact of this trend will result in staggering increases in health problems and in many cases premature death. In 1997, federal, provincial and territorial ministers responsible for physical activity, sport and recreation, recognised physical inactivity as a serious health issue. According to a public health objective of the Canadian government, the government would strive for a 10% reduction in the level of physical inactivity in Canada by 2003 (Katzmarzyk, Gledhill and Shepherd 2000). Meeting this challenge would require co-ordinated effort between governments, the private and voluntary sectors, communities and individuals.

2.3.2 Prevalence of physical inactivity in the United States of America

Numerous studies on physical fitness in the youth were completed in the United States of America (USA) on a regular basis between the late 1950's and the mid 1980's. Since then, however, researchers have turned their attention to monitoring physical activity of young people. Guo, Roche, Chumlea, Gardner and Siervogel (1994) reported that nearly 50% of American young people aged between 12 and 21 years did not engage in vigorous physically active lifestyles on a daily basis. According to Simons-Morton, McKenzie, Stone, Mitchell, Osganian, Stikmiller, Ehlinger, Cribb and Nader (1997), modern urban children in the USA use their free time to engage in a variety of leisure activities that include watching television for a minimum of 24 hours per week and playing video games. In another a study conducted by Harrel, Gansky, Bradley and McMurray

(1997) on the leisure activities of elementary school children in the USA the activities commonly reported by boys were playing video games (33%), playing football (32%), cycling (31%), watching television (28%) and playing basketball (26%). The girls reported involvement in homework (39%), cycling (31%), watching television (30%), dancing (27%) and reading (23%). These patterns of inactivity are not confined to the USA, as similar patterns have been observed in other developed countries.

Morrow, Jackson, Bazzarre, Milne and Blair (1999) reported that only $\frac{1}{3}$ of Americans were aware of the Physical Activity and Health Report of the Surgeon General. This lack of awareness among the American population could be a contributing factor to the low levels of physical activity participation among the American population. The most recent report from the Centre for Disease Control and Prevention in America (2003) suggested that about one in five American adults engaged in a high level of overall activity. However, on the other end of the spectrum, about one in four American adults engaged in little or no regular physical activity. The United States has also been monitoring the health risk behaviours that contribute to death and disability among the youth since 1990 using the Youth Risk Behaviour Surveillance System (YRBSS). The behaviours monitored include physical inactivity, tobacco use and alcohol use. Based on these surveillance data, various health education programmes were developed and implemented.

2.3.3 Prevalence of physical inactivity in the United Kingdom

London Health Observatory reported that both adults and children in Britain are less active and less fit than previously. The Allied Dunbar National Fitness Survey (1992) identified UK adult population groups who were sedentary as women aged 16-24 years, middle-aged men and people aged 50 years and over. In the Health Survey in England 1997, the health and growth of children and young people aged two-24 years were evaluated. For the first time in a series of health surveys in England, physical activity levels among children were also included. The survey reported that in the two-15 year age group, 22% boys and 30% girls were reported as being physically inactive. In the 16-24 year age group, 39% of the males were reported as inactive and 62% of the females were reported as inactive. In 1997, the Health Education Authority initiated a process of expert consultation and review of the evidence surrounding promotion of health-enhancing physical activity among young people, with the aim of producing a policy framework and recommendations for physical activity among young people (Health Education Authority 1998). Currently the United Kingdom has introduced various programmes to facilitate increased physical activity among school age children. These programmes include Sports for All and Fit for Life. These programmes aim to get people to adopt healthier lifestyles.

2.3.4 Prevalence of physical inactivity in Australia and New Zealand

Initially the limited data that existed regarding levels of physical activity participation in children in New Zealand indicated good levels of participation

(Russell and Isaacs 1986). However, Riddoch and Boreham (1995) indicated a decline in physical activity levels in adolescents, especially amongst girls. Arroll and Swinburn (1994) in their study clearly indicated that adult levels of physical activity in New Zealand were considered to be sub-optimal. Optimal levels of physical activity for children and young people have not yet been clearly identified for New Zealand. According to Tobias and Roberts (2001) the current fatal burden of physical inactivity in New Zealand was estimated to be 2600 deaths per year (9% of all deaths). It is estimated that by 2021, the prevalence of physical inactivity will increase by 4%. According to Schofield (2003), surveillance in the area of physical activity levels of youth had been neglected and he identified a need for research to identify the determinants of physical inactivity in youth in New Zealand. The author stated that understanding these determinants with the aid of quality population data would inform successful intervention. In June 2003, the New Zealand Ministry of Health released a document called DHB Toolkit: Physical Activity. The aim of the document was to promote physical activity among the New Zealand population with priority groups being inactive people, children and adolescents and older people. It addresses one of the priority areas for population health in New Zealand.

In Australia in 1996, the need was identified to develop evidence-based, population-wide strategies and public policies to promote higher levels of involvement in regular physical activity. The relative contribution of physical inactivity to disease and disability in Australia was 7%, second only to smoking,

which was 11% (Struber 2004). In November 1997, a national baseline population survey was conducted as a benchmark for the Active Australia initiative (Bauman 1997). The results of the study found that 35% of males over 16 years of age and 43% of females over 16 years of age were inactive.

2.3.5 Prevalence of physical inactivity in South Africa

The Birth to Twenty (BTT) study is the largest and longest running study of child health and development in Africa, and it is also one of the few large-scale longitudinal studies in the world (Birth to Twenty 2002). The results of the BTT study have had a major impact on a number of areas of children's health, well-being and education, both locally and nationally. Unpublished findings from the BTT studies have found that insufficient physical activity is not limited to adults. It was found that the levels of physical activity are much lower than expected in South African children (Birth to Twenty 2002). More than 40% of young people do not participate in regular physical activity. The BTT study found that physical activity was less common among girls than boys and among those with lower income and less education. Another study in a local community in the Western Cape reported similar inactive lifestyle patterns in young people, in which 65% of high school students in the Strand were considered to have physically inactive lifestyles (Phillips 2001). A study conducted in North West Province, South Africa as part of the Transition and Health During Urbanisation of South Africa (THUSA) study, found physical inactivity to be a major determinant of obesity in black women (Kruger, Venter, Vorster and Margetts 2002a).

Physical inactivity is thus seen as highly prevalent in many countries of the world. The increasing number of people around the world who are exposed to the hazard of low physical activity levels poses a major public health problem. As physical activity is recognised as playing an important role in the prevention and treatment of secondary diseases such as cardiac disease and obesity, members of the WHO established a task force with the mission to increase physical activity levels in countries around the world in order to reduce the burden of obesity. The steering committee consisted of members from the following countries: the USA, Australia, Canada, South Africa, Brazil, Scotland, France, the Netherlands and Japan.

2.4 BENEFITS OF A PHYSICALLY ACTIVE LIFESTYLE

Regular physical activity can be a practical means to achieving numerous health gains either directly or indirectly through its positive impact on other major risks in particular high blood pressure, high cholesterol, obesity, tobacco use and stress. Many studies show that physical activity improves health (Caspersen et al. 1985; MMWR 1993). It is known that consistent physical activity improves fitness, endurance, muscle strength and cardiovascular health.

Physical activity is known to reduce the risk of cardiovascular disease (Lee, Paffenbarger, Thompson 2001), some cancers (Hardman 2001) and type 2-diabetes (Diabetes UK 2003). These benefits are mediated through a number of

mechanisms: in general, physical activity improves glucose metabolism, reduces body fat and lowers blood pressure. Physical activity also reduces the risk of colon cancer by its effects on prostaglandins, reduced intestinal time and higher antioxidant levels (Giovannucci, Ascherio, Rimm, Colditz, Stampfer and Willet 1995). In addition, physical activity is also associated with lower risk of breast cancer, which may be the result of effects on hormonal metabolism.

The WHO (2003c) summarised the benefits of regular physical activity as:

- * reducing the risk of dying prematurely
- * reducing the risk of dying from heart disease or stroke
- * reducing the risk of developing heart disease, colon cancer and type 2 diabetes
- * prevention/reduction of hypertension
- * prevention/reduction of osteoporosis
- * reducing the risk of developing low back pain
- * helping to build and maintain healthy bones, muscles and joints
- * promoting psychological well-being, and reducing stress, anxiety and depression
- * helping to prevent or control risky behaviours, especially in children and young people.

2.4.1 Reducing the risk of all cause mortality

According to Sherman, D'Agostino, Silbershatz and Kannel (1999) and Blair, Kohl and Barlow (1995), there is a lower risk of all-cause mortality amongst adults who adopt physical activity even if they do so later in life. Blair et al. (1995) further reported that an increase in physical activity for middle-aged men and women appears to confer a health benefit in terms of subsequent risk of death. Paffenbarger, Hyde, Wing, Lee, Jung and Kampert (1993) reported that even moderate and incidental forms of activity, such as using the stairs, are associated with reduced risk of mortality.

2.4.2 Prevention of cardiovascular disease

Numerous studies have shown that people who are at least moderately active have significantly decreased risk of cardiovascular problems than those who are sedentary (United States Department of Human and Health Services 1996; Bauman and Campbell 2001). In addition to the benefits of life-long physical activity amongst adults, there are benefits from starting physical activity during childhood and adolescence. There is evidence that physical activity among young people can impact favourably on other cardiovascular risk factors (Bar Or 1994).

2.4.3 Prevention of cancer

The best evidence for physical activity in the prevention of cancer relates to colon cancer. Colditz, Cannuscio and Frazier (1997) reported a clear and consistent

dose-response relationship between different forms of physical activity and cancer. It is thought that physical inactivity causes around one-fifth of all colon cancers in the population, thus indicating a strong role for primary prevention

2.4.4 Prevention of diabetes

The increasing rate of non-insulin dependent diabetes mellitus is a cause for public health concern. Longitudinal studies show that the risks of developing diabetes in a population are lower in people who are physically active than those who are sedentary (Helmrich, Ragland, Loung and Paffenbarger 1991; Folsom, Kushi and Hong 2000). Physical activity is an important dimension in the management of diabetes, as exercise may improve glucose metabolism, increase insulin sensitivity and prevent the increase in heart disease among people with diabetes. Thus the use of exercise in managing diabetes is well documented (Van Rooijen, Rheeder, Eales and Molatoli 2002; Odebeyi and Ohwovoriola 2002).

2.4.5 Prevention of falls

Physical activity is a beneficial component of the prevention of falls especially amongst the elderly (Myers, Young and Langlois 1996). This is achieved partially through effects on muscle strengthening and balance and possibly through maintaining bone density, thus preventing osteoporosis. This is important for young people as it is during the period of adolescence that lifelong bone

deposition occurs, thus being active during the adolescent stage is important for the prevention of osteoporosis.

2.4.6 Prevention of low back pain

To help prevent low back pain, the leg, back and hip muscles must be flexible and strong. Poor flexibility and weak muscle can lead to poor posture, which ultimately leads to dysfunction of the nerves, muscle and joints in the back (Silveri and Spinasanta 2003).

2.4.7 Mental health benefits

The mental health benefits of physical activity are well recognised. According to Paluska and Schwenk (2000), aerobic exercise or strength training programmes can reduce symptoms of depression. Studies have also indicated that physical activity was positively associated with feelings of wellness, lowered levels of stress and anxiety and positive mental health (Stephens 1988; Simonski 1991).

2.5 FACTORS INFLUENCING PHYSICALLY INACTIVE LIFESTYLE

Despite these proven benefits of a physically active lifestyle, many adolescents are still sedentary. Various factors influence the development of physical inactivity in children or attempt to explain the lack of physical activity in the general population. Several theoretical models of human behaviour have guided the research on the determinants of physical inactivity in youth. Bandura's Social Cognitive Theory, asserts that personal (knowledge, self-efficacy, beliefs,

intentions), environmental (physical and social) and behavioural (self observation, judgment, reaction) factors interact to determine the final action of the individual (Bandura 1986). According to Sallis (1994), understanding the many factors that influence physical activity may help improve the effectiveness of intervention programmes.

The factors influencing physical activity include physical environmental factors, psychological factors, social and cultural factors and biological and developmental factors that include health status and cardiovascular and musculoskeletal fitness (Sallis 2000). There is increasing recognition that environmental factors play an important role in promoting and supporting physically active lifestyles. The environmental factors included unsafe neighbourhoods, limited access to facilities that promote participation in physical activity (MMWR 1999), inadequate public transport systems, poor safety on roads, few pavements in communities and no cycle paths (Powell and Pratt 1996). These factors systematically excluded physical activity from the lives of children. Access to labour-saving devices at work and home contributes to a similar status of physical inactivity. In addition we also have increases in sedentary activities such as watching television and using computers. Psychosocial factors include lack of time, work and family demands, the individual's perception of exercise, and personal interest in physical activity (Napolitano and Marcus 2000; Sallis, Hovell and Hofstetter 1989). According to Rabinovitz (1997), another factor that affects young people are socio-economic

status, which includes lack of financial resources and lack of family support. In addition, biological and developmental factors such as ill health, for instance asthma and other respiratory disorders, contribute to the inactive lifestyles in children.

A study conducted by Gorden-Larsen, Mc Murray and Popkin (2000) found that although participation in physical activity was most influenced by environmental factors, physical inactivity was much more influenced by socio-demographic factors. These factors included level of education of parents, family income and gender. Thus it became clear from this study that key modifiable environmental factors that had an effect on physical activity participation did not affect inactivity. It became clear that higher socio-economic status, measured by maternal education and family income had a large impact on the likelihood of engaging in inactivity. Sallis, Alcaraz, McKenzie, Hovell, Kolody and Nader (1992a) indicated that participation in physical activity is strongly influenced by parent, sibling and peer behaviour. In addition, factors such as attending school also influenced participation in physical activity (Benefice 1998).

2.5.1 Biological and developmental factors

Biological factors are strongly associated with level of physical activity. The biological factors include age, gender, ethnicity and musculoskeletal injuries.

Age is a potent predictor of physical activity and the level of physical activity is known to decrease throughout the entire age span. Sallis (1993) indicated that

during the school years, the activity level declines by about 50%. In a comprehensive review of the correlates of physical activity in the United States by Sallis, Prochaska and Taylor (2000), it was reported that younger children were more active than adolescents, boys were more active than girls and white children were more active than African-American and Hispanic children and youth. According to Treuth, Butte, Puyau and Adolph (2000), physical activity habits have been shown to be heritable. Both genetics and ethnicity have been shown to be associated with fitness. According to Klein (1999), genetic evolution has been unable to match the rapidity of cultural change and our genes remain adapted for conditions that existed in the early years. This discordance or mismatch between our contemporary lives and our genetic make-up has important pathophysiological implications, due to coronary arteriosclerosis, age-related fractures and obesity, which are promoted by physical inactivity. Bouchard, Lesage and Lortie (1984) reported that approximately 60% of an individual's fitness level is genetically determined. Research has indicated that obesity and other body composition measures may also be genetically determined and could affect an individual's inclination to be active (Yanovski and Yanovski 1999; Stunkard, Harris, Pederson and McClearn 2000).

In addition, various studies have found that black children have lower levels of fitness than do white children (Pivarnik, Bray, Hergenroeder, Hill and Wong 1995; Gutin, Islam, Manos, Cucuzzo, Smith and Stachura 1994). Perhaps the most evident biological correlate of physical activity behaviour is gender. In addition

data suggest that boys are twice as active as girls (Troost, Pate and Dowda 1996; Stephens and Caspersen 1994; Sallis 1993). However, it has been stated that perhaps this difference is due to socialisation rather than to biological factors.

Physical traits such as the individual's fitness level, body composition, and motor skill development also influence physical activity levels. Cardiorespiratory fitness may also be a potent determinant of physical activity behaviour in that participation in physical activity may increase to meet the physical capacity of the child. According to Kohl and Hobbs (1998), data is lacking as to whether aerobic capacity may be a determinant of physical activity participation. Physical health status is also a determinant of physical activity behaviour among children and adolescents. Another biological reason why adults drop out of vigorous exercise programmes is musculoskeletal injuries (Sallis and Nader 1990). Although it is important to understand the potential for biological and physiological factors as determinants for physical activity behaviour in children and adolescents, we need to realise that many of the determinants (gender and genetic influence) are non-modifiable or uncontrollable (biological maturation).

2.5.2 Psychological factors

Psychological influences on children's physical activity have not been widely researched, perhaps due to parents and teachers controlling and selecting the activities in which children participate. Among adults, a wide variety of psychological factors influence participation in physical activity. Much of our

current understanding can be summarised by stating that personal beliefs about one's own physical activity, perceptions of personal efficacy and confidence regarding one's ability to be active on a regular basis, will influence physical activity participation (Crocker, Eklund and Kowlaski 2000). A number of studies have found self-efficacy to be positively associated with physical activity in young people (Biddle and Armstrong 1992, Craig, Goldbeg and Dietz 1996; Trost et al. 1996). Research on how a young person's beliefs about behaviour, perceived benefits of behaviour and enjoyment of physical activity and physical education classes influence physical activity is not conclusive (Crocker et al. 2000).

According to Stucky-Ropp and DiLorenzo (1993), enjoyment appears to influence the activity levels of children. One of the main influences on enjoyment is the amount of exertion required by the activity. According to Epstein, Smith, Vara and Rodefer (1991), children prefer activities with lower levels of exertion, and dropout rates are higher from vigorous activity than from moderate intensity activity (Dishman and Sallis 1994). One of the main factors influencing participation in physical activity among children was lack of time due to schoolwork (Allison, Dwyer and Makin 1999). Milligan, Burke, Beilin, Richards, Dunbard, Spencer and Gracey (1997) identified lack of will power, ignorance about the health benefits of exercise, poor time management, limited social life and lack of social support as barriers to a physically active lifestyle. For children the lack of suitable role models also contributes to a lack of participation.

2.5.3 Social and cultural factors

It is a common assumption that most of the healthy or unhealthy lifestyles originate, at least in part, in family socialisation. The family is considered the most important agent of socialisation, although as children become adolescents, peers and other adults become increasingly important. The study by Lau, Quadrel and Hartman (1990) found that modelling of behaviour is the strongest socialisation technique in developing healthy lifestyles and therefore it is the most promising route for public health officials hoping to change those lifestyles. According to Sallis, Simons-Morton, Stone, Corbin, Epstein, Faucette, Iannotti, Killen, Klesges, Petray, Rowland and Taylor (1992b), broader family variables such as family structure, socio-economic status, and ethnic heritage also affect habits related to children's physical activity. It is suggested that families with single parents or parents who are frequently absent because of work have children who are socially and/or physically disadvantaged. However, we are finding that for our children today, there is a lack of suitable role models amongst our adults. Sallis et al. (1992b) recommended that interventions to increase children's physical activity should involve increased parental support of physical activity to children. The school offers the earliest opportunity for broad scale intervention in behavioural risk reduction and is a natural setting for epidemiological studies of lifestyle health behaviours in children (Gottlieb and Chen 1985).

Social influences on physical activity are strong for people of all ages. For adults, social support can come from friends, co-workers, or family members. The main types of support are encouragement, participating in physical activities and providing assistance such as childcare (Dishman and Sallis 1994). For adolescents however, the influence of family and peers is paramount. Sallis (1994) reported that if a given adolescent identifies with a peer group that values and participates in physical activity, the group creates a supportive environment for its members. If the main peer group devalues physical activity, this is an effective deterrent.

A study by Lindström, Hanson and Ostergren (2001) found that the extent to participation in leisure-time physical activity was influenced by socio-economic status. According to Gordon-Larsen et al. (2000) low socio-economic status appears to be associated with physical inactivity in young people. The study by Gottlieb and Chen (1985) found that there was a strong relationship between sex-typing, ethnic influence, father's occupation and sport type. The study also found that physical activity participation was influenced by race. Yang, Telama and Leino (1999) reported in their study that social factors such as income, education, occupation and family formation influenced physical activity participation. The study further reported that the more professional the occupation of the adult, the more likely the adult was to participate in physical activity. The study further reported that early socialisation with physical activity was a more important predictor of adult physical activity.

2.5.4 Environmental factors

It seems self-evident that physical environmental factors such as climate, weather, facilities and neighbourhood safety would have a major effect on physical activities. Automobiles, television, computers, labour-saving devices and sedentary jobs have created an environment that makes possible a profoundly sedentary lifestyle for a large number of people. The physical environment can strongly promote children and adolescents to be physically active or virtually ensure that they will not be. At present many of our communities have no sidewalks or streetlights thus decreasing walking as an activity. Increasing traffic congestion and aggressive driving also hampers the walkability of neighbourhoods. According to Sallis (1994), a supportive environment for adults must consist of a safe and attractive space for outdoor activities. For adolescents it may be especially important to have organised activities in convenient locations. According to Klesges, Eck, Hanson, Haddock and Klesges (1990), it is difficult for children to be active indoors, and thus time spent outdoors is highly correlated with physical activity levels. Sallis, Nader, Broyles, Berry, Elder, McKenzie and Nelson (1993a) indicated that many parents are concerned about the safety of their neighbourhoods and prohibit children from going outside to play. Thus the more parental rules that limit children's play, the less physically active the children may be.

Television, computer games and videos are a part of the environment of children and adolescents that encourages sedentary behaviour. According to Robinson,

Hammer, Killen, Kraemer, Wilson, Hayward and Taylor (1993), there is reason to limit the hours per week children watch television, because of the association between the amount of television viewing and obesity. A study conducted by Epstein et al. (1991) found that simply moving the television set could increase the levels of physical activity in obese children. When the television set was moved to another building and exercise equipment was placed in the room with the children, the obese children used the equipment rather than walk several minutes to watch television. Young children often express a continuing interest in being involved in recreational and physical activities, but technology and social evolution have changed their lifestyles (Rabinovitz 1997; Rich 1999). Many children do not walk to and from school any more. Playing outside is not safe in many neighbourhoods and child entertainment has changed to television, computers and video games. Andersen (1999) stated that automobiles, public transportation, and other labour-saving devices contribute to sluggish lifestyle. Rich (1999) stated that an increase in television watching had been directly associated with lower physical activity levels and increases in obesity.

2.6 THEORETICAL MODELS THAT GUIDE RESEARCH ON THE DETERMINANTS OF PHYSICAL INACTIVITY

Physical activity education should range from public health messages that provide basic information on the effects and cost to comprehensive interventions with specific objectives that would influence behavioural changes. Research needs to identify the ingredients required to implement effective programmes that

would contribute to the reduction of the negative health effects of physical inactivity. Theoretical models designed from research enable programme planners and policy makers to allow for a sound foundation for program development.

The most widely used formal approaches regarding health-related behaviours are probably the Health Belief Model (Rosenstock, Strecher and Becker 1988), the Social Learning Theory (Bandura 1986) and the transtheoretical model. Mechanisms of physical activity behaviour change have empirically been derived and theoretically hypothesised.

2.6.1 The Health Belief Model

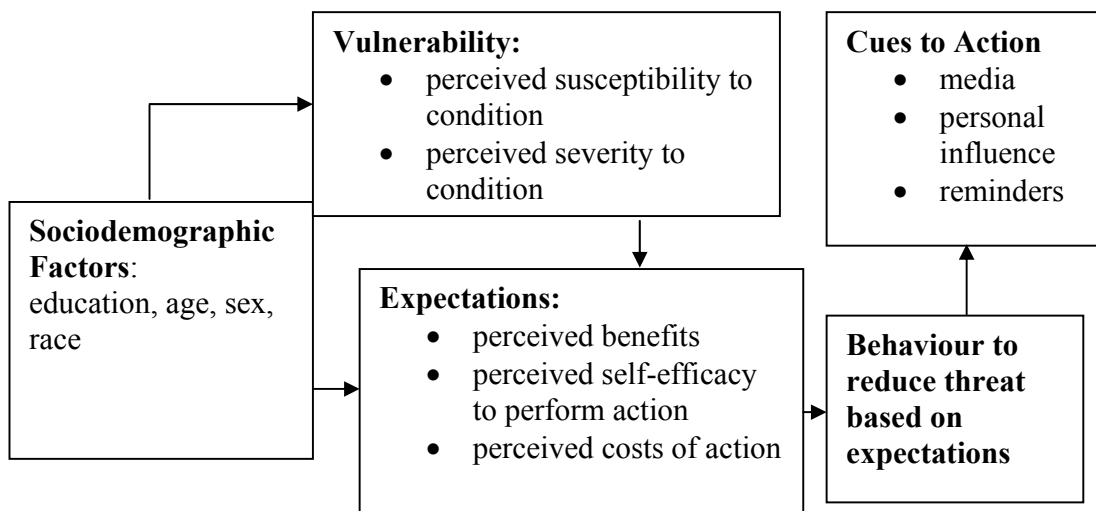
The Health Belief Model (Fig. 2.1) is one of the most widely used conceptual frameworks for understanding health behaviour. The Health Belief Model was developed in the early 1950's and is based on the understanding that a person will take a health-related action if that person:

- feels that a negative health condition can be avoided
- has a positive expectation that by taking a recommended action, s/he will avoid a negative health condition and
- believes that s/he can successfully take a recommended health action.

The model initially had four key concepts, namely perceived susceptibility, perceived severity, perceived benefits and perceived barriers. In 1988 the

concept of self-efficacy was added to address the challenges of habitual unhealthy behaviours.

FIGURE 2.1 THE HEALTH BELIEF MODEL (ROSENSTOCK ET AL. 1988)



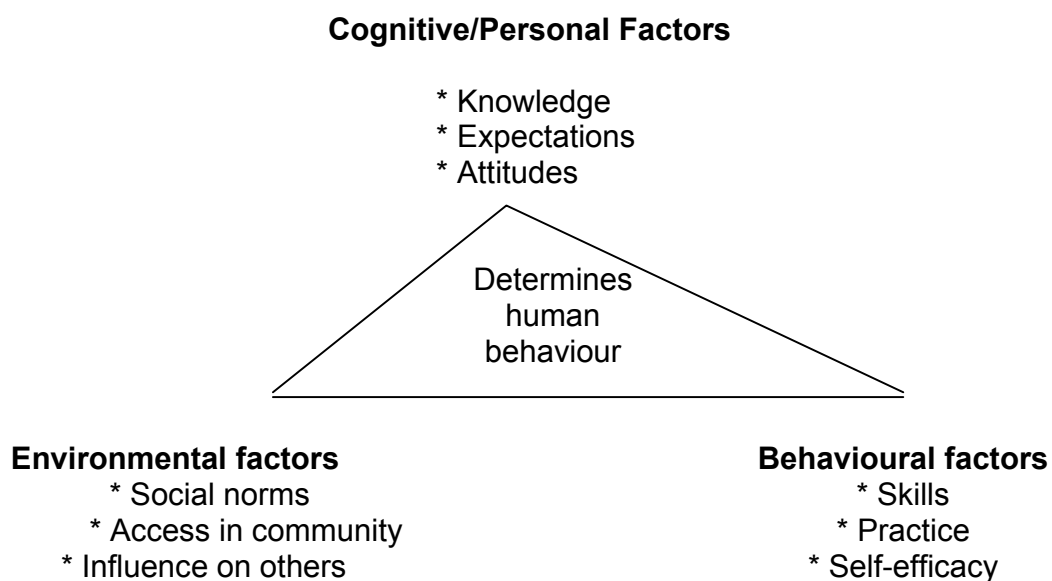
The Health Belief Model is thus a framework for motivating people to take positive health actions that uses desire to avoid a negative health consequence as the prime motivation. For example, obesity or chronic heart disease is a negative health consequence and the desire to avoid obesity or chronic heart disease can be used to motivate physically active lifestyles. It can be used to focus on primary as well as on secondary prevention. The challenge that one faces when using the Health Belief Model is to be careful not to blame the victim, as the Health Belief Model stresses personal responsibility which may lead people to feel it is their fault if they cannot solve their own problems. The Health Belief

Model works well with other learning theories such as the Social Learning Theory.

2.6.2 The Social Learning theory

Learning theories attempt to explain how people think and what factors determine their behaviour. The Social Learning theory (Figure 2.2) is grounded in the belief that human behaviour is determined by a three-way relationship between cognitive factors, environmental influences and behaviour.

FIGURE 2.2 THE SOCIAL LEARNING THEORY (BANDURA 1977)



In the application of the Social Learning theory, the learner is encouraged to:

- observe and imitate the behaviours of others
- see positive behaviours modelled and practised
- increase their own capability and confidence to implement new skills

- gain positive attitudes about implementing new skills
- experience support from their environment in order to use their new skills.

The Social Learning theory is useful for prevention programmes. One of the most common Social Learning theories is the Social Cognitive theory. Evaluation research indicates that health interventions informed by the Social Cognitive theory can be effective in a number of domains. According to the Social Cognitive theory, an effective intervention must consist of four components:

- information related to perceived vulnerability and self-efficacy
- development of self-regulatory and risk reduction skills
- further development of these skills and the self-efficacy to use them
- development and use of peer group support.

2.6.3 The WHO STEPwise approach to surveillance of non-communicable diseases

The WHO STEPwise approach to surveillance (STEPS) was recommended by WHO as a surveillance tool for non-communicable diseases (WHO 2003b) (Figure 2.3). This framework unifies all WHO approaches to defining core variables for population-based surveys, surveillance and monitoring instruments. The document offers an entry point for low and middle-income countries to get started on surveillance of activities related to non-communicable diseases. STEPS for NCD risk factors is based on the concept that surveillance systems

require standardised data collection as well as sufficient flexibility to be appropriate in a variety of country situation and settings.

The key feature of the STEPS framework is the distinction between the different levels of risk-factor assessment:

- * self report information by questionnaire (Step 1)
- * objective information by physical measurements (Step 2)
- * objective information by blood samples for biochemical analyses (Step 3)

The three modules involved in describing each risk factor includes core, expanded core and optional (TABLE 2.1). The STEPS approach encourages a focus on obtaining core data at each level on the established risk factors that determine the major disease burden.

2.7 IS PHYSICAL INACTIVITY A PUBLIC HEALTH PROBLEM?

2.7.1 Physiological impact

For centuries infectious diseases were the main causes of death worldwide. Currently chronic diseases are the major cause of death and disability worldwide (World Health Report 2001), and increasingly affect people from developing as well as developed countries. A few largely preventable risk factors account for most of the world's disease burden.

FIGURE 2.3 WHO STEPS – THE FRAMEWORK FOR NON-COMMUNICABLE DISEASE RISK FACTORS

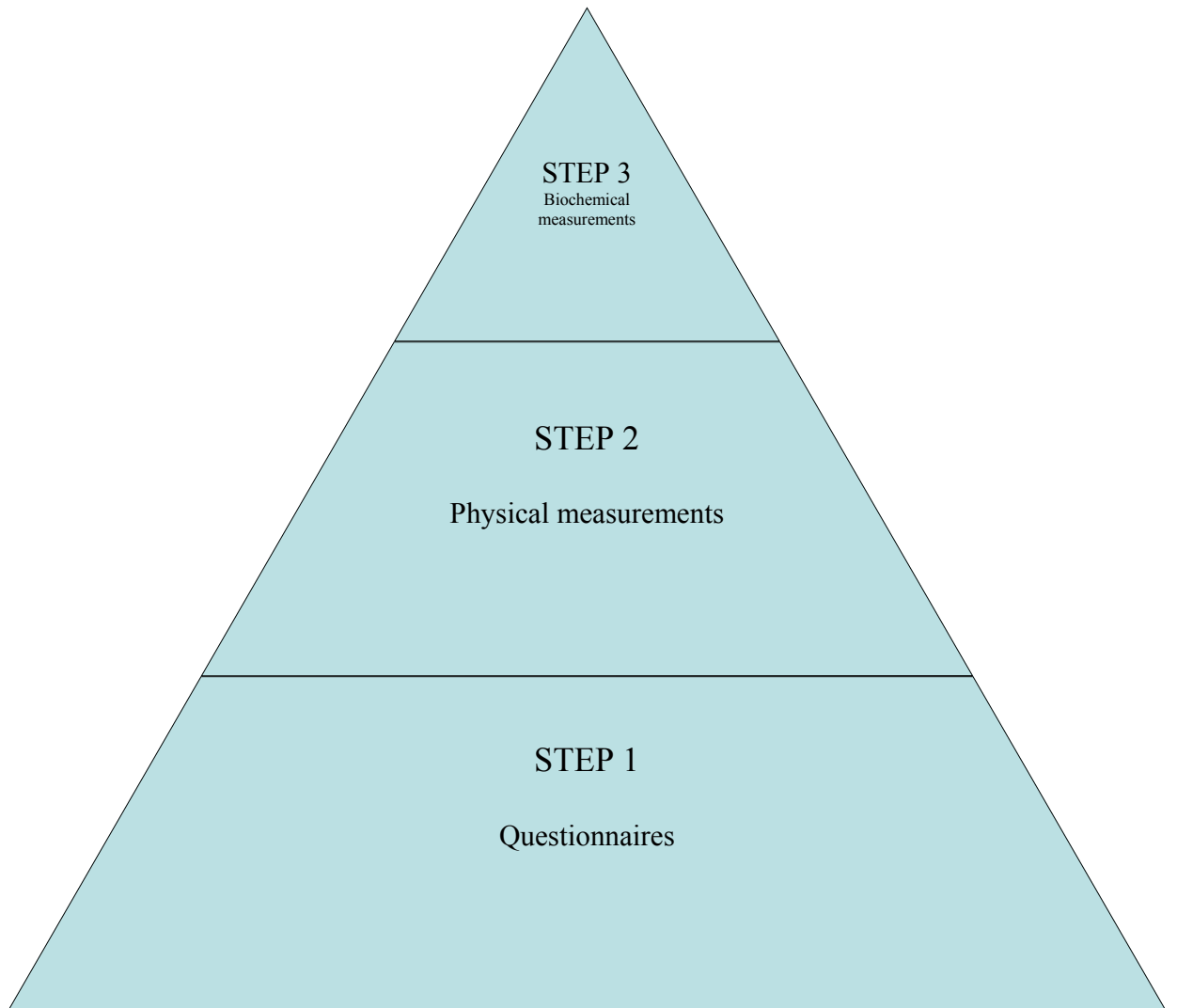


TABLE 2.1 STEPS APPROACH TO RISK FACTOR ASSESSMENT

Measures	Step 1 (self report)	Level 2 (physical)	Level 3 (Biochemical)
Core	Socio-economic & demographic variables, years of education, tobacco and alcohol use, physical inactivity, intake of fruit & veg	Measured weight and height, waist circumference, blood pressure	Fasting blood sugar, total cholesterol
Expanded core	Ethnicity, income, education, household indicators, dietary patterns	Hip circumference, pulse rate	HDL-cholesterol, triglycerides
Optional (examples)	Other health-related behaviours, mental health, disability, injury	Timed walk, pedometer, skinfold thickness	Oral glucose tolerance test, urine examination

(WHO/NMH/CCS/03.01)

Chronic diseases of lifestyle are a group of diseases that share similar risk factors as a result of exposure, over many decades, to unhealthy diet, smoking and physical inactivity (Medical Research Council 2001). Physical inactivity has been reported to be an effect and the cause of health conditions. Research has shown that many cases of heart disease, hypertension, type 2 diabetes, colon cancer, stroke, osteoporosis, depression and anxiety and falls among elderly are

attributable to inactive lifestyles (Gupta 2000; Pate and Sirard 2001, Paffenbarger et al. 1993; Blair, Kohl and Paffenbarger 1989). A report by the Surgeon General (1996) stated that physical inactivity increases the risk of dying prematurely, dying of heart disease, developing diabetes, colon cancer and high blood pressure. 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.

Because children who have high blood pressure are at greater risk of becoming hypertensive adults (Lauer and Clarke 1989) and because high blood pressure is likewise 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 Lauer and Clarke (1989), Rowland (1990) and 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. Sallis and Patrick (1994) indicated that in order to lower blood pressure, physical activity must be performed frequently, at least several times a week at a moderate to high intensity.

According to Bouchard, Shephard, Stephens and McPherson (1990), physical activity is defined as any movement of the body produced by skeletal muscles

and resulting in energy expenditure. Genetics largely determines a person's physiological predisposition. Yet the fact of the matter is that all adolescents, independent of genetic disposition, can improve their physical fitness and can maintain it by participating in regular physical activity. Good physical health helps one become more apt for physical labour and facilitates the execution of tasks related to studies, physical activity and leisure pursuits (Caspersen and Merrit 1995; Sallis and Patrick 1994).

According to Paffenbarger, Hyde, Wing and Hsieh (1986), physical inactivity reduces life expectancy by more than two years. The association between regular physical activity and risk of overall mortality is well documented in developed countries (Paffenbarger et al. 1986; Lissner, Bengtsson, Bjorkelund and Wedel 1996). According to the Surgeon General's Report (1996), there is strong evidence that those persons involved in moderate to high levels of physical activity have a lower mortality rate than those who lead sedentary lifestyles. In South Africa, various studies have indicated that people participating in moderate to vigorous activities lead an improved lifestyle (Dreyer, Dreyer and van der Merwe 2001; Laubscher, Strydom and Dreyer 2003). Worldwide there is evidence to suggest that a low level of participation in physical activity leads to an increase in the risk of chronic heart disease (Donahue, Abbott, Reed and Yano 1988; Eaton, Medalie, Flocke, Zyzanski, Yaari and Goldbourt 1995). In South Africa the study conducted by Coetsee (2003) also indicated the relationship between physical fitness and chronic heart disease (CHD).

According to Kruger, Venter and Vorster (2002b), physical inactivity has been identified as a risk factor for cardiovascular disease in communities undergoing rural to urban transition in South Africa. Physical activity reduces the risk of chronic heart disease through a number of physiological and metabolic mechanisms. These include the potential for increasing the level of high-density lipoprotein cholesterol, reducing blood pressure (Hagberg 1990), and enhancing glucose tolerance and insulin sensitivity (Ivy 1987). Studies have shown that physically active children and adolescents and those with higher level of fitness have a lower triglyceride level in their blood and a higher plasma concentration of HDL (Baranowski et al. 1992). In adults, this lipid profile is associated with a considerably decreased risk of developing coronary heart disease. The Surgeon General's Report (1996) also indicated that physical activity and diet had been found to be the most effective means of controlling non-insulin dependent diabetes mellitus (NIDDM).

Physical activity also plays a role in promoting musculoskeletal health. The amount of physical activity required for normal growth, bone development, body height and biological development is not yet known (Bar-Or and Malina, 1995). According to Cailliet (1988) and Gracovetsky, Kay, Levy, Ben Said, Pitchen and Helie (1990), the theoretical link between physical activities, physical fitness and low back pain is largely based on functional anatomy. Plowman (1992) reported that a properly functioning cardiovascular system is necessary for disc nourishment and to slow disc degeneration. The skeletal system and the spine

are the primary supporting structures of the body. If the weight carried by the spine is largely muscular, healthy functioning should result, but if a large portion of the body mass is fat, this adds extra weight on the discs. The relationship between physical activity and low back pain in children and adolescents has been found to be evenly distributed among low, moderate and high activity groups (Kujala, Salminen, Taimela, Oksanen and Jaakkola 1992; Taimela, Kujala, Salminen and Viljanen 1997; Troussier, Davoine, deGaudemaris, Fauconnier and Phelip 1994). The study conducted by Salminen (1995) found that low participation in activity was associated with an increase in the frequency of low back pain. Despite the convincing evidence of health-related effects of physical activity, physical inactivity continues to be a public health concern worldwide.

2.7.2 Economic impact

Non-communicable diseases are the new pandemic of the 21st century. They threaten to swamp the meagre health care resources of many countries. According to Pate, Pratt, Blair, Haskell, Macera, Bouchard, Buchner (1995), physical inactivity has become one of the leading preventable contributors to death for Americans, second only to tobacco, and it has become a huge economic burden. Xie, Rehm, Single and Robson (1999) estimated that the costs of illness attributable to preventable risk factors are of importance to decision makers as they provide some notions of the overall cost savings if the risk factor could be removed or reduced in prevalence. According to Stephenson, Bauman,

Armstrong, Smith and Bellow (2000), in Australia the cost of injury studies around health risk factors found that obesity cost Australian \$736 million, poor nutrition cost \$3.6 billion, while alcohol and tobacco cost \$ 10.2 billion.

These figures provide a broad range of estimates that may not indicate indirect costs. In Minnesota an estimated US \$495 million was spent during the year 2000 that could have been avoided if the population were more active (Healthy Minnesotans Update 2001). This is likely to be an underestimation of the true costs attributable to physical inactivity as these costs only included diseases with a strong link to physical inactivity, according to literature. The indirect costs of productivity loss from illness and early death from the diseases were not calculated. Wolf and Colditz (1998) conducted a study using a prevalence-based approach to estimate the economic costs attributable to obesity for type 2 diabetes mellitus, coronary heart disease, hypertension, breast, endometrial and colon cancer and osteoarthritis. The total cost attributable to obesity amounted to \$99.2 billion. The economic and personal health costs of overweight and obesity are enormous and compromise the health of the United States. DeJong, Sheppard, Lieber and Chenoweth (2003) indicated that physical inactivity has a high human cost in terms of health. It shortens years of life, decreases quality of life and limits functional independence. Thus, in Michigan, it was determined that physical inactivity cost the government nearly \$8.9 billion in 2002. These costs were borne largely by employers through health insurance premiums and loss of productivity. According to DeJong et al. (2003), in order to determine the total

cost of physical inactivity, both direct and indirect costs must be calculated. The previous section dealt with direct cost (loss of productivity, medical aid). Indirect cost calculated in Michigan accounted for \$205 million (DeJong et al. 2003). This included the cost of replacement staff, lost opportunities, long rehabilitation times, drug reactions and additional usage of medical services. This study estimated that if one in 20 sedentary adults were to become physically active, a cost avoidance of \$575 million per year over the next four years could be realised.

According to Katzmarzyk et al. (2000), about 2.5% of the total direct health care costs (\$2.1 billion) in Canada could be attributed to inactivity. Conservative estimates suggested that reducing the prevalence of inactivity would save about \$150 million. These costs were borne largely by employers through health insurance premiums and loss of productivity as well as by the government. Residents of the various countries ultimately absorb these costs in terms of higher taxes and increased cost of goods. In a study done in 1995 for the Ontario Government, called "The Relationship between Physical Fitness and the Cost of Health Care," it was estimated that medical claim costs could have been reduced by \$31 million a year if all Ontario adults aged 20 and above had at least an average level of fitness (Public Health Agency Updated 2004). In Canada health care costs related to major disease groups were reported as follows: cardiovascular disease cost the health care system \$7.3 billion in direct costs and \$12.4 billion in indirect costs (Public Health Agency of Canada 1998).

Cancer in Canada had an economic burden of \$13.1 billion and diabetes accounted for \$1 billion in direct and indirect costs. If the cost of illness with regard to physical inactivity in countries such as Australia, America and Canada had burdened them to such a great extent, what would the effect of physical inactivity be on our health system and economy?

2.7.3 The social impact

With regard to relationship skills, several specialists are of the opinion that practising of physical activity and sports by young people contribute to their psychological and social development. According to LeBlanc and Dickson (1997), organised sport would seem to provide an atmosphere and behavioural code for adolescents that are favourable to the development of their social skills. Over the past decade and especially since the lapse in enforcement of laws to control population movement, the increase in urbanisation in South Africa has become evident. According to Steyn, Fourie and Bradshaw (1992), risk factors for chronic diseases of lifestyle constitute a major health problem for a large proportion of the South African population. Levitt, Katzenellenbogen, Bradshaw, Hoffman and Bonnici (1993) identified urbanisation and socialisation as significant independent risk factors for the prevalence of certain chronic diseases of lifestyle.

Given the numerous health benefits of physical activity, the hazards of being inactive are clear. Physical inactivity is a serious, nationwide problem. Its scope poses a public health challenge for reducing the national burden of unnecessary

illness and premature death. The economic burden of physical inactivity is large. The health and economic consequences of physical inactivity are sufficiently great to merit public health action now. Coupled with the clear causal relationship between physical inactivity and chronic disease and the availability of effective public health intervention strategies, these factors reinforce the need to make reducing physical inactivity a public health priority.

2.8 HOW MUCH PHYSICAL ACTIVITY IS ENOUGH TO PREVENT DISEASE AND PROMOTE HEALTH?

Physical inactivity is recognised as a risk factor for various diseases. Thus physical activity can play a role in both primary and secondary prevention of disease. The question arises: how much physical activity is enough? Exercise recommendations were first released in the United States of America in the late 1970s and early 1980s (Cale and Harris 2001). For children and young people, there is less evidence of the benefits and desirable amount and type of physical activity. In 1993 a recommendation was released in America by the American College of Sports Medicine (ACSM) regarding physical activity (ACSM 1995) and this was reinforced by the US Surgeon General's Report in 1996.

In 1997 the Health Education Authority of England initiated a process of expert consultation and review of the evidence surrounding the promotion of health-enhancing physical activity among young people with the aim of producing a policy framework and recommendations (Biddle, Sallis and Cavill 1998). The

outcome of the Health Education Authority's review process was a set of recommendations for young people (five - 18 years). The primary recommendations were that all young people should participate in physical activity of moderate intensity for one hour per day. Alternatively, if they currently do little activity they should participate in physical activity of at least moderate intensity for at least 30 minutes per day.

Guidelines widely used at present include:

- the guidelines recommended by the American Council of Sports Medicine (ACSM) in 1990 stating that adults should be involved in vigorous exercise 3-5 days/week for at least 20 minutes per session (US Department of Health and Human Services 1996);
- the health-related guidelines established by the CDC and ACSM that state that all adults should accumulate at least 30 minutes of more moderate intensity activity on most or all days of the week;
- the guidelines of the British Health Authority that state that children should be involved in 60 minutes of moderate physical activity each day (Health Education Authority 1998). If the young people are currently not active, they should strive for at least half an hour of moderate intensity activity per day (three and a half hours per week);
- the guidelines provided by Sallis, Patrick and Long (1994) that state that adolescents should be involved in moderate to vigorous physical activity for 30 – 60 minutes daily.

2.9 PHYSICAL EDUCATION IN SCHOOLS: THE FOCUS ON HEALTH

Children and youth return to school each year and begin anew with their academic and extra-curricular activities. Teachers, administrators and learners focus on education in preparation for the future. While many parents, learners and administrators turn their focus toward traditional academic issues associated with schooling, they must not forget the significant health and physical benefits that can be derived from an excellent physical education programme. In the same way that cognitive information is addressed in schooling, the student's psychomotor development must also be addressed.

Physical education should be an integral part of the total education of the child. Quality physical education programmes are needed to increase the physical competence, health-related fitness, self-esteem and enjoyment of physical activity for all learners so that they can be physically active for a life-time (Seefeldt and Vogel 1986). According to the New Jersey Department of Education, people who are health literate and physically educated have the knowledge and skills to better achieve and maintain physical, social and emotional health. Fitness activities in the school setting have important individual, societal, and economic implications. However, the teaching of Physical Education in schools in South Africa is now greatly diminished or non-existent. According to Travill (1997), in South African schools during restructuring, physical educators' posts were the first to go. The Director of Sport in the

Western Cape indicated that contrary to what was believed earlier when rationalisation took place, the physical education teacher is a critical post.

Inactive, unhealthy children will become sedentary, sick adults, whose illness will add to the health care crisis and diminish the quality of life of all people. Physical education in schools provides the best opportunity for a child to learn and develop life-long health and fitness skills. Without opportunities for school physical education, many children have no access to safe, supervised physical activity of any kind. According to the National Association of Sport and Physical Education (2001), physical education can serve as a vehicle for helping students to develop the knowledge, attitudes, motor skills, behavioural skills and confidence needed to adapt and maintain physically active lifestyles. The outcomes of physical education programmes should include the development of each student's physical competence, health-related fitness, self-esteem and overall enjoyment of physical activity. These outcomes enable students to make informed decisions about and choices leading to a physically active lifestyle.

In America most youth experience physical education at some point in their school experience (Surgeon General's Report 1996). However, it was found that the higher the level of education, the lower the level of participation in physical education. An analysis of the current status of physical education in South African schools accentuates the constraints that will have to be overcome in order to ensure that schools are the appropriate avenue through which the public

can be educated regarding the health benefits of regular physical activity. In the early 1990s when teaching in South Africa was restructured, the first casualties were physical education and school sport. This was especially true in poorer communities where parents could not afford to subsidise private posts for physical education. Travill (1997) indicated that the physical education curriculum and syllabus in South African schools was in the process of undergoing revision and reviewing. The author suggested that part of the process of revision of the curriculum and syllabus should adequately reflect the health objectives of physical education.

In the current curriculum 2005 in South African schools, physical education has found its place in the area of Life Orientation. One of the aims of this learning area is to encourage a healthy lifestyle, characterised by specific and contextualised application of the actions and values expressed in this rationale, celebration of, care for and responsibility towards the self and the social, natural and material environments. As physical education in schools decreases steadily in availability, frequency and quality, health problems related to inactivity are increasing among children and adolescents. Non-insulin dependent diabetes, cardiovascular disorders and osteoporosis, once considered to be age-related conditions are now commonly diagnosed in younger people. According to Bailey, Faulkner and McKay (1996), the peak gain in bone mineral density occurs at age 13 –14 years, and at the end of adolescence 90% of adult bone mineral content is established. Obesity among youth has doubled in the past decade. Although

obesity rarely causes medical complications in adolescents, the risk for the overweight youngster lies in the chance of his or her obesity carrying over into adulthood. Thus the question may be asked: Is there a need for the return of physical education to our schools in order to promote physically active lifestyles?

2.10 INSTRUMENTS ASSESSING LEVELS OF PHYSICAL ACTIVITY

Valid and appropriate assessment of physical activity and inactivity is a challenging task. To assess habitual physical activity is difficult, but according to literature reliable and valid measures are available. The most commonly used method for measuring physical activity in epidemiological studies are questionnaire assessments. A number of different techniques are available for assessing physical activity, including heart rate monitors, activity monitors, pedometers, direct observation techniques and various self-report instruments. In the references discussed below it is found that physical fitness measurement may also be used as a marker for habitual physical activity. There are advantages and disadvantages associated with each technique (see Table 2.2). According to Welk and Wood (2000) factors such as ease of use, reliability/validity, choice of output measure, burden on participant, and cost are just some of the factors that must be considered when comparing different techniques. To evaluate the habitual physical activity levels of children various studies used various methods.

TABLE 2.2 COMPARISON OF DIFFERENT TYPES OF INSTRUMENTS TO ASSESS PHYSICAL ACTIVITY

Type of activity measure	Advantages	Disadvantages
Heart rate monitor	<ul style="list-style-type: none"> • accurate indicator of physical activity • good educational potential to teach about the cardiovascular system 	<ul style="list-style-type: none"> • High cost • Time intensive to download • Difficult to assess large numbers of children • Relevant only to aerobic activity • Other factors affect heart rate
Activity monitor	<ul style="list-style-type: none"> • accurate indicator of physical activity • good educational potential to teach about accumulating activity over the whole day 	<ul style="list-style-type: none"> • high cost • Time intensive to down load • Difficult to assess large numbers of children
Pedometer	<ul style="list-style-type: none"> • easy to use • records distance 	records quantity of movement but not quality (intensity)
Direct observation	<ul style="list-style-type: none"> • provides quantitative and qualitative information 	<ul style="list-style-type: none"> • requires trained observers • can only track several students at a time • very time consuming
Self report	<ul style="list-style-type: none"> • low cost • easy to administer to large groups • good educational potential for use in curriculum 	<ul style="list-style-type: none"> • potential problems with validity and reliability • respondent must have the cognitive ability to self-report activity for part of a day or across days

(WELK AND WOOD 2000)

Table 2.3 describes the use of heart rate monitoring (Armstrong, Balding, Gentle and Kirby 1990; Armstrong and Bray 1991; Janz, Golden, Hansen and Mahoney 1992; Armstrong, McManus, Welshman and Kirby 1996), direct observation techniques (Baranowski, Hooks, Tsong, Cieslik and Nader 1987; Sleep and Warburton 1992) and self-report measures (Craig et al. 1996; Simons-Morton et al. 1997). In the studies using heart rate monitors, the percentage of children defined as being physically active varied from 7% to 39%. The studies using

direct observation techniques found differences in interpretation of data. Baranowski et al. (1987) reported that only 8%-13% of children were active for 20 minutes but 58%-63% were considered active when less stringent methods were used to interpret the data. These discrepancies may suggest that children are more likely to perform intermittent activity.

In the self reporting studies it was found that the mean minutes of activity per day ranged from 72-97 minutes per day (Craig et al. 1996; Simons-Morton et al. 1997). The activity levels from these studies are higher than those reported with other instruments and thus we might assume that there is usually overestimation of activity using self report instruments. Welk, Corbin and Dale (2000) conclude that there is no single way of obtaining a highly accurate account of physical activity or energy expenditure in children.

According to Kriska and Caspersen (1997), as well as Sallis (1991), various epidemiological studies have utilised a self report physical activity questionnaire to assess participation in physical activities in populations. Depending on the scope of the instrument, they can provide very detailed or very general information about physical activity. Objective measures such as energy expenditure and physical fitness measures are used to validate the subjective activity measures.

**TABLE 2.3 RESULTS OF SELECTED STUDIES CHARACTERIZING
ACTIVITY LEVELS IN CHILDREN**

Authors	Learners	Methods	Results
Armstrong et al. (1990)	270 children aged 11-16 years	continuous heart rate monitoring for 12 hours	<ul style="list-style-type: none"> 12% girls and 23% boys with HR>139 for 20 minutes
Armstrong & Bray (1991)	132 children aged 10-11 years	continuous heart rate monitoring for 12 hours	<ul style="list-style-type: none"> 34% girls and 39% boys with HR > 139 for 20 minutes
Janz et al. (1992)	152 children aged 6-17 years	continuous heart rate monitoring for 8-11 hours	<ul style="list-style-type: none"> 7% of children with HR >60% of age predicted max. for 20 minutes
Armstrong et al. (1996)	129 children aged 10-11 years	continuous heart rate monitoring for 12 hours/day over 3 days	<ul style="list-style-type: none"> 37% girls and 40% boys with HR>139 for 20 minutes
Baranowski et al. (1987)	24 children ages 8 -12 years	direct observation for 2 days	8-13% of children active for 20 minutes
Sleap and Warburton (1992)	56 children	direct observation for 2 days	14% of children active for 20 minutes

A physical activity questionnaire is the preferred instrument for most population studies because of its practicality, applicability and accuracy (Kriska and Caspersen 1997). The estimates obtained in an activity questionnaire are valuable in relative terms and can be used to rank individuals within a population from the least to the most active. The ranking can then be examined with regard to physiological parameters and disease outcomes (Kriska and Bennet 1992).

Instruments that have been utilised in population studies include the KIHD 24-hour Total Physical Activity Record (Kriska and Caspersen 1997); Godin Leisure-Time Exercise Questionnaire (Godin and Shepherd 1985); and Seven-Day Physical Activity Recall (Sallis, Haskell, Wood, Fortmann, Rogers, Blair and Paffenbarger 1985). The KIHD 24-hour questionnaire assesses both leisure and occupational activities over a 24-hour recall period. It is also a self-administered questionnaire. This will assist in ensuring that there is adequate monitoring of each individual's daily activities on a daily basis. This questionnaire had also been tested for reliability in adults. The limitation of this instrument is that it does not assess the intensity levels. The Seven-Day Physical Activity Recall also measures leisure and occupational activities over a seven-day recall period but it is time consuming, as an interview is required. The Godin Leisure-Time Exercise Questionnaire is limited as it only assesses leisure-time activities. It is however, an instrument that has been used to determine leisure activity levels in children and can be used to determine frequency and intensity.

2.11 THE ASSOCIATION BETWEEN PHYSICAL ACTIVITY AND PHYSICAL FITNESS

Today there is a growing emphasis on looking good, feeling good and longevity. Scientific evidence tells us that one of the keys to achieving these ideals is fitness and exercise. The new approach to physical fitness is less about exercising and more about increasing physical activity. The 1990s brought a historic new perspective to exercise, fitness, and physical activity by shifting the

focus from intensive vigorous exercise to a broader range of health-enhancing physical activities. According to Caspersen et al. (1985), physical fitness is defined as a set of attributes that allow the body to respond or adapt to the demands of stress or physical activity. Howley and Franks (1997) described physical fitness as a state of well-being with low risk of premature health problems and energy to participate in a variety of physical activities. Physical fitness consists of multiple components, it is primarily determined by physical activity habits and it is important throughout life to develop and maintain functional ability.

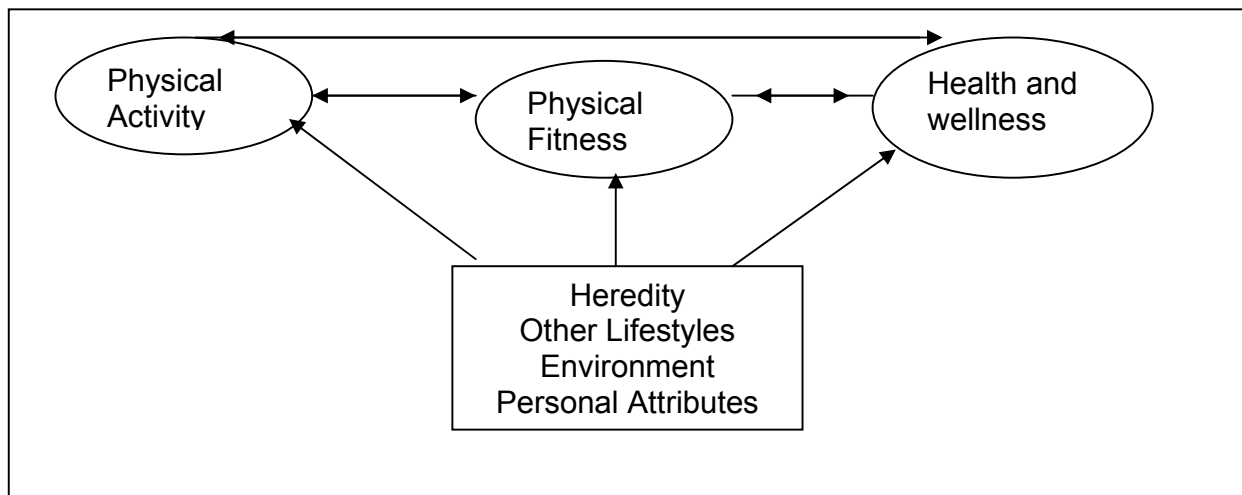
Physical activity has been identified as any movement of the body produced by skeletal muscles and resulting in energy expenditure (Bouchard et al. 1990). The first International Consensus statement on physical activity, fitness and health suggested that physical activity is an umbrella term that had multiple dimensions. Forms of physical activity such as exercise, sport, leisure activities and dance are considered sub-categories of physical activity. Bouchard et al. (1990) defined exercise as a leisure-time physical activity conducted with the intention of developing physical fitness. The authors also defined leisure activity as a physical activity undertaken during discretionary time.

The general model underlying most current research on the relationships among physical activity, physical fitness and health is that physical fitness is one of the mediators of physical activity's effects on health outcomes (Bouchard et al.

1990). According to the studies conducted by Baranowski et al. (1992) and Saris (1986), it was concluded that both increased physical activity and physical fitness are associated with improved health indexes.

The following model (Figure 2.4) was adapted from Bouchard et al. (1990) and it describes the relationship between physical fitness, physical activity and health and wellness. It also recognises that other factors such as lifestyle, environment and personal attributes affects physical fitness, physical activity and health.

FIGURE 2.4 COMPLEX RELATIONSHIPS AMONG PHYSICAL ACTIVITY, PHYSICAL FITNESS, HEALTH, WELLNESS AND OTHER FACTORS



(ADAPTED FROM BOUCHARD ET AL. 1990)

Physical fitness is divided into motor fitness (muscular power and agility), which is largely genetically determined, and health-related physical fitness, which is

associated with important health outcomes and can be modified through physical activity and exercise. Caspersen et al. (1985) stated that the most accepted components of health-related physical fitness include cardiovascular endurance, body composition, muscular strength/endurance and flexibility.

In a study conducted by Sallis, McKenzie and Alcaraz (1993b), levels of physical activity were found to be related to multiple components of health-related physical fitness. Riddoch (1990) concluded from the Northern Ireland Fitness Survey of children aged 11- 18 years that in stature, body composition and physical fitness they match their peers in other western industrialised countries. However, the survey also showed a significant number of these children may be at considerable risk of future ill health during adult life since they display a number of adverse lifestyle behavioural traits.

2.12 SUMMARY

From the literature reviewed it can be seen that physical inactivity is a public health problem worldwide. Physical inactivity has been identified by the WHO as one of the major risk factors for chronic diseases of lifestyle. It has also been shown that if reversed it could be associated with a variety of health outcomes. If d effective intervention programmes are not put in place to decrease the escalating levels of physical inactivity, a worldwide problem will be experienced, which will have far-reaching social, economic and health effects. The WHO has identified a method of monitoring risk factors for chronic diseases of lifestyle. This

information would assist in identifying appropriate interventions for various population groups. It has become clear that there is no single intervention with greater potential than physical activity to reduce the risk of chronic diseases.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

This chapter explores the method utilised in the study. A broad description of the research setting is provided as well as the study population and sampling methods used. In addition, both the study design and methods of data collection and methods of data analysis are described. Finally, the issues of ethical considerations regarding the study are also reported.

3.2 RESEARCH SETTING

The study was conducted in the Belhar community. Belhar is a community in the Western Cape within the Tygerberg substructure in Cape Town. Stellenbosch Arterial Road flanks Belhar on the east side, the R300 motorway on the northern boundary, and Modderdam Road on the southern boundary. Flanking the Belhar community on the west side are the railway tracks, on which the train runs from Bellville to Cape Town. Belhar consists of four 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 (52.4% are female; 47.6% are male) of which 6 181 (13.3%) fall into the category of ages 10 - 18 years (Republic of South Africa Census, 2001). The predominant population group in Belhar in 2001 was Coloured (94%), with smaller numbers of people from the Black (4%), Indian/Asian (1.5%) and White (0.5%) population groups.

The coloured population group is a population of mixed ancestry i.e. Afro-Euro-Malay-Khoisan ancestry (Temple, Steyn, Hoffman, Levitt and Lombard 2001).

Situated within this community are two community health centres. Services rendered by the community health centres include promotive, preventive, curative and rehabilitative services. At the centres, health conditions treated range from maternal and childcare to management of chronic diseases of lifestyle such as stroke and diabetes. Belhar also has two libraries at which community-based projects are operated. These projects include home-based educare, after-school care and youth development projects. In addition, there are three community halls, three sports fields, as well as four high schools and nine primary schools. On the outskirts of Belhar, near to the western boundary, an Olympic size indoor sports complex was built prior to the bid for the 2004 Olympics. Community structures within Belhar include the Belhar Sports Board, the Belhar Health Forum that meets every second Tuesday of the month, the Neighbourhood Watch, as well as the Belhar Youth Forum. The Civic Association has been one of the most long-standing organisations and has been the voice of the community. A Police Forum was also established, its main focus being to address the safety and security of the community. Lack of recreational facilities in the area force children to join gangs, and their boredom motivates the development of destructive health risk behaviours such as alcohol and drug abuse.

The community includes people ranging from low to high socio-economic groups. According to the 2001 Census of South Africa, the unemployment rate within this community among persons aged 15 - 65 years was 10%. Those classified as economically inactive form 26% of the population. Almost 44% of the residents had at least secondary education, i.e. they had completed high school (grades 8 - 12). The most common monthly income for families in the Belhar community ranged between R1000 and R2999 (22%). However, the income per family ranged from R1 – R30 000 per month. A study by Groenewald, Bradshaw, Nojilana, Bourne, Nixon, Mahomed and Daniels (2003), revealed that the top five causes for death for persons in this community was ischaemic heart disease (11%), homicide (8%), diabetes mellitus (7%), stroke (6.6%), and hypertensive heart disease (6%). Thus it can be said that non-communicable diseases accounted for approximately 30% of deaths in the Belhar community.

3.3 STUDY POPULATION AND STUDY SAMPLE

The whole study was divided into four parts involving qualitative and quantitative research procedures. The study population for both the qualitative and quantitative studies was made up of the four high schools in the community.

Parts 1 – 3 of the study constituted the quantitative component of the study, and part 4 formed the qualitative component of the study. Part 1 focused on the socio-demographic data of the learners while part 2 dealt with their health-related fitness. Part 3 allowed the learners to record their daily habitual physical activity

over a 24-hour period for seven days. Part 4 comprised the reflections of the learners regarding barriers and benefits to physical activity.

3.3.1 Study sample for the quantitative studies

It was estimated that there were approximately 3500 learners in the four high schools at the time of the study. However, only two high schools agreed to take part in the study and the total student population was 2343 students. This represented approximately 38% of the 13 - 18 year age group in the Belhar community. School A had a total of 1432 learners, made up of 784 males and 648 females. School B had a population of 911 learners (507 were males and 404 were females). Of these 2343 students, 1291 were males and 1052 were females. 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 conducted and were therefore excluded from the study. The total number of students excluded was 300 high school learners (197 from School A and 103 from School B). The study population thus consisted of 2043 high school learners. In order to prevent the disruption of the learners' schedule, the teachers determined the availability of learners to participate in the study. Thus the study sample was a conveniently selected stratified sample of 1250 learners to ensure that learners of all age groups were represented. However, 95 learners did not want to participate and thus for parts 1 and 2 the study sample finally consisted of 1055 high school learners (84% response rate). Of the 1055 high school learners 527 were male and 528 were female. For part 3 the study,

the sample consisted of 951 learners as not all the learners completed the 24 - hour recall over the seven days.

3.3.2 Study sample for the qualitative study

A purposively selected stratified sub sample of 180 male and female adolescents aged 13-18 years was selected to participate in this component of the study. The final sample consisted of a total of 177 learners of which 91 were females and 86 were males. The sample consisted of adolescents from grades 8 - 11.

3.4 STUDY DESIGN

Both quantitative and qualitative designs were utilised in this study. Neuman (2000) indicated that the between methods triangulation adopted in a study would make study findings more informative and comprehensive. Thus in this study, besides quantitative assessments of physical inactivity, the learners' narratives were obtained using focus groups discussions. Quantitative assessments using self-administered questionnaires as well as objective measures were used to present the learners' true reflection of their physical activity levels and fitness levels. The qualitative information provided in-depth information about the reasons for their current physical activity and fitness levels. A qualitative approach was adopted in order to access meaning and understandings of the adolescents informally. According to Hennink and Diamond (1999), focus groups are a tool for collecting qualitative data from group discussions. When conducting the focus group discussions, 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. Qualitative researchers are interested in answering those "why" questions and pay greater attention to understanding the human way of thinking. Sample sizes are not of a big concern, the researchers would rather seek "information rich sample" (Burns 2000).

3.5 METHODS OF DATA COLLECTION

3.5.1 Quantitative studies: Parts 1, 2 and 3

For part 1 of the study, which sought to obtain socio-bio-demographic data of the learners, a self-administered questionnaire was utilised (Appendix 1). This instrument consisted of 17 items seeking information on demographic characteristics (e.g. age, gender and grade), as well as the socio-economic status of the respondents' parents (level of education, occupation and income) and also health-related behaviours (smoking and drinking).

Part 2 of the study sought to obtain data on health-related fitness of the learners. A data capture sheet based on the one used by Riddoch, Savage, Murphy, Cran and Boreham (1991) was utilized (Appendix 2) as this was found to be a suitable method of recording the data collected. The variables measured included body composition (height, weight, and skin fold measurement), flexibility, muscular

strength and endurance, cardiovascular fitness and blood pressure measurements. The data collected were based on the Prudential Fitnessgram, and the tests included the PACER test (cardiovascular), sit-ups (abdominal strength), the Push-up Test (upper body), Sit and Reach test (flexibility) and Percentage Body Fat (% body fat) and BMI (body composition).

Part 3 of the study utilised a self-administered questionnaire (Appendix 3) designed to record the 24-hour daily activities of each individual over a seven-day period (Kriska and Caspersen, 1997). The instrument reflected a 24-hour recall time period and learners were required to record activities on a 30-minute basis. This was used to ensure adequate monitoring of each individual's activities on a daily basis. The time period that had been chosen ensured greater recall reliability and accuracy. The KIHD 24 - hour Physical Activity Record adapted to be used in this study is reported to be more reliable as it measures activities in a short period of recall (Baranowski, 1988). The daily physical activity report was divided into 13 activities, viz. sitting, sleeping, grooming, studying, walking for at least 15 minutes, gardening, household chores, etc. For analysis it was further classified into four categories as reported by the Surgeon General's Report (1996) and Jones, Ainsworth, Croft, Macera, Lloyd and Yusuf (1998). The four categories included sedentary activities, light intensity activities, moderate intensity activities and vigorous intensity activities.

3.5.2 Qualitative study

Focus group discussions were used to provide in-depth information regarding the respondents' attitude towards physical activity, the barriers towards physical activity as well as their perceptions as to how physical activity can be promoted.

3.6 PROCEDURE

Permission was obtained from the principals of the participating schools (Appendix 4). One week before the commencement of the study, all learners at the school who fell in the 13 - 18 year old age category was given letters that explained the purpose of the research. This allowed for parents and learners to give written consent (Appendix 5 and 6). Learners who participated in the study were selected by the teachers conveniently on the day of the study to prevent disruption of classes. Only learners who had consent in the selected classes were allowed to participate in the study. They were then sent to a classroom that had been identified as the designated venue where the research was to take place. At the designated venue, the researcher informed the learners about the study and they were given the opportunity to withdraw at this stage. The questionnaire for part 1 was explained to the learners and they were asked to complete the questionnaires with the researcher present to answer any queries.

Once the questionnaire for part 1 was completed, the learners were taken to a separate venue, which had been arranged in the form of various stations to do the fitness testing. The learners were advised on the purpose of the tests, the

procedures were explained and at this point learners were allowed to withdraw if they so desired. Trained research assistants were present at each station to do the relevant tests and they had clearly outlined procedures for each test (Appendix 7). Once all data had been collected, learners returned the questionnaire to the researcher or research assistants on the same day and then returned to their classes. Data collection for parts 1 and 2 lasted a week at each school and was done between 08:30 and 12:00. The data for part 3 were not collected in the same week as the data for parts 1 and 2 of the study. Here was a one-week interval after completion of the health-related fitness assessment before the instrument to collect 24-hour activity was distributed. Seven data collection sheets were stapled together and handed to the students so that they could complete daily information from the previous Sunday to the next Saturday. The researcher or research assistants collected data collection sheets from the schools on a daily basis.

3.7 OUTLINE OF DATA TO BE COLLECTED BASED ON W.H.O. STEPWISE FRAMEWORK

A pathway of the steps of the study is presented in Table 3.1. Information obtained was divided into basic risk factor information which was questionnaire based and added risk factor information which was an objective measurement. The data obtained was divided into core data and expanded data. The core data for the basic risk factor information included basic data such as age, gender, education grade and information about the participants. Expanded data in this

area included information about parents that would influence the data of the participants' e.g. parental education, occupation and income.

The core data for the added risk factor information included measurements that would indicate prevalence of obesity and hypertension among the respondents. The expanded data for this section included additional measurements such as skinfold and percentage body fat which would assist with more in-depth analysis.

TABLE 3.1 PATHWAY AND POPULATION SAMPLES OF THE STUDY

	Core	Expanded
Demography	Age (13-18 years)	Household income
	Gender	Parent occupation
	Education grade	Parent education
Tobacco	% of current smokers	
Alcohol	% of current drinkers	
Physical inactivity*	% sedentary	% active
Obesity	Height	Skinfold
	Weight	% body fat
	Waist circumferences	
Blood pressure	Mean levels of systolic and diastolic BP	
Fitness testing	Muscle endurance	
	Muscle strength	
	Flexibility	
	Cardiovascular fitness	

* Physical inactivity was measured separately and the sample size was N =951

3.8 PILOT STUDY

A pilot study was conducted to pre-test the questionnaire for part 1 of the study, thus determining the content validity of the questionnaire for possible changes before it was administered. The pilot study was conducted on 15 learners who were not included in the main study. Changes were made to the questionnaire to questions that were not clear. The pilot study was done to determine the time it would take to complete part 1 of the questionnaire. In addition the pilot study was used to facilitate the fitness testing procedures and to ensure that all research assistants understood the procedure sheets at all stations. It was found that at least three measurements needed to be taken to avoid measurement error of the researcher, and the average of the three readings would be used. This allowed for test-retest reliability.

The pilot study also determined that students had initially not understood what was expected of the 24-hour recall, but after demonstration and inclusion of a copy of a completed data capture sheet the learners found it easier to complete part 3 of the data capture sheet.

3.9 RELIABILITY AND VALIDITY OF THE STUDY

Reliability and validity are fundamental concerns in all measurements. Reliability refers to dependability or consistency of measurements (Redfern and Norman 1994). As both quantitative and qualitative methods were used simultaneously, the results were more reliable than if one method was used. Although the two

methods operate from entirely two different poles, related areas can be identified. Integrating the two methods is called triangulation of the methods. This approach reduces the possibility of bias and produces results that are more reliable with complementary strengths (Rees and Bath 2001).

3.9.1 Qualitative reliability and validity

Under the umbrella of reliability and validity for qualitative designs terms such as dependability, credibility, fittingness/transferability and confirmability replace the terms reliability and validity (Robson 1985). These terms form part of the process of establishing trustworthiness. Dependability means that another researcher can clearly follow the decision trail used and arrive at the same conclusions. In this study the researcher attempted to make both the data collection procedure as well as the analysis procedure as simple as possible to follow. Credibility is achieved when descriptions or interpretations of human experience are so faithful to the experience that people can immediately identify with it. This was attempted in the current study by presenting the themes identified and substantiating them with quotes from the people that best represent those themes. In addition, two study designs are used in the data collection method to confirm findings (triangulation). Field notes were kept throughout the research process. Fittingness/transferability refers to the fact that findings are able to fit contexts outside this specific study. The transferability of the data was improved by providing a dense description of the background of the subjects. The description of the exact methods of data collection, analysis and interpretation contributed to

the credibility of the study. A colleague who was not involved in any other aspects of the study read through three transcripts and identified categories. It was then discussed and compared to the researcher's category system (confirmability).

Reflexivity refers to the conscious examination of the position of the researcher within the research. It is recognised that the background of the researcher will affect the research relationship and the nature of the data collected. The researchers' interest in the area and in the community influenced the willingness of the learners to give their opinion. Many young people reflected: "We are glad someone is interested in what we have to say."

3.10 METHODS OF DATA ANALYSIS

Quantitative and qualitative data were analysed separately. Qualitative data were used to complement the quantitative data and these data presented a deeper meaning to findings of the quantitative part of the study.

3.10.1 Quantitative analysis

Demographic data and data regarding smoking, drinking and participation in any form of activity at school or at home were initially coded and entered into the Excel program. The Statistical Package for Social Sciences (SPSS) version 10.0 was used to analyse the data. In analysing the quantitative results, descriptive statistics were conducted to obtain a profile of the study population. Demographic

characteristics and health-related behaviours were presented using frequency tables.

Inferential statistics in the form of cross-tabulations using chi-square was done to determine the associations between various variables. The descriptive data reported were presented in table form and the inferential statistics were reported as (chi-square, df and p values). ANOVA tables as well as Pearson's correlations were used to calculate the strength of the relationship between variables such as age, gender, and sum of the skin folds, percentage body fat and waist and hip ratio.

3.10.2 Qualitative analysis

The qualitative data were analysed using a process of writing a line-by-line index of the transcribed focus group discussions, summarising these by words or phrases and creating a visual image of the themes that arose during the focus group discussions. Once the thematic analysis of the data had been completed, the data were discussed with some of the learners as well as with researchers in the field. This was to ensure plausibility and authenticity. Authenticity pertains to the reliability and trustworthiness of the research process (Carpenter and Hammell 2000). In order to gain deeper understanding of the results, quantitative data was supplemented by qualitative data in the discussion chapter. This was done to qualify the process of between methods triangulation.

3.11 ETHICAL CONSIDERATIONS

The respondents could not be identified by name in any way but were given a reference number as the questionnaire was coded for reference purposes only. There was no obvious risk involved in participating in the study. The respondents were allowed to withdraw at any stage of the study. The goal of the research was clearly stated in letters to the principal (Appendix 2), parents (Appendix 3), the learner (Appendix 4) and the Western Cape Department of Education. Permission to conduct the study was obtained from the University of the Western Cape, Western Cape Education Department (Appendix 6) and the principals of the participating schools. Letters of consent were sent to parents of the learners in order to obtain written informed consent for both the quantitative and qualitative part of the study.

CHAPTER FOUR

PHYSICAL ACTIVITY LEVELS IN HIGH SCHOOL LEARNERS

4.1 INTRODUCTION:

One of the aims of the study was to establish the habitual physical activity patterns of high school learners in Belhar over seven consecutive days. The health benefits of a physically active lifestyle for adults are well documented. According to the American Heart Association (1992) and Powell, Thompson, Caspersen and Kendrick (1987) there is strong epidemiological evidence demonstrating a relationship between a sedentary lifestyle and the risks of cardiovascular diseases. Lack of physical activity has also been shown to contribute to a range of other health conditions such as stroke, cancer, non-insulin dependent diabetes and osteoporosis (Kiely, Wolf, Cupples, Beiser and Kannel 1994; Helmrich et al. 1991). This has prompted several government and scientific organisations to develop physical activity guidelines. However, there is concern among experts (CDC 1997; Corbin and Pangrazi 1998) that schools have eliminated recess and physical education programmes because of economic factors or to gain more time for academic learning. Not providing adequate activity during the school day is counter to the scientific guidelines and can result in low levels of fitness, increased risk of obesity and low levels of activity later in life. Physical activity levels among young people have raised cause for concern. In America the 1995 school-based youth-risk-behaviour study

indicated a 10.4% prevalence of inactivity among young people (CDC 1996). In Australia the Active Australia survey found that during the year 2000, 15% all Australians were inactive and among the young people 10% were inactive (Bauman and Campbell 2001).

For children and young people, there was less evidence of the benefits and desirable amount and type of physical activity. In 1997 the Health Education Authority of England initiated a process of expert consultation and review of the evidence surrounding the promotion of health-enhancing physical activity among young people with the aim of producing a policy framework and recommendations (Biddle et al. 1998). The outcome of the Health Education Authority's review process was a set of recommendations for young people aged 5-18 years. The primary recommendation was that all young people should participate in physical activity of moderate intensity for one hour per day. Alternatively, if someone currently did little activity, he/she should participate in physical activity of at least moderate intensity for at least 30 minutes per day.

Similarly, the American College of Sports Medicine (ACSM) in 1990 recommended that adults should be involved in vigorous exercise 3-5 days/week for at least 20 minutes per session (US Department of Health 1996). In addition, the CDC (1996) and ACSM (1995) established health-related guidelines that stated all adults should accumulate at least 30 minutes or more moderate intensity activity on most or all days of the week. The Scottish Intercollegiate

Guidelines Network (2003) stated that children should be involved in 60 minutes of moderate physical activity each day. If the young people were currently not active, they should strive for at least half an hour of moderate intensity activity per day (three and a half hours per week). Sallis et al. (1994) also recommended that adolescents should be involved in moderate to vigorous physical activity for 30 - 60 minutes daily. For this study 30 or more minutes of moderate to vigorous activity on seven days of the week was accepted as being physically active (3.5 hours per week).

Self-report measures remain the most commonly used method of assessing physical activity on epidemiological studies. This section is purely based on self-reported activity. The effect of inadequate recall was limited by having the learners recall for 24hours daily for seven days.

4.2 METHODOLOGY

A total of 1055 learners had the opportunity to take part in recording their 24-hour daily activities. However, only 951 learners between the ages of 13 and 18 years completed the activity recall capture sheet. A data capture sheet was designed to record the 24-hour daily activities of each individual over a 24-hour period. The instrument designed was adapted from a variety of instruments summarised in Kriska and Caspersen (1997). The instrument reflected a 24-hour recall time period and learners were required to record activities on a 30-minute basis over a seven-day period.

Habitual physical activities were subdivided into 12 categories, which included activities such as sleeping, grooming, commuting, gardening, household chores and studying. The habitual physical activities included in the study were based on the outcome of an earlier study carried out in the Belhar community among the residents including primary school children, high school children, adults and the elderly (Amosun, Frantz, Phillips and Louw, 2001). These activities were further grouped into four categories, namely sedentary activities, light activities, moderate activities and vigorous activities. Sedentary activities included sleeping, sitting, grooming, commuting and study-related tasks. Light activities included household chores, walking for at least 5 minutes and activities classified as “other”, which were classified by the researcher into light activities based on the type of activities. Moderate activities included activities such as household chores (gardening and vacuuming that involved pushing and shoving), dancing and aerobic activities, whereas vigorous activities included sporting activities and resistance training. To be classified as physically active, the participant needed to be involved in moderate to vigorous activity for 30 minutes per day or more for at least seven days per week. Thus a minimum of 3.5 hours per week of moderate to vigorous activity could be classified as being active.

4.3 DATA ANALYSIS

The data were interpreted according to mean time spent on moderate/vigorous activity according to gender, and mean time spent on moderate/vigorous activity according to age.

Learners were then further classified according to their activity levels where group 1 were learners who were active for less than 30 minutes per day on at least five days of the week or not active at all (inactive), and group 2 were learners who were active for more than 30 minutes per day on at least seven days of the week (active). Gender and age distinctions were also made. This classification identifies learners who achieved the recommended levels of physical activity of an average of 30 minutes per day of moderate intensity activity on seven days of the week.

The data were further interpreted according to the number of learners participating in moderate/vigorous activity for at least 30 minutes per day over the seven day period, and the number of learners participating in moderate/vigorous activity for at least 30 minutes per day over the seven day period according to gender.

4.4 RESULTS

The 951 respondents in the study consisted of 477 males and 474 females. The mean age for this group of learners was 15.2 years, ranging from 13-18 years. Table 4.1 summarises the activities highlighted by the learners for the various activity categories. The mean values in terms of hours spent participating in the various activities for the week are presented in Table 4.2. A total of 168 hours over seven consecutive days was calculated. The respondents (n=951) spent an average of 147.6 hours (sd=6.6), i.e. 87.9% of the week, in sedentary activities.

In addition 8% of the week was spent on light activities, about 2% in moderate activities and about 2.5% in vigorous activities (Table 4.2). Information regarding participation of the learners according to age and gender is represented in Tables 4.3, 4.4 and 4.5.

TABLE 4.1 SUMMARY OF ACTIVITIES

Level of activity	Activities
Sedentary activities	sleeping, grooming, dressing, travelling, studying, watching television, playing computer games.
Light activities	making the bed, doing the washing, walking to the shop for at least five minutes
Moderate activities	gardening, vacuuming, doing aerobic activities, dancing
Vigorous activities	swimming, playing rugby, playing soccer

TABLE 4.2 TOTAL NUMBER OF HOURS PER WEEK OF ACTIVITIES FOR ALL LEARNERS

Level of activity	N	Mean(SD)	Min.	Max.
Sedentary	951	148.1(6.0)	114.5	161.5
Light	951	13.6(4.6)	3.0	35.5
Moderate	951	2.6 (2.4)	0.0	22.5
Vigorous	951	3.7 (2.6)	0.0	22.5

TABLE 4.3 TOTAL NUMBER OF HOURS PER ACTIVITY/WEEK BY AGE

Level of activity	Age years	N	Mean(SD)	Min.	Max.	95% CI	
						Lower	Upper
Sedentary	13	128	147.3(5.6)	128.5	160.5	146.4	148.3
	14	262	148.1(6.0)	129.0	161.5	147.5	148.9
	15	193	146.7(6.5)	116.5	161.0	146.3	148.0
	16	162	147.6(7.3)	124.5	160.5	146.9	148.9
	17	119	148.6(6.3)	132.0	161.0	147.9	150.0
	18	87	149.0(5.6)	130.0	161.0	147.7	150.5
Light	13	128	14.2(4.5)	3.0	27.5	13.5	15.0
	14	262	13.1(4.5)	4.0	26.5	12.6	13.7
	15	193	13.3(4.4)	4.0	29.0	12.9	14.2
	16	162	14.1(5.5)	4.0	35.5	13.4	15.0
	17	119	13.5(4.6)	5.0	34.0	12.7	14.4
	18	87	12.7(3.9)	3.0	23.0	13.3	14.0
Moderate	13	128	2.8(2.5)	0.0	16.5	2.4	3.2
	14	262	2.6(2.7)	0.0	15.0	2.3	2.8
	15	193	2.9(3.1)	0.0	20.5	2.6	3.3
	16	162	2.3(2.8)	0.0	16.0	1.9	2.7
	17	119	2.1(2.8)	0.0	13.0	1.7	2.5
	18	87	2.3(3.2)	0.0	15.0	1.8	2.8
Vigorous	13	128	3.6(2.6)	0.0	11.0	3.1	4.0
	14	262	3.9(2.7)	0.0	12.5	3.6	4.3
	15	193	4.3(3.1)	0.0	22.0	3.9	4.6
	16	162	3.5(2.9)	0.0	18.5	3.1	3.9
	17	119	3.4(2.3)	0.0	14.5	2.9	3.9
	18	87	3.3(2.9)	0.0	19.0	2.6	3.6

Using the Pearson correlation the total number of hours spent on sedentary activities increased with age ($p < 0.05$). However, the total number of hours spent in moderate and vigorous physical activities respectively decreased with age ($p < 0.01$ and $p < 0.05$).

TABLE 4.4 TOTAL NUMBERS OF HOURS PER ACTIVITY/WEEK BY GENDER

Level of activity	Gender	N	Mean(SD)	Min.	Max.
Male					
Sedentary		477	147.9(6.0)	116.5	161.5
Light		477	13.4(4.6)	3.0	35.5
Moderate		477	2.7(2.5)	0.0	20.5
Vigorous		477	3.9(2.6)	0.0	22.0
Female					
Sedentary		474	148.2(5.9)	127.6	161.5
Light		474	13.9(4.6)	3.0	34.0
Moderate		474	2.4(2.3)	0.0	16.5
Vigorous		474	3.5(2.5)	0.0	19.0

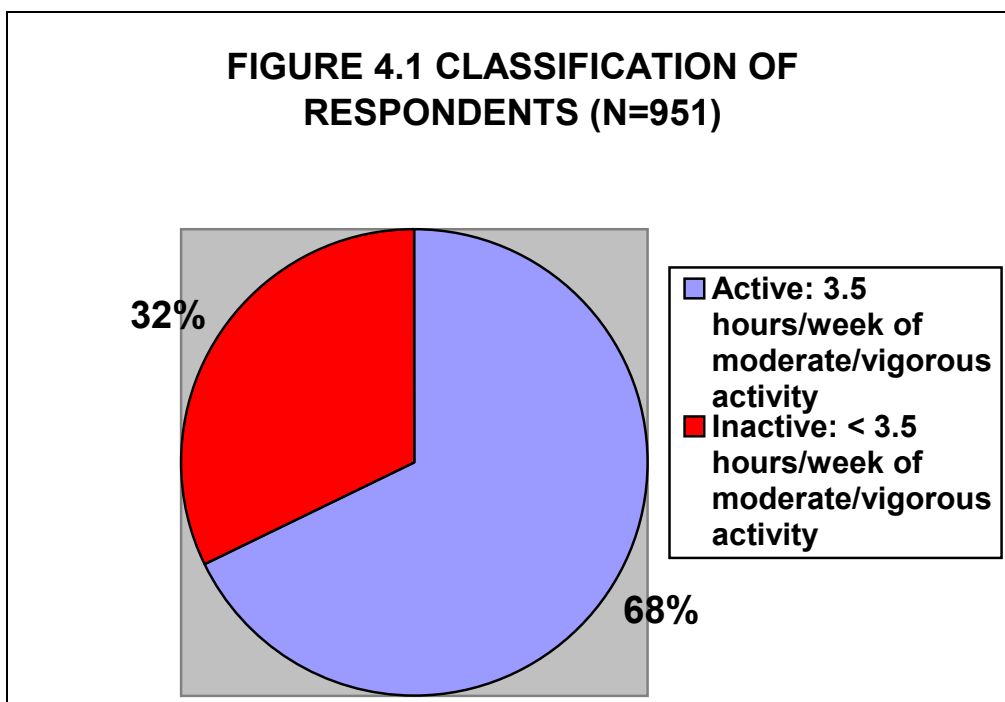
Using the student t-test it was found that there was no statistical significance between gender and the average time spent in sedentary activities ($p=0.5$).

TABLE 4.5 MEAN NUMBERS OF HOURS PER ACTIVITY PER WEEK BY AGE AND GENDER

Level of activity	Age	N	Male	Female
			Mean (SD)	Mean (SD)
Sedentary	13	128	147.3(4.6)	147.4(6.1)
	14	262	147.9(5.6)	148.6(6.1)
	15	193	147.8(6.5)	147.2(5.3)
	16	162	147.4(7.1)	148.5(6.6)
	17	119	149.2(6.2)	148.7(5.6)
	18	87	148.6(5.4)	150.6(4.4)
Light	13	128	14.1(4.2)	14.4(4.8)
	14	262	12.9(4.5)	13.4(4.6)
	15	193	12.7(4.3)	14.5(4.2)
	16	162	14.4(5.7)	14.1(5.2)
	17	119	13.0(4.4)	14.2(4.9)
	18	87	13.8(4.0)	12.3(3.8)
Moderate	13	128	2.7(2.4)	2.8(2.4)
	14	262	2.9(2.4)	2.3(2.2)
	15	193	3.1(2.7)	2.8(2.4)
	16	162	2.3(2.5)	2.3(2.4)
	17	119	2.1(2.3)	2.1(2.2)
	18	87	2.7(2.5)	1.7(1.8)
Vigorous	13	128	3.9(2.4)	3.4(2.6)
	14	262	4.3(2.6)	3.6(2.6)
	15	193	4.4(2.7)	4.0(2.5)
	16	162	3.9(2.6)	3.0(2.4)
	17	119	3.7(2.9)	3.0(2.4)
	18	87	3.4(2.7)	3.0(2.7)

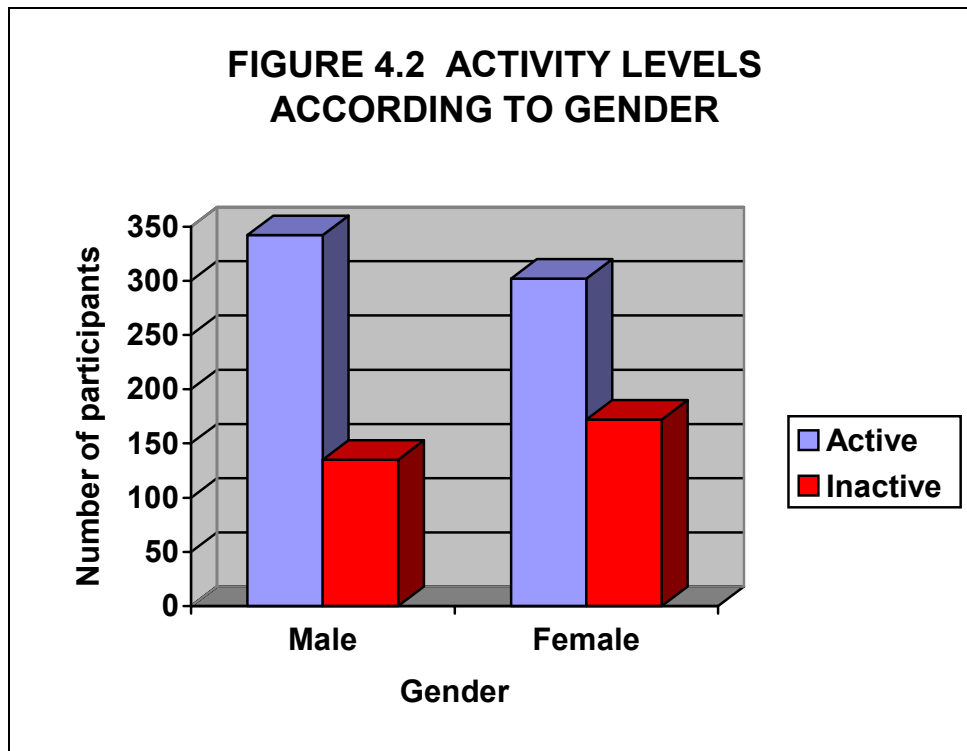
The range for the proportion of time spent in sedentary activities during the 7-day recall for males was 86.6% to 88.8% and for females was 87.7% to 89.6%. The time spent in light activities for males ranged from 7.6% to 8.4% and for females ranged from 7.3% to 8.6%. In addition, the time spent in moderate and vigorous physical activities ranged from 1.25% to 1.8% and from 2.0% to 2.6% for males respectively and from 1.0% to 1.7% and 1.8% to 2.4% for females respectively.

In Figure 4.1 respondents are classified into “active” or “inactive” according to the recommendation of the WHO which requires participation in moderate to vigorous physical activity for 3.5 hrs/week to be classified as active. At least 648 (68.1%) of the respondents participated in moderate to vigorous physical activity for 30 or more minutes per day on at least 5 - 7 days of the week. Thirty-two percent of the respondents were classified as inactive based on the fact that they did not meet the criteria of being active for at least 3.5 hours in moderate to vigorous activities over a seven-day period and thus spent more of their time in more sedentary and light activities.



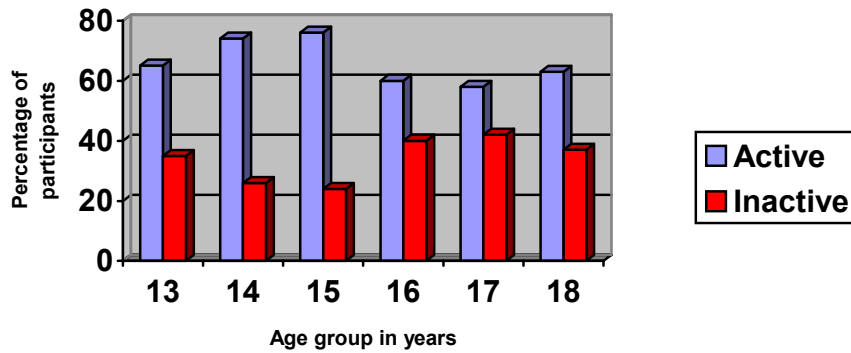
Figures 4.2 and 4.3 reflect the number of respondents that meet the requirements of 3.5 hours of moderate to vigorous activity per week based on

gender and age respectively. Of the 951 respondents 28% of the males were classified as inactive and 36% of the females were classified as inactive (Figure 4.2).



There is a significant association ($p < 0.05$) between gender and classification of physically active learners and physically inactive learners. In addition, within age groups respondents tended to become physically inactive as they got older, with 34% being physically inactive at the age of 13 years and almost 42% being physically inactive at the age of 17 years (Figure 4.3). There was also a significant difference ($p < 0.01$) in the proportion of participants in physical activity at the different age groups.

**FIGURE 4.3 ACTIVITY LEVELS
ACCORDING TO AGE**



**Figure 4.4 Trends of activity levels according
to gender as age increases**

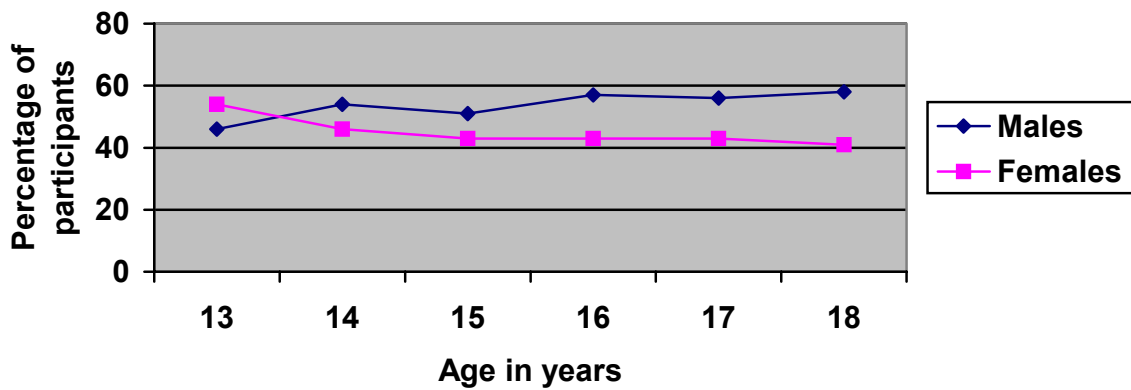
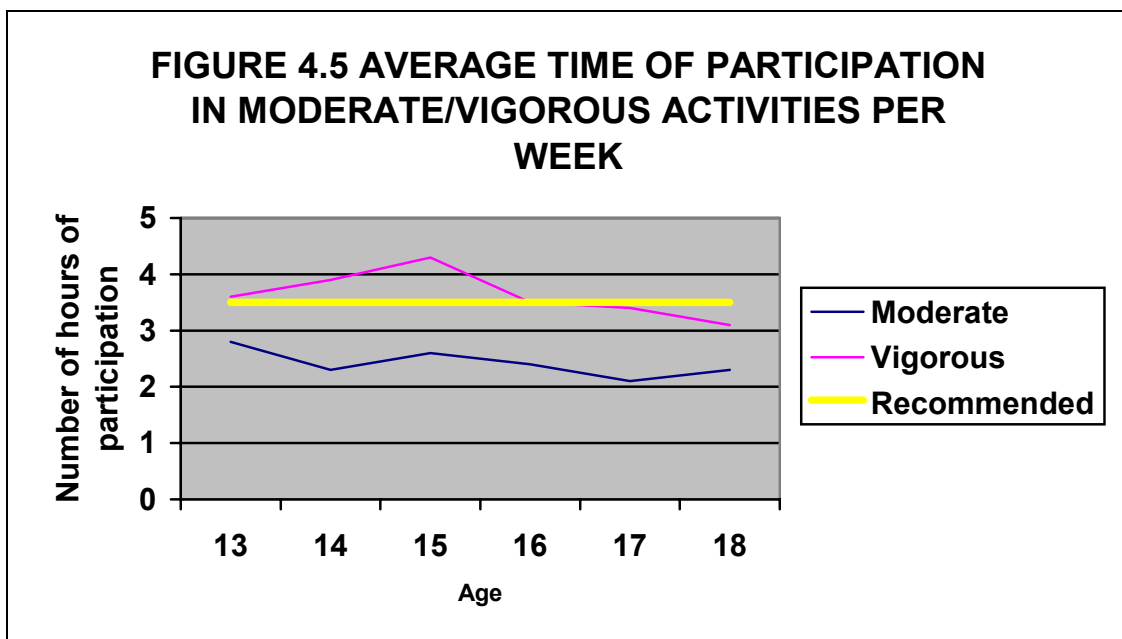


Figure 4.4 illustrates the trend in male and female participation in physical activity as their age increases. It appears that participation levels tend to plateau from the age of 15 to 18 with no real increase or decrease in physical activity participation.

Figure 4.5 illustrates the average number of hours that learners participated in moderate and vigorous activity for the week in relation to the recommended level of 30 minutes of moderate to vigorous activity per day for seven days of the week. It is clear that as the age increased, the number of hours of participation in physical activity decreased.



4.5 DISCUSSION

Physical inactivity is a major risk factor for developing coronary artery disease. It also contributes to other risk factors, including obesity, high blood pressure and

diabetes (American Heart Association 2001). The current study revealed that among the learners 88% of the week was spent in sedentary activities with only 4% of the week spent in moderate to vigorous activities. In hours this accounted for an average of three hours per week spent on moderate activities and an average of four hours per week spent on vigorous activities. However, when moderate and vigorous activities were combined, it was found that 32% of the learners did not meet the requirements of being physically active for at least 30 minutes per day on seven days of the week. This fact supports the concern raised by the Regional Adviser for Health Promotion at the WHO Regional Office for Africa who stated that in Africa “there is a clear and unmistakable tendency towards sedentary lifestyle among all age groups” (WHO 2002).

The study also reported that as the age of the children increased there was an increase time spent in sedentary activities and a decrease in the time spent in moderate to vigorous activities. In addition, there seems to be little difference in the proportion of time spent in all levels of activities between male and female learners. This is similar to the study by Riddoch and Boreham (1995), which suggested that a young child’s natural state of activity might gradually deteriorate during adolescence, as children are habituated into a sedentary lifestyle. They pointed out that young people spent much of their time indoors at school and at home (e.g. doing homework, watching television and playing computer games) and that this sedentary lifestyle may become the norm as they get older. Results from the current study were similar in indicating that sedentary activities, which

accounted for over 80% of the time included grooming, travelling by public or private transport, doing schoolwork, watching television and playing computer games.

Various studies have indicated that participation in physical activity is related to both age and gender. Studies conducted by Calfas and Taylor (1994), Pate et al. (1995), Sallis, Marilyn, Calfas, Caparosa and Nichols (1997) and Sallis, Alcaraz, McKenzie and Hovell (1999) reported that the total amount of time spent in physical activity declines with age and inactivity progressively increases with age for both men and women. Most cross-sectional studies reported that boys are more active than girls, especially in vigorous activity for all ages, and that activity participation decreases with age (Heath et al. 1994; Shephard, Jequier, Lavallee, La Barre and Rajic 1980; Caspersen, Pereira and Curran 2000). In the current study it was found that participation in physical activity tended to plateau from age 15 – 18 years for both males and females with no obvious decline in activity participation. The average daily activity levels for males were found to be four hours per week and for women three hours per week. Martin, Morrow, Jackson and Dunn (2000) reported that men usually reported greater levels of moderate and vigorous activity whereas women tended to report participation in light to moderate activities. Studies by Corbin, Pangrazi and Welk (1994) also supported the finding that males seemed to be more active than females. However, the study also indicated that learners were not consistent in maintaining physical activity on a daily basis.

With the mounting evidence indicating a significant increase in the chronic diseases of lifestyle, the need has arisen to identify risk factors or health behaviours that predispose the individual to this leading cause of mortality (WHR 2002). According to Bradshaw, Bourne, Schneider and Sayed (1995), habits such as smoking, consuming typically Western diets and following a sedentary lifestyle fuel the development of many of the risk factors, which accumulate through the lifespan and ultimately present with chronic diseases of lifestyle. With this background, the researcher progressed to assess further the profiles of the learners who were classified as physically active or physically inactive.

4.6 SUMMARY

This study attempted to establish the habitual physical activity patterns of high school learners in the Belhar community over seven consecutive days. The outcome revealed that over 80% of the time was spent in sedentary activities. Due to the seriousness of the possible consequences of physical inactivity, it is necessary to identify possible means of intervention that are appropriate for this study population. This requires having a deeper knowledge of the profile of the learners. The next chapter focuses on the socio-bio-demographic characteristics of the learners.

CHAPTER FIVE

HEALTH PROFILES OF PHYSICALLY ACTIVE AND INACTIVE LEARNERS

5.1 INTRODUCTION

The first aim of the second stage of this thesis is to identify the socio-demographic characteristics of the physically inactive learners in the Belhar community. The second aim is to obtain information on the engagement of the learners in two health risk behaviours, namely smoking and drinking. Literature indicates that a variety of factors influence adopting a physically active lifestyle. According to Kohl and Hobbs (1998), behavioural and attitudinal factors that may influence participation in physical activity include environmental, physiological, developmental, psychological, social and demographic factors. Studies on adolescent habitual activity patterns suggested socio-demographic differences influencing participation in physical activity (Vilhjalmsson and Thorlindsson, 1998). According to Moore, Lombardi, White, Campbell, Oliveria and Ellison (1991), the general socio-economic status of the family and parents significantly contributes to the physical activity behaviour of adolescents. Wold, Oygard and Eder (1994) in their study stated that the physical activity levels of parents and friends were greatly associated with the participation of adolescents in physical activity.

One of the factors that influence participation in physical activity is the health status of the learners. Rimmer (2000) noted that healthy people have been consistently more active than people with medical problems. A study by King, Blair, Bild, Dishman, Dubbert, Marcus, Oldridge, Paffenbarger, Powell and Yeager (1992) also found that individuals who tended towards overweight and obesity were less likely to be physically active. Gorden-Larsen et al. (2000) stated that environmental determinants are modifiable factors in the physical environment that impose a direct influence on the opportunity to engage in physical activity. According to Pate, Long and Heath (1994), physical safety of the surroundings and environment also influenced physical activity.

The main objective of this chapter is to document the socio-bio-demographic characteristics of the learners classified as active and inactive in order to identify possible factors that may influence physically inactive lifestyles. The associations between demographic factors, predisposing factors, enabling factors and physical activity are discussed.

5.2 METHODOLOGY

The study sample consisted of learners from grades 8 - 11. The socio-bio-demographic characteristics of the learners were assessed using an instrument adapted from the Canada Fitness Survey (Kriska and Caspersen, 1997). The variables that were examined included age, gender, grade at school, smoking cigarettes, drinking alcohol, parents' education, neighbourhood safety, family's socio-economic status (family income, parents' occupation and parents'

education) as well as learner and parent participation in physical activity. Socio-economic status was assessed by grading the family income (below R1000; R1001 - R3000; and more than R3000), parents' occupation (unemployed, unskilled labour, skilled labour), and parents' educational level (no education/primary education; secondary education and tertiary education). Socio-economic status was classified into three groups in order to determine low socio-economic class, middle socio-economic class and upper socio-economic class. A family income of less than R1000, parents with no education/primary education and being unemployed constituted a group of learners of low socio-economic status. A family income of R1001 – R3000, parents with secondary education and being employed constituted a middle socio-economic status. The high socio-economic status groups had a family income of more than R3000, parents with at least secondary education and parental occupation was classified as skilled labour.

5.3 DATA ANALYSIS

In analysing the results, descriptive statistics were utilised and frequencies regarding the socio-demographic characteristics were presented in the form of percentages. Inferential statistics in the form of cross-tabulations using chi-square were utilised to determine the degree of association between reported participation in physical activity and

1. age
2. indicators of socio-economic status

3. gender
4. smoking and drinking behaviour

Association between physical activity participation of the parents and physical participation of the learners was also determined. A logistic regression model of physical activity and inactivity was used to investigate interactions in relation to environmental and socio-demographic correlates.

5.4 RESULTS

A total of 1250 learners took part in the study. This included approximately 40% of the total number of learners at these schools, out of which 195 (15.6%) were excluded due to insufficient information being provided on the questionnaire. Demographic information (Table 5.1) of the completed questionnaire indicated 1055 respondents of which 527 were male and 528 female learners. The mean age of the learners was 15.1 years with a standard deviation of 1.5 (range = 13-18 years). Of the total number of learners, at least 20% participated in health risk behaviours that could become risk factors for chronic diseases of lifestyle.

Table 5.2 shows the distribution of socio-demographic and environmental factors of active and inactive learners. In comparison to active learners only 17% and 22.5% of the inactive respondents participated in some form of physical education (PE) and extramural (EM) activities respectively. Socio-economic status based on paternal education and family income did not differ significantly

between active and inactive learners. With regard to safety in the neighbourhood, 64% of the active learners considered their neighbourhood safe, whereas only 54% of the inactive learners considered their neighbourhood safe.

**TABLE 5.1 BIO-DEMOGRAPHIC CHARACTERISTICS OF ALL LEARNERS
(N=1055)**

	Variable	Frequency	%
Gender:	Male	527	50
	Female	528	50
Age:	13	149	14.2
	14	296	27.9
	15	215	20.4
	16	182	17.3
	17	126	11.7
	18	88	8.3
Grade:	8	442	41.9
	9	267	25.3
	10	121	11.5
	11	225	21.3
Family members:	2	16	1.5
	3	73	6.9
	4	282	26.7
	>4	684	64.8
Education: (mother)	no education	38	3.5
	primary education	172	16.3
	secondary education	715	67.8
	tertiary education	102	9.7
	no mother	28	2.7
Education: (father)	no education	39	3.6
	primary education	139	13.2
	secondary education	641	60.8
	tertiary education	131	12.4
	no father	105	10.0
Income:	< R1000	176	16.7
	R1000 – R2000	350	33.2
	R2001 – R3000	230	21.8
	> R3000	299	28.3

TABLE 5.2 ENVIRONMENTAL AND SOCIO-ECONOMIC PROFILE OF PHYSICALLY ACTIVE AND PHYSICALLY INACTIVE LEARNERS (N=951)

VARIABLE	ACTIVE (N=644)	INACTIVE(N=307)
	N (%)	N (%)
PE participation	164 (26)	51 (17)
EM activity participation	198 (31)	69 (23)
Environmental Safety	412 (64)	166 (54)
Paternal Education		
No education	12 (2)	9 (3)
Primary education	82 (13)	50 (16)
Secondary education	430 (67)	195 (64)
Tertiary education	72 (11)	36 (12)
No parent	48 (7)	17 (5)
Income		
< R1000	107 (15)	50 (16)
R1001- R2000	203 (32)	110 (36)
R2001-R3000	135 (21)	67 (22)
> R3000	198 (30)	80 (26)

PE = Physical Education

EM = Extra-mural activities

Table 5.3 indicates the number of learners that exhibited health risk behaviours such as smoking and drinking. Of these 33% smoked, 27% drank alcohol and 76% did not participate in any form of physical activity. Of the learners 38% felt that the neighbourhood in which they lived was not safe.

TABLE 5.3 HEALTH RISK BEHAVIOURS (N=1055)

Variable	Total	Male	Female
Smoking	351(33%)	186(35%)	165(31%)
Drinking	290(27%)	148(28%)	142(27%)
*No PE/EM physical activity	800 (76%)	354 (67%)	413 (78%)

* Learners did not participate in any form of physical activity.

PE = physical education

EM = extra-mural activities

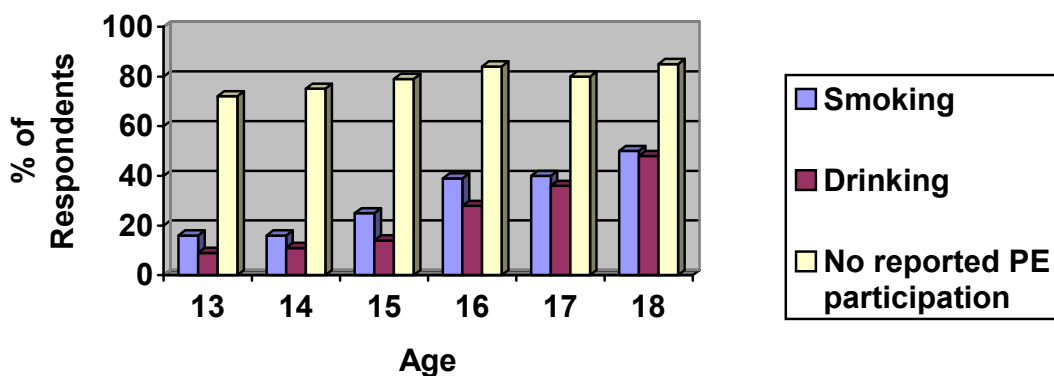
The relationship between health risk behaviours and age and gender is presented below. It was found that gender is not statistically related with smoking (chi-square=5.3; df=1; p=0.25), or drinking (chi-square = 2.3; df=1;p=0.12). However it was found that gender and physical activity were significantly related at the 1% level (chi-square=48.05; df=1; p=0.00). When looking at the relationship between health risk behaviours and age, it was found that age and smoking (chi-square=81.3; df=5; p=0.000); as well as age and drinking (chi-square=93.1; df=5; p=0.00) were found to be significantly related at the 1% level.

Table 5.4 illustrates a profile of all the respondents as well as those who were classified as being physically active and physically inactive. It was found that 41% of the physically inactive respondents smoked and 45% drank alcohol in comparison to the 31% and 21% of the active respondents respectively.

TABLE 5.4 PROFILE OF THE HEALTH RISK BEHAVIOURS OF THE RESPONDENTS

Variable	All learners N=1055	Physically active learners N=644	Inactive learners N=307	No data N=104
Gender				
Male	527	342	135	50
Female	528	302	172	54
Age				
13	149	83	45	21
14	296	194	68	34
15	215	146	47	22
16	182	97	65	20
17	126	69	50	7
18	87	55	32	0
Smoking				
Yes	351(33)	201(31)	126(41)	24(23)
No	704(67)	443(69)	218(56)	80 (77)
Drinking				
Yes	290 (27)	138 (21)	137 (45)	15 (14)
No	765 (73)	506 (79)	244 (55)	89 (86)

**FIGURE 5.1 : HEALTH RISK BEHAVIOURS
ACCORDING TO AGE (N=1055)**



From the information above it can be seen that participation in health risk behaviours increased with age (Figure 5.2). Sixteen percent of the learners aged 13 years indulged in smoking and at the age of 18 years, 50% of the learners indulged in smoking. This is statistically significant ($p < 0.05$). The same applies to the health risk behaviour of drinking where 24% of the 13-year-old learners consumed alcohol compared to the 55% of the 18-year-old learners. The data also suggested that a large percentage (76%) of the learners do not participate in any form of physical education at school or extra-mural activities. Although the results showed that as the age of the learners increased the participation in physical education and extra-mural activities decreased, this was not found to be statistically significant ($p > 0.05$). Approximately 38% of the learners found themselves in unsafe environments and therefore would not attempt to participate in extra-mural activities in their neighbourhood. With regard to

parental participation in physical activities as role models, it was found that approximately 76% of the parents did not participate in any physical activity.

Associations between socio-economic status and participation in physical activity via extra-mural activities and physical education were also examined. It was found that socio-economic status and participation in physical education at school were statistically related (chi-square =81; df=2; p=0.01). Likewise, socio-economic status and participation in extra-mural activities were found to be statistically related (chi-square=9.2; df =2; p =0.02). The learners who were classified into the upper socio-economic status group were found to participate more in extra-mural activities such as sport and going to gym than the learners who were classified into the lower socio-economic status group.

In the study 30% of the learners reported that their parents participated in some form of physical activity. Further analysis revealed that the participation of parents in physical activity positively influenced the participation of the learners in physical activity ($p < 0.00$). Regression analysis of the outcome variable “physically active” is indicated in Table 5.3. By using demographic factors, an attempt was made to build a model to predict respondents’ involvement in physical activity. Participation of parents in physical activity and gender emerged as the strongest predictors for the participation of the learners in physical activity. The regression model was significant ($F=12.54$, $p < 0.000$).

**TABLE 5.5 REGRESSION ANALYSIS: PREDICTORS OF PARTICIPATION
IN PHYSICAL ACTIVITY**

Step	Variables	b	Beta	t	P-value
1	Gender	.202	.206	6.919	0.000***
2	PPA	.190	.035	5.433	0.000***
3	Age	2.633	.036	2.55	0.01**
4	SES	-3.92	-0.45	-1.48	0.1*
	Constant	.682		3.022	0.003***

PPA = parental participation in activity
SES = socio-economic status

Notes: F=12.543 p<0.000

*****p<0.001, **p<0.05, *p<0.1**

5.5 DISCUSSION

Various factors influence participation in physical activity. These include socio-demographic factors (e.g. age, gender), re-enforcing factors (family) and enabling factors (environment) (Novia Scotia Sport and Recreation Commission 2001). The results of the current study show important associations between reported participation in physical activity and factors influencing participation. The study highlighted the fact that factors such as gender, age, socio-economic status and parents' participation in physical activity influenced the participation of the learners. This is similar to findings of the study conducted by Gordon-Larsen et al. (2000) among American adolescents. Sallis and Pate (2001) indicated that

it appeared as if there was a decline in activity among children aged 13 - 18 years. The current study only evaluates children aged 13 - 18 years and thus cannot be compared to studies done on other age groups. However, the study indicated that, as the age increased from 13 to 16 years, more learners were not participating in physical activity. Table 5.2 indicated that boys were more likely to participate in physical activity than girls and this is a basic fact that has been shown in more than 90% of other studies focusing on physical activity levels.

One of the predictors of physical activity in the current study was parent participation in physical activity. It is reasonable to expect that good role modelling by parents can inspire their children to be physically active. However, this is not often the case, as indicated by Sallis and Pate (2001). Other factors such as peers and neighbourhood safety may seem to be more powerful practical barriers and if these are not removed, having an active parent cannot convince the child to become active. Kohl and Hobbs (1998) indicated that the environment social and demographic factors played a major role in determining physical activity participation. A study conducted in Nova Scotia by the Sport and Recreation Commission (2001) identified factors such as personal demographics (age, gender, socio-economic status), enabling factors (fitness levels and physical environment) as well as predisposing factors (perceptions of ability to be active) and re-enforcing factors (such as family, friends and teachers, etc.). Although the current study did not highlight the environment as an important factor in influencing a person's decision to be active, a study conducted by the

US Department of Health and Human Services indicated that in order for one to implement successful strategies in promoting physical activity, the environment should be conducive to physical activity.

On assessing the health risk behaviours of this group (smoking and drinking), it was found that 31% of those who reported that they smoked and 21% of those who drank did not meet the requirements to be classified as being physically active. The current study indicated that a large percentage of the learners' who were classified as being inactive, smoked and drank. However, smoking was only weakly correlated to participation in moderate to vigorous physical activity. Pate et al. (1995) found similar results and concluded that although smoking may not be positively related to physical activity participation, smokers were more likely to drop out of fitness programmes than non-smokers.

5.6 SUMMARY

This study attempted to illustrate the profile of the physically active and physically inactive learners in the Belhar community. It was found that the physically inactive learners were more likely to participate in health risk behaviours such as smoking and drinking. Due to the fact that modifiable risk factors for chronic diseases of lifestyle exist besides inactivity such as obesity and hypertension, it became important to assess the health-related physical fitness levels of the learners. The outcome may possibly identify early warnings of the impact of physical inactivity.

CHAPTER SIX

HEALTH-RELATED FITNESS COMPONENTS IN PHYSICALLY ACTIVE AND INACTIVE LEARNERS

6.1 INTRODUCTION:

According to Bouchard et al. (1990), the general model underlying most research on the relationships among physical activity, physical fitness and health is that physical fitness is one of the mediators of the effects of physical activity on health outcomes. Katzmarzyk et al. (1998) emphasised the fact that the relationship between physical activity and physical fitness is of major interest. Although physical fitness and physical activity are often used interchangeably, they are not synonymous. According to Bouchard et al. (1990), physical fitness is a complex phenomenon that is difficult to define but that is widely accepted as a “set of attributes that people have or achieve and that relates to the ability to perform physical activity”.

Traditionally physical fitness has been linked with performance in sports and physical education. Health-related physical fitness as opposed to performance related fitness is associated with important health outcomes and can be modified through physical activity or exercise. To develop effective interventions to assist positive health outcomes one needs to evaluate the health-related physical fitness levels of the youth. The most accepted components of health-related

physical fitness according to Caspersen et al. (1985) include cardiovascular endurance, body composition, muscular strength and muscular endurance and flexibility. The purpose of this study was to evaluate the health-related physical fitness components of high school learners in the Belhar community.

The testing and assessment of the physical fitness of school-aged youngsters have been going on for decades in the United States (Winnick and Short 2001). These tests focus strictly on identifying physical fitness status and comparing the results of adolescents with others (norm-referenced). However, an interest has grown in health-related tests of physical fitness in which results attained by the youth are compared with criteria representing positive health (criterion-referenced). The Prudential Fitnessgram battery of tests was adapted and used in this study. According to this fitness test, the components for health-related physical fitness are cardiovascular endurance, abdominal strength, upper limb strength, flexibility and agility. All these components, except for the agility testing, were utilised in the study. The aim of these tests is for individuals to score above the 85th percentile. The instructions for administering these tests are clearly defined and reliability and validity for each test has been clarified (Safrit and Wood 1995).

In this section the relationship of BMI with various selected variables is analysed. These variables include those that may be affected by BMI, such as socio-economic status, blood pressure and fitness levels. There is a focus on BMI

because of the reported immediate and long-term health risks associated with childhood overweight. According to Rona, Qureshi and Chinn (1996), McMurray, Harrel, Levine and Gansky (1995) and Plieger, Treiber, Davis, McCaffrey, Rauniker and Strong (1994), overweight children have higher blood pressure and total cholesterol than other children. Research has also proven that overweight children have a greater liability to some respiratory symptoms (Dura-Tauleria, Rona and Chinn 1995; Somerville, Rona and Chinn 1984).

Moreover, overweight in late adolescence and extreme overweight in early adolescence have been associated with overweight continuing into adulthood, although most overweight adults had not necessarily been overweight children (DiPietro, Mossberg and Stunkard 1994; Sorenson and Sonne-Holm 1988; Troiano et al. 1995). However, sufficient concern on overweight had been raised in South Africa (Temple et al. 2001; Steyn et al. 1990; Puoane, Steyn, Bradshaw, Laubscher, Fourie, Lambert and Mbananga 2002). There is no generally accepted definition of overweight in children and adolescents. Various studies have used a variety of BMI percentile cut-offs to define overweight (Troiano et al. 1995). Thus in this study percentiles of the BMI distribution are used to analyse BMI and its relationships to other variables.

Raised blood pressure is a risk factor for both coronary heart disease and stroke. Although less is known about the distribution of blood pressure in children than in adults, ample evidence now supports the idea that the roots of hypertension

extend to early childhood (DeSwiet, Fayers and Shinebourne 1992; Lauer and Clarke 1989; Nelson, Ragland and Syme 1992). Blood pressure is known to be more directly related to age, height and weight in children than in adults (Chen, Rennie and Reeder 1995; Clarke, Woolson and Lauer 1986). Currently the guidelines that are most widely used for blood pressure in children are those published in 1996 by the National High Blood Pressure Education Program Working Group on Hypertension Control in Children and Adolescents in the United States.

6.2 AIM OF THE STUDY

The aim of the study was to objectively evaluate the health-related fitness components of the high school learners in the Belhar community and highlight the difference between physically active and physically inactive learners.

6.3 METHODOLOGY

To evaluate the health-related fitness components of the learners a data capture sheet based on the one used by Riddoch et al. (1991) were used. The variables measured included body composition (height, weight, and skin fold measurement), flexibility, muscular strength and endurance, cardiovascular fitness and blood pressure measurements. The room was set up in circuit form and a research assistant was trained to monitor each station. Each research assistant had a structured page describing the procedure that needed to be followed at each station. This was done to ensure that all learners were subjected to the same tests with the same degree of difficulty. Results were

captured on the Excel 2000 spreadsheet and coded in order to determine the fitness levels of the learners. To ensure that reliable information was being obtained, three readings were taken and an average of the three readings was used. All learners were dressed in shorts and t-shirts.

The procedure for the measurements at various stations is described below.

STATION ONE

Pulse rate and blood pressure measurements

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

Procedure

Pulse rate and blood pressure:

- The subject was made to sit for at least five minutes prior to testing.
- His/her right arm was bare and resting at an angle of 45 degrees on a table with palm up.
- A cuff of appropriate size was wrapped firmly around the upper arm at heart level.
- The start button was then pressed and the cuff inflated.
- Once maximum inflation was reached the cuff automatically deflated and both the resting blood pressure and the resting pulse rate was recorded.
- A blood pressure reading was done twice at one-minute intervals.

STATION TWO

Anthropometric measurements

Weight: Weight was measured using a scale (Sochnic weighing scale).

Procedure:

- The learners were asked to remove all excess clothing and to stand only in training shorts and t-shirt.
- The weight of the subject was recorded in kilograms to the nearest whole number.

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

Procedure:

- The subject was expected to stand with heels, buttocks and upper back against the wall.
- The subject also had to remove his/her shoes, stand feet together and arms at the sides.
- The subject's height was recorded in centimetres.
- The height in metres was then squared. BMI was calculated using the following formula: $\text{Body weight (kg)/height (m)}^2$.

STATION THREE

Waist to hip ratio (WHR)

Waist:

With abdomen relaxed, a horizontal measurement was taken at the level of the narrowest part of the torso just below the twelfth rib using a tape measure. The learner was required to stand upright.

Hip:

While the subject stood erect, a horizontal measurement was taken at the level of maximum circumference of the hips/buttocks.

Procedure:

- The subject had to stand with feet together and the arms at the sides.
- The waist and hip circumference was measured.
- The tape had to be horizontal and around the entire circumference.
- The tape had to be pulled snugly but without causing an indentation in the skin.
- Scores were recorded to the nearest millimeter.
- Duplicate measurements were taken.
- The average of the scores was recorded.
- The waist-hip ratio was determined.

STATION FOUR

Skin fold measurements

The skin fold was measured using a skin fold caliper, and this measurement was chosen as a measure of adiposity among children because of its high correlation with percentage of body fat (Cortmaker, Dietz and Cheung 1990). The areas measured included the triceps, suprailiac crest and calf.

Procedure

- Measurements were taken on the right side of the body with the participant standing.
- Skin fold sites were carefully identified, measured and marked.
- With caliper in right hand, the skin fold was grasped with thumb and index finger of left hand.
- The caliper was placed halfway between crest and base of fold.
- The caliper pressure was gently and fully released.
- Pinch was maintained while the dial was being read.
- Duplicate measurements were taken at each site.
- It was necessary to re-measure if first and second reading were not within 1-2mm.
- The average score was recorded.

Triceps

The arm was held freely along the side of the body. A vertical fold was made on the posterior midline of the upper arm, midway between the acromion and olecranon process.

Iliac crest

The skin fold pinch was taken at a site immediately above the iliac crest. The fold is an oblique line following the natural angle of the iliac crest.

Calf

A vertical pinch was made at the point of largest circumference on the medial side of the calf.

The sum of the skin folds was determined by adding the readings from the three different sites. Based on the readings, the body density was calculated using the following formula: $\text{Body Density} = 1.10938 - 0.0008267 (\text{sum of three skin folds}) + 0.0000016 (\text{sum of three skin folds})^2 - 0.0002574 (\text{age})$. Once the body density was obtained, the percentage of body fat was calculated using the following formula: $\% \text{ Body fat} = (457/\text{body density}) - 414.2$

STATION FIVE

Flexibility

Flexibility was measured using the sit and reach test that measures combined shoulder, trunk and hamstring flexibility. The test was conducted using a specially designed sit and reach box.

Procedure:

- Subjects wore shorts and t-shirts and were barefoot.
- Subjects sat facing the flexibility box with knees fully extended and feet slightly apart.
- Feet were flat against the board.
- The subject was told to extend the arm straightforward with the hands placed on top of each other.
- The subject had to reach directly forward, palms down as far as possible along the measuring scale.
- Movement was to be slow and controlled.
- There were to be no fast, jerking motions.
- The tester had to ensure that subject's knees did not bend.
- The extended position was held for one to two seconds while the reading was recorded. The score recorded was the distance of the fingers beyond the toes.
- Duplicate measures were taken to the nearest centimeter.
- An average measurement was recorded.

STATION SIX**Muscular strength and endurance**

This station measured muscular strength and endurance using the push-up test to assess the upper body muscle strength and endurance.

Male push-up test

Procedure:

- The body had to be rigid and straight as for a push-up with toes tucked in and hands approximately shoulder-width apart, straight under the shoulders and with fingers facing forward. The toes were the pivot point.
- The tester placed a fist beneath the subject's chest.
- The subject started from the up position with arms fully extended and lowered himself down until his chest touched the fist of the tester.
- The subject's had to keep the back and hips in a straight line.
- The subject then raised himself back up to the starting position. Once the subject had returned to the starting position, it was counted as one repetition.
- Rest was allowed in the up position only.
- The score was the total number of push-ups performed in one minute

Female push-up test

Procedure:

- The subject was required to assume the bend-knee position for a push-up. The knees were the pivot point.
- Hands were to be slightly ahead of the shoulders in the up position and were to be directly below the shoulders in the down position.
- The subject lowered herself to approximately fist distance from the floor.
- Her back had to remain perfectly straight throughout.
- The subject then had to raise herself back up to the starting position.

- Rest was allowed in the up position only.
- The score was the total number of push-ups recorded per minute.

STATION SEVEN

Sit-up test

The one-minute sit-up test was used to measure abdominal strength and endurance. In the starting position the subject's back was on the floor, knees bent to a 45 degree angle, feet 6-9 cm from buttocks and feet flat on the floor, and hands behind head with elbows facing outward.

Procedure

- The subject curled head and upper back upward, until the chest touched the thighs.
- Elbows remained facing outward with fingers laced and held behind head.
- The feet and buttocks had to remain on the floor during the entire curl-up.
- The subject then returned to the starting position.
- The subject was allowed to rest in the starting position.
- The total number of complete sit-ups per minute was recorded.

STATION EIGHT

Cardiovascular fitness assessment

Beep test/PACER test

This test involved continuous running between two lines 20m apart in time to recorded beeps. The time between recorded beeps decreased with each level.

The initial running velocity was 8.5 km/h, which increased by 0.5 km/h each minute/level. The athletes' score recorded were the level and number of shuttles reached before he/she was unable to keep up with the recorded beeps.

6.4 DATA ANALYSIS

Data was analysed according to the Prudential Fitnessgram standards (Appendix 4). Unfortunately the researcher did not have the computerised analysis program and therefore analysis was done manually using the norms of the Fitnessgram test as the basis for defining fitness levels (Safrit and Wood 1995). Data analysis was done for all learners and then subdivided for those who were classified as active and inactive. In addition, data were examined with SPSS for Windows using analysis of variance tests as appropriate for continuous variables and chi-square test for categorical data. After examining univariate relationships between variables, multivariate stepwise models were initially used to identify which of the correlated variables such as the several variables indicating obesity and body composition (weight, BMI, waist-hip ratio and skinfold), provided the best model with a particular dependent variable. A level of $p < 0.05$ was considered significant. Norms used in the study were the values used for the Fitnessgram tests.

The data is presented as follows:

- means of the health-related fitness components of all the learners

- means of the health-related fitness components according to age and gender
- the health-related fitness components of all the learners according to the norms with subsequent subdivision of the data into active and inactive learners.

6.5 RESULTS

The total number of learners who participated in this part of the study was 1055 of which 527 were male learners and 528 were female learners. Results in this chapter will highlight the health-related fitness components as means, highlight obesity based on BMI classification, and show associations between age, gender and BMI as well as associations between fitness scores and age and gender. In Table 6.1 the health-related fitness components are presented as means to give an overall picture of the learners.

TABLE 6.1 HEALTH-RELATED FITNESS COMPONENTS OF LEARNERS

Variable	Mean(SD)	Minimum	Maximum
Age (years)	15.1(1.5)	13	18
Weight (kg)	54.2(10.5)	29	102
Height (m)	1.61(0.09)	1.36	1.94
BMI (kg/m ²)	20.8 (3.7)	13.78	40.16
PR (beats/min.)	81(23.7)	52	128
SBP (mmHg)	118.6(13.2)	76	183
DBP (mmHg)	74.3(10.2)	53	126
WHR	0.75(0.05)	0.61	0.97
S/sum (mm)	39.1(19.1)	9	126
%B/F	11.8 (6.5)	2	42
Flexibility (cm)	26.7(7.3)	4	53
Sit-ups (/min.)	24.3(10)	2	75
Push-ups (/min.)	21.4(9.8)	1	66
CVF	35.61(19.8)	5	103

PR = Pulse Rate
 SBP = Systolic Blood Pressure
 DBP= Diastolic Blood Pressure
 %B/F=Percentage Body Fat

WHR= Waist Hip Ratio
 S/sum= Sum of skin folds
 CVF= Cardiovascular fitness
 BMI = Body Mass Index

In Table 6.2 the health-related fitness components are presented according to age. Significant differences are noted between age and the following health-related fitness components – body weight ($p<0.00$), systolic blood pressure ($p<0.01$), diastolic blood pressure ($p<0.01$), waist hip ratio ($p<0.05$), percentage body fat ($p<0.05$), flexibility ($p<0.05$), sit-ups ($p<0.05$) and push-ups ($p<0.05$).

TABLE 6.2 MEAN HEALTH-RELATED FITNESS COMPONENTS WITH REGARD TO AGE

	13	14	15	16	17	18 YEARS	p value
Weight (kg)	53	54	52	55	57	56	$p<0.00$
Height (m)	1.6	1.6	1.6	1.6	1.6	1.6	$p=0.72$
BMI (kg/m^2)	20.6	20.8	20.3	21.0	21.1	21.5	$p=0.11$
PR (beats/min)	82	81	81	80	85	78	$p=0.30$
SBP (mmHg)	114	116	120	119	123	123	$p<0.01$
DBP (mmHg)	73	73	74	75	75	79	$p<0.01$
WHR	0.76	0.76	0.75	0.74	0.75	0.75	$p<0.05$
S/Sum (mm)	39	37	39	40	41	42	$p=0.22$
%B/F	11.4	11.0	11.6	12.2	12.4	12.9	$p<0.05$
Flexibility (cm)	25.5	25.9	26.5	26.8	28.7	27.6	$p<0.05$
Sit-ups (/min.)	20.4	23.2	23.1	25.0	24.1	23.9	$p<0.05$
Push-ups (/min.)	19.9	20.1	21.5	22.2	23.3	23.6	$p<0.05$
CVF	32.8	34.9	38.1	35.1	36.2	35.6	$p=0.70$

PR = Pulse Heart Rate
 SBP = Systolic Blood Pressure
 DBP= Diastolic Blood Pressure
 %B/F= Percentage Body Fat

WHR= Waist Hip Ratio
 S/sum= Sum of skin folds
 CVF= Cardiovascular fitness

In Table 6.3 the health-related fitness components of all the learners are presented according to gender. It was found that there was a significant difference between gender in waist hip ratio ($p<0.00$), flexibility ($p<0.00$), sit-ups ($p<0.00$), push-ups ($p<0.05$) and cardiovascular fitness ($p<0.00$).

TABLE 6.3 MEAN HEALTH-RELATED FITNESS COMPONENTS WITH REGARD TO GENDER

	Male	Female	P-value
Weight (kg)	53.2	53.3	$p=.271$
Height (m)	1.63	1.59	$p=0.062$
PR (beats/min.)	76	73	$p<0.001$
SBP (mmHg)	118	117	$p=0.369$
DBP (mmHg)	73	84	$p=0.246$
WHR	0.77	0.73	$p<0.000$
S/Sum(mm)	29.4	48.8	$p<0.000$
%B/F	8.52	14.86	$p<0.000$
Flexibility (cm)	25.2	28.0	$p<0.000$
Sit-ups (/min.)	27.8	18.8	$p<0.000$
Push-ups (/min.)	22.2	18.7	$p<0.05$
CVF	46.5	24.7	$p<0.000$

PR = Pulse Rate
 SBP = Systolic Blood Pressure
 DBP= Diastolic Blood Pressure
 %B/F= Percentage Body Fat

WHR= Waist Hip Ratio
 S/sum= Sum of skin folds
 CVF= Cardiovascular fitness

In Table 6.4 the mean health-related fitness components of all the learners are presented according to levels of physical activity. It was found that there was a significant difference between physically active learners and physically inactive learners in the health fitness components of sit-ups, push-ups and cardiovascular fitness.

TABLE 6.4 MEAN HEALTH-RELATED FITNESS COMPONENTS ACCORDING TO PHYSICALLY ACTIVE AND PHYSICALLY INACTIVE CLASSIFICATION

Variables	Physically active	Physically inactive	P-value
Weight (kg)	53.8	55.23	p =0.09
Height(m)	1.61	1.61	p=0.113
BMI	20.6	21.2	p=0.77
PR (beats/min.)	80	81	p<0.05
SBP (mmHg)	118	120	p=0.192
DBP (mmHg)	72	75	p<0.05
WHR	0.76	0.75	p<0.000
S/Sum(mm)	37.3	42.7	p<0.000
%B/F	11.14	13.06	p<0.000
Flexibility (cm)	26.5	27.2	p=0.196
Sit-ups (/min.)	27.8	22.6	p<0.01
Push-ups (/min.)	21.2	18.7	p<0.01
CVF	36.6	30.1	p<0.05

PR = Pulse Rate
 SBP = Systolic Blood Pressure
 DBP= Diastolic Blood Pressure
 %B/F= Percentage Body Fat

WHR= Waist Hip Ratio
 S/sum= Sum of skin folds
 CVF= Cardiovascular fitness

Data for all learners for the tests on pulse rate, cardiovascular fitness, Sit-ups, push-ups and flexibility according to age are presented below. Table 6.5 indicates that approximately 90% of the male learners and 87% of the female learners were within the norms for their pulse rate. Table 6.6 and table 6.7 refer to the results of the pulse rate for physically active and physically inactive learners. Approximately 10% of physically active male learners and 12% of physically active female learners were not within the norms for pulse rate (Table 6.6). Similarly, approximately 23% of the physically inactive learners did not meet the standardised norms for pulse rate (Table 6.7). There was a significant difference between the physically active and the physically inactive learners ($p < 0.00$).

TABLE 6.5 PULSE RATE RESULTS FOR ALL LEARNERS (CARDIOVASCULAR) N=1055

Age	Norms Males	Males n=527	Norms Females	Female n=528
13	65-105	52	70-110	73
14	60-100	131	65-105	134
15	55-95	106	60-100	89
16	55-95	79	60-100	82
17	50-90	58	55-95	48
18	50-90	46	55-95	32

**TABLE 6.6 PULSE RATE RESULTS FOR PHYSICALLY ACTIVE LEARNERS
(CARDIOVASCULAR) N=644**

Age	Norms Males	Males n=342	Norms Females	Female n=302
13	65-105	33	70-110	43
14	60-100	93	65-105	80
15	55-95	70	60-100	60
16	55-95	47	60-100	38
17	50-90	36	55-95	24
18	50-90	29	55-95	20

**Table 6.7 PULSE RATE TEST RESULTS FOR PHYSICALLY INACTIVE
LEARNERS (CARDIOVASCULAR) N=307**

Age	Norms Males	Males n=135	Norms Females	Female n=172
13	65-105	12	70-110	21
14	60-100	19	65-105	35
15	55-95	23	60-100	18
16	55-95	22	60-100	30
17	50-90	14	55-95	20
18	50-90	14	55-95	11

Table 6.8 indicates that 58% of the males and 52% of the females were within the norms for the sit-ups test. About 31% of the physically active male learners and 44% of the physically active female learners were not within the norms for the sit-ups test (Table 6.9). Among the physically inactive group, 62.3% of the male learners and 75% of the female learners were not within the norms (Table 6.10). An analysis of variance test indicated that there was a significant difference between the physically active and physically inactive learners ($F=7.55$;

p<0.01). In addition the student t-test indicated a significant difference between males and females (p<0.00 at 95% CI).

TABLE 6.8 SIT-UP TEST RESULTS FOR ALL LEARNERS (ABDOMINAL STRENGTH) N=1055

Age	Norms Males	Males n=527	Norms Females	Female n=528
13	21-40	35	18-32	45
14	24-45	45	18-32	81
15	24-47	85	18-35	47
16	24-47	68	18-35	51
17	24-47	45	18-35	31
18	24-47	28	18-35	21

TABLE 6.9 SIT-UP TEST RESULTS FOR PHYSICALLY ACTIVE LEARNERS (ABDOMINAL STRENGTH) N=644

Age	Norms Males	Males n=342	Norms Females	Female n=302
13	21-40	30	18-32	26
14	24-45	63	18-32	52
15	24-47	59	18-35	35
16	24-47	40	18-35	27
17	24-47	26	18-35	15
18	24-47	17	18-35	14

TABLE 6.10 SIT-UP TEST RESULTS FOR PHYSICALLY INACTIVE LEARNERS (ABDOMINAL STRENGTH) N=307

Age	Norms Males	Males n=135	Norms Females	Female n=172
13	21-40	5	18-32	8
14	24-45	5	18-32	10
15	24-47	11	18-35	4
16	24-47	12	18-35	10
17	24-47	11	18-35	8
18	24-47	7	18-35	3

Similarly for the push-up tests, about 65% of the males and 60% of the females were within the norms for this test (Table 6.11). Among the physically active learners, 36% of the male learners and 44.4% of the female learners were also not within the norms for the test. (Table 6.12). Among the physically inactive group, 63.7% of the male learners and 69.8% of the female learners were also no within the norms for the test (Table 6.13). An analysis of variance table indicates a significant difference between the physically active and physically inactive learners ($F=6.79$; $p<0.001$).

TABLE 6.11 PUSH-UP TEST RESULTS FOR ALL LEARNERS (MUSCULAR STRENGTH) N=1055

Age	Norms Males	Males n=527	Norms Females	Female n=528
13	12-25	32	10-25	61
14	14-30	107	10-25	91
15	16-35	69	14-30	58
16	18-35	56	14-30	44
17	18-35	44	14-30	38
18	18-35	33	14-30	25

TABLE 6.12 PUSH-UP TEST RESULTS FOR PHYSICALLY ACTIVE LEARNERS (MUSCULAR STRENGTH) N=644

Age	Norms Males	Males n=342	Norms Females	Female n=302
13	12-25	16	10-25	25
14	14-30	72	10-25	52
15	16-35	41	14-30	35
16	18-35	39	14-30	27
17	18-35	26	14-30	15
18	18-35	23	14-30	14

TABLE 6.13 PUSH-UP TEST RESULTS FOR PHYSICALLY INACTIVE LEARNERS (MUSCULAR STRENGTH) N=307

Age	Norms Males	Males n=135	Norms Females	Female n=172
13	12-25	5	10-25	10
14	14-30	8	10-25	10
15	16-35	13	14-30	7
16	18-35	8	14-30	12
17	18-35	9	14-30	9
18	18-35	6	14-30	4

For the flexibility tests, 69% of the males and 76% of the females did not meet the norms for this test (Table 6.14). Among the physically active learners, 73% of the male learners and 78% of the female learners were not within the norms (Table 6.15). However, among the physically inactive learners, 70% of the male learners and 84% of the female learners were not within the norms for the test (Table 6.16). An analysis of variance table indicates no significant difference between the physically active and physically inactive learners ($F=1.63$; $p<0.001$)

but a t-test indicates a significant difference existed between males and females ($p < 0.000$).

TABLE 6.14 SIT AND REACH TEST RESULTS FOR ALL LEARNERS (FLEXIBILITY) N=1055

Age	Norms Males	Males n=527	Norms Females	Female n=528
13	26-31	16	31-36	27
14	26-33	46	33-38	31
15	28-36	42	36-40	17
16	30-37	20	34-43	21
17	30-38	25	35-42	19
18	34-41	6	35-42	10

TABLE 6.15 SIT AND REACH TEST RESULTS FOR ALL PHYSICALLY ACTIVE LEARNERS (FLEXIBILITY) N=644

Age	Norms Males	Males n=342	Norms Females	Female n=302
13	26-31	7	31-36	13
14	26-33	32	33-38	21
15	28-36	30	36-40	5
16	30-37	10	34-43	12
17	30-38	13	35-42	10
18	34-41	2	35-42	4

TABLE 6.16 SIT AND REACH TEST RESULTS FOR PHYSICALLY INACTIVE LEARNERS (FLEXIBILITY) N=307

Age	Norms Males	Males n=135	Norms Females	Female n=172
13	26-31	6	31-36	5
14	26-33	9	33-38	6
15	28-36	7	36-40	4
16	30-37	6	34-43	4
17	30-38	10	35-42	6
18	34-41	2	35-42	2

For the cardiovascular fitness tests, 45% of the male learners and 48% of the female learner were within the norms for this test (Table 6.17). Among the physically active learners, 54% of the male learners and 51% of the female learners did not meet the norms for the test (Table 6.18). However, among the physically inactive learners, 81% of the male learners and 74% of the female learners were not within the norms for this test (Table 6.19). An analysis of variance table indicates significant difference between the physically active and physically inactive learners ($F=4.26$; $p<0.05$) but a t-test indicates a significant difference existed between males and females ($p<0.000$).

TABLE 6.17 PACER TEST RESULTS FOR ALL LEARNERS N=1055

Age	Norms Males	Males	Norms Females	Female	%
13	35-74	35	15-42	70	71
14	41-80	79	18-44	95	58
15	46-85	55	23-50	44	46
16	52-90	31	28-56	33	35
17	57-94	19	34-61	11	24
18	57-94	18	34-61	3	24

**TABLE 6.18 PACER TEST RESULTS FOR PHYSICALLY ACTIVE LEARNERS
N =644**

Age	Norms Males	Males	Norms Females	Female	%
13	35-74	21	15-42	33	65
14	41-80	55	18-44	60	59
15	46-85	36	23-50	29	45
16	52-90	21	28-56	17	39
17	57-94	14	34-61	5	28
18	57-94	11	34-61	3	25

**TABLE 6.19 PACER TEST RESULTS FOR PHYSICALLY INACTIVE
LEARNERS N=307**

Age	Norms Males	Males	Norms Females	Female	%
13	35-74	10	15-42	16	58
14	41-80	8	18-44	12	29
15	46-85	8	23-50	6	30
16	52-90	0	28-56	6	9
17	57-94	0	34-61	4	8
18	57-94	0	34-61	0	0

Table 6.20 indicates that approximately 23% of the learners were overweight. Among the physically active learners only 16% were overweight (Table 6.21). However, among the physically inactive learners, 24% were classified as overweight (Table 6.22).

TABLE 6.20 BMI RESULTS FOR ALL LEARNERS (N=1055)

Age	Males			Female		
	Normal 16.1-23.4	Underweight <16	Overweight >23.5	Normal 16.1-23.4	Underweight <16	Overweight >23.5
13	56	0	7	65	3	16
14	114	4	27	110	9	32
15	88	8	15	71	7	26
16	69	2	20	59	3	29
17	47	1	17	38	0	23
18	36	3	11	16	2	19
Total	412	18	97(18)	359	24	145(27)

TABLE 6.21 BMI RESULTS FOR PHYSICALLY ACTIVE LEARNERS (N=644)

Age	Males			Female		
	Normal 16.1-23.4	Underweight 16	Overweight >23.5	Normal 16.1-23.4	Underweight <16	Overweight >23.5
13	34	0	4	33	4	8
14	82	2	20	68	7	15
15	62	5	7	58	5	9
16	43	1	11	35	2	5
17	31	2	6	23	0	7
18	24	2	6	16	1	6
Total	276	12	54(16)	234	19	50(17)

TABLE 6.22 BMI RESULTS FOR PHYSICALLY INACTIVE LEARNERS (N=307)

Age	Males			Female		
	Normal 16.1-23.4	Underweight <16	Overweight >23.5	Normal 16.1-23.4	Underweight <16	Overweight >23.5
13	13	0	3	22	1	6
14	22	2	3	28	2	11
15	18	3	4	15	2	5
16	17	2	7	26	1	12
17	14	0	9	22	0	5
18	13	0	5	10	1	3
Total	97	7	31(23)	123	7	42(24)

From Table 6.23 it can be seen that 23% of the high school learners were classified as overweight with 27% being female and 18% male. In addition approximately 15% of the students were tending towards being hypertensive with regards to their systolic and diastolic blood pressure. According to Himes and Deitz (1994), it is recommended to classify BMI-for-age at or above the 95th percentile as overweight and between the 85th and 95th percentile as at risk of overweight. According to the World Health Organisation Expert Committee on Physical Status the cutoff for underweight is BMI less than the 5th percentile (WHO 1996). Females had a higher BMI than males and this was more common in the 15-year old age group. Cross tabulations and analysis of variance tables (ANOVA) indicated that the relationship between BMI and gender (df=1; F=28.43, p<0.000) were statistically significant as well as age and BMI (df=5, F=5.335; p<0.000). There was also a statistically significant (p<0.05) relationship between BMI and classification of hypertension according to systolic blood pressure and classification of hypertension according to diastolic blood pressure. Within the category of overweight learners, 61% of the learners were classified

as hypertensive according to their systolic blood pressure and 45% were classified as hypertensive according to their diastolic blood pressure.

TABLE 6.23 DESCRIPTION OF LEARNERS' PHYSIOLOGICAL MEASUREMENTS WITH REGARD TO OBESITY AND INCREASED BLOOD PRESSURE.

Variable		Total	Males	Females
		1055	527	528
BMI	16.1-23.4 (Normal)	771(73%)	412(78%)	359(68%)
	>23.5 (Overweight)◇	242(23%)	97(18)	145(27%)
	< 16 (Underweight)	42(4%)	18(4%)	24(5%)
PR	<72 (Good)	558(53%)	365(70%)	193(36%)
	72-78 (Average)	224(21%)	101(20%)	123(23%)
	>79 (Poor)	270(26%)	53(10%)	217(41%)
SYS	<129 (normal)	889(85%)	445(86%)	444(83%)
	130-139 (stg 1 hypertension*)	99(9%)	44(9%)	55(10%)
	>140 (stg 2 hypertension*)	64(6%)	30(5%)	34(7%)
DIAS	<85 (normal)	894(85%)	448(86%)	446(84%)
	86-90 (stg 1 hypertension)	98(9%)	48(9%)	50(9%)
	>90 (stg 2 hypertension)	60(6%)	23 (5%)	37(7%)

◇ overweight = BMI \geq 95th percentile

* stage 1 and 2 hypertension

Skin fold sum, percentage body fat and waist hip ratio (WHR) were also used to identify the tendency to obesity of the learners. ANOVA tables as well as Pearson's correlations were used to calculate the strength of the relationship between variables such as age, gender, and sum of the skin folds, percentage body fat and waist and hip ratio. It was found that correlations between the variables gender and sum of skin folds, gender and percentage body fat as well as gender and WHR were statistically significant at the 0.000 level (2-tailed). There was strong relationship between the variables age and percentage body fat (df=488; F=1.84; p<0.000).

On examining the physical fitness and coronary heart disease risk factors, the following was found: Smoking, a widely recognised risk factor, was found to be present among 31% of the learners. Physical inactivity is another risk factor for heart disease and 32% of the learners were found to be inactive. In addition, 23% were obese and 15 % showed signs of hypertension and 78% had a poor fitness level.

Risk appraisals have been developed to quantify an individual's susceptibility to CHD. The following risk factors for CHD are commonly recognised: cigarette smoking (> 10 per day), physical inactivity, hypertension and obesity as well as hyper-cholesterolaemia. According to McArdle, Katch and Katch (1996), the interaction of three or more of these risk factors in an individual, magnifies their effects. Table 6.24 gives a profile of risk factors of learners in the study. Of the

learners who participated in all phases of the study, 21% had two or more risk factors, 10% had three or more risk factors and 4% had four risk factors.

TABLE 6.24 MULTIPLE MODIFIABLE RISK FACTOR PROFILE (N=951)

Number of risk factors present	% of learners
physical inactivity	32
physical inactivity and smoking	21
physical inactivity, smoking and obesity	10
physical inactivity, smoking, obesity and hypertension	4

6.5 DISCUSSION

According to Sallis et al. (1997), the general model underlying most current research on relationships between physical activity, physical fitness and health, is that physical fitness is one of the mediators of the effects of physical inactivity on health outcomes. Currently, there is a great deal of concern regarding the physical fitness and health status of South African youth. In fact, one of the objectives of the Department of Sports and Recreation (DSR) in South Africa is to make sure that all children and young adults participate in some form of physical activity (DSR White Paper 1997). However, South Africa currently does not have normative data against which to measure the physical fitness levels of our young people. Thus the findings of the current study can be considered a guide as to what we could be facing among our youth if the effective measure are not put in place.

There are studies that show that symptoms such as overweight, high blood pressure and hypercholesterolemia originate from childhood and early adolescence (Mc Gill, McMahan, Zieske, Malcolm, Tracy and Strong 2001). In the current study it was found that 17% of the total number of learners was classified as being overweight with 15% of them tending towards hypertension. However, within the overweight learner group, an average of 53% of the learners tended towards hypertension. This is cause for concern as overweight and physical inactivity are related to increased risk of several chronic diseases. According to Blair and Brodney (1999), inactivity and low cardiorespiratory fitness are as important as overweight as predictors of mortality.

The clinical significance of overweight and obesity in adolescent populations is a public health concern. This is especially so when studies show that an overweight and/or obese adolescent is 70 - 80% more likely to be an overweight adult (Boreham, Twisk, Murray, Savage, Strain and Cran 2001). Obesity is also a major risk factor for insulin resistance and diabetes, hypertension, dyslipidaemia , poor cardiorespiratory fitness and arteriosclerosis (Berenson, Srinivasan, Bao, Newman, Tracy and Wattingey 1998; Vanhal, Vanhala, Kumpusalo, Halonen and Takala 1998 and Boreham et al. 2001). Adolescents who are overweight have increased average blood pressures, heart rates and cardiac outputs compared to their non-overweight peers (Moran 1999). This current study supports this finding. The National High Blood Pressure Education Programme prepared tables that assist physicians in determining high blood pressure in adolescents.

This programme indicated that various factors influence high blood pressure in adolescents. Such factors include the time of day, physical activity, emotional moods, stress, age, height, weight, gender and medical history. In the current study an increase in the BMI was associated with an increase in blood pressure. In addition to the health risk concerns of obesity, adults who had been obese children have increased morbidity and mortality, irrespective of adult weight (Gunnel, Frankel, Nanchahal, Peters and Davey-Smith 1998) and overweight adolescents may suffer long-term social and economic discrimination (Gortmaker, Must, Perrin, Sobol and Deitz 1993). Thus it can be seen that childhood obesity should be a major target for intervention.

According to Sallis (1993), obese adolescents are usually found to have relatively low levels of aerobic power and performance on field tests of fitness. Boreham and Riddoch (2001) support the fact that fatness/obesity is a major confounding variable in the relationship between fitness and other risk factors for cardiac diseases. Thus any initiative to improve health and health-related fitness should ideally involve prevention strategies that improve fitness and lower fatness. Low abdominal muscular strength and endurance is significant since it is related to the risk of low back pain, which is one of the most common ailments in adults' leading causes of absenteeism in the workplace.

From the current study it can be seen that a substantial amount of these learners are at risk of developing chronic diseases of lifestyle. The risk factors identified in

literature have been identified in these learners namely, obesity, high blood pressure and inadequate fitness levels. Accumulating evidence regarding adolescent health-related physical fitness is important as it assists health professionals in identifying young people at risk, thus allowing for early intervention. Baranowski et al. (1992) indicated that most children tend to have at least one risk factor for cardiovascular disease. If more than one is indicated as is present in 21% of the learners in this study, they are predisposing themselves to an early development of certain chronic diseases, e.g. arteriosclerosis.

6.6 SUMMARY

This study attempted to determine the health-related physical fitness levels of the learners. It was found that the physiological measurements of the physically inactive learners highlighted that 23% were overweight, 13% were hypertensive based on the diastolic blood pressure. In addition, of the physically inactive learners approximately 69% did not meet the requirements for the sit-ups test and 67% did not meet the requirements for the push-ups test. Similarly, approximately 78% did not meet the requirements for the flexibility test and the cardiovascular fitness test. Fitness should be a major cornerstone of any national preventive effort in terms of health promotion and disease prevention. There are many proven reasons for us to promote physical activity and fitness as well as to establish physical fitness norms for the South African population. Unfortunately, there will be the need to identify the attitudes of high school learners in Belhar community towards physical activity in order to identify possible barriers. The

next chapter thus focuses on assessing the knowledge of, attitudes and perceived barriers to participation in physical activity among high school learners in Belhar.

CHAPTER SEVEN

KNOWLEDGE OF, ATTITUDES AND PERCEIVED BARRIERS TO PHYSICAL ACTIVITY AMONG HIGH SCHOOL LEARNERS

7.1 INTRODUCTION

Physical activity is widely recognised as an important health behaviour, providing benefit against cardiovascular disease and some cancers, as well as improving mental health (Bouchard, Shephard and Stephens 1994). However, there is a body of evidence to suggest that levels of physical activity among young people may also be on the decrease (Armstrong et al. 1990; Armstrong and Welsman 1997; Armstrong and van Mechelen 1998). While a considerable amount of research clearly describes the widespread inactivity of adults, the evidence base concerning the nature and scope of physical activity among children and young people is weaker. According to Mulvihill, Rivers and Aggleton (2000), there have been a number of qualitative studies of young people and physical activity but most tended to focus on involvement in exercise and sport, rather than physical activity more broadly defined. Health education theories suggest that health behaviours are influenced in part by the perceived benefits of and barriers to a specified action. According to Aggleton, Whitty, Knight, Prayle, Warwick and Rivers (1998), there is a pressing need to know what children and young people feel about health issues. Obtaining a detailed understanding of the perceived benefits and barriers to physical activity forms the first step in designing appropriate health education and prevention programmes (O'Dea 2003). The aim

of this section of the study was to provide clarity using qualitative methods, on the knowledge of, as well as on the motivation and barriers to physical activity among high school learners.

7.2 METHODOLOGY

A qualitative approach was adopted in order to access meanings and understandings informally and interactively. Data were collected from three high schools in Belhar. The focus groups included 177 high school learners (91 females; 86 males) aged 13 - 18 years. Learners were randomly selected from class lists and given parental consent forms to return (98.3% response rate). A total of 18 focus group discussions were conducted, each lasting between 15 and 30 minutes. Six focus groups were conducted at each school. The learners in a particular focus group were all the same age. No differentiation was made between genders as well as whether learners were active or inactive. A semi-structured interview guide was developed (Table 1) to assist researchers. Each focus group began with an introductory question. All focus group discussions were tape-recorded in full with the permission of the learners. A total of nine hours of tape-recorded interviews were obtained and transcribed verbatim to produce a manuscript. The data were then 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. The data collected and analysed were verified by means of peer review. According to Ely and Anzul (1991), peer review or debriefing

provides an external check of the research process much in the same spirit as interrater reliability in quantitative research. The reviewer acted as a research assistant and kept a detailed account of all focus groups.

Below is the semi-structured interview guide used for each focus group.

Semi-structured interview guide for high school learners

1. Perceptions of physical activity
 - When you think of physical activity what comes to mind?
 - What does it mean to be physically active?
2. Beliefs/knowledge about physical activity and its benefits
 - Do you think physical activity is important?
 - What types of physical activity are better and why?
 - How much physical activity do you think you should participate in?
3. Perceived barriers to physical activity
 - Do you consider yourself to be physically active?
 - What prevents you from being physically active?
 - Do you think you are less active now than when you were in primary school?
 - Would you like to be more active and which activities would you like to do?
 - Do you think you meet the recommendations of being active for at least one hour every day?

4. Recommendations

- How can you become more active?
- What role should your parents, school and community play in promoting physical activity?

7.3 RESULTS

A number of current issues emerged from the data collected from the high school learners. These included perceptions of physical activity, perceived benefits; barriers to physical activity as well as recommendations.

7.3.1 Perceptions of physical activity

Respondents were asked what came to mind when asked: “What is physical activity and what does it mean to be physically active?” Initial responses equated physical activity with physical education at school and participating in sports. Learners were aware that one needed to participate in some form of physical activity on a daily basis in order to be classified as being physically active. On further questioning about physical activity, the following responses were made:

“Playing soccer in the street every day can be called being physically active.”

Male, 15 years.

“I walk to and from school every day, very slowly. Can this be called being physically active?”

Female, 16 years. The group response was an emphatic, NO!

From these statements it can be seen that respondents understood that the activity needed to be vigorous in order for one to be classified as being physically active. Preferred activities highlighted by the respondents were soccer, dancing, swimming, hockey and netball. When looking at their own levels of participation, the respondents felt that they were not active enough even though they were aware of the importance of physical activity.

7.3.2 Perceived benefits and motivating factors regarding participation:

There was a high level of awareness among the young people interviewed that physical activity was important. Learners had a clear idea as to what physical activity was, and placed much emphasis on the health benefits of physical activity:

“You stay healthy and it builds the immune system.”

Female, 14 years

“Physical activity is important because it will help you live longer.”

Male, 13 years.

A marked difference was noted in what boys considered to be more beneficial than girls in regard to physical activity. Boys considered physical activity as being beneficial in building muscles, becoming strong and attractive, a mechanism which helps keep them out of trouble and something that if well looked into can lead to a profession. Girls, on the other hand, related physical activity benefits to weight maintenance, healthy diets, healthy minds and forming social relationships. Motivational factors that were highlighted for involvement in

physical activity included achievement, weight control, good shape for body and opportunity to socialise.

Major reported perceived benefits of physical activity are classified below according to major themes that emerged:

Major benefits

Typical comments

Physiological

Disease prevention

“I won’t get all those adult diseases.”

Female, 13 years

Increase life span

“Helps us to live longer.’

Male, 13 years

Causes weight loss

“It causes weight loss.”

Female, 15 years

Improves muscle strength

“Helps improve my muscle strength.”

Male, 16 years

Social (fun and interaction with friends)

Fun/enjoyment

“It’s the fun part that’s great without the pressure.”

Male, 15 years

Socialising

“It allows you to make friends.”

Female, 13 years

Psychological (self-esteem and decreased stress levels)

Confidence

“When I achieve my goals it gives me more confidence.”

Male, 14 years

Developing discipline "I have developed discipline since taking part in sport"

Female, 15 years

Enjoying challenges "I enjoy the challenges that each new competition offers me."

Male, 14 years

Cognitive benefits

Enhances concentration "I study better after I have exercised."

Male, 17 years

Clears mind "I am able to think better."

Female, 16 years

Coping strategy

Stress relief "I can vent my anger on the courts."

Male, 17 years

Outlet for frustration "It takes my mind off the school work."

Female, 15 years

Anger relief "I am able to relieve all my frustration and anger in sport."

Male, 15 years

"When I'm angry I go and play soccer to blow off steam."

Male 16 years

7.3.3 Barriers to participation

It was possible to identify a number of barriers to participation in higher levels of physical activity among the learners. The barriers identified could be classified into four main themes, namely physical, psychosocial, environmental and financial. The feelings of self-consciousness about the body and the frustration at

having too little time due to homework and housework were common amongst the more senior girls. Financial constraints were a common barrier experienced by both boys and girls.

Major Barriers

Typical comments

Physical:

Illness

“I have asthma and prefer not to participate.”

Female, 14 years

Injury

“I don’t do anything since I hurt my knee two years ago.”

Male, 15 years

Menstruation

“I hate doing sports while I have my periods.”

Female, 15 years

Psychosocial:

Time

“Don’t have time - have to do all the housework.”

Female, 17 years

No energy

“Too tired after doing house/homework.”

Female, 16 years

No enjoyment

“It’s too much effort and you feel sweaty.”

Female, 14 years

Self-consciousness

“Other children are better than me.”

(image among peers)

“I am too shy to show my legs.”

Female, 15 years

Lack of support “I don’t get motivation from home.”
Female, 13 years.

Environment:

Availability of facilities “Facilities are vandalized by gangsters.”
Male, 14 years

Safety “I am scared of the gangsters.”
Female, 14 years

Financial:

Cost of public transport “I don’t have money to get to the sports field.”
Male, 14 & 18years

Costliness “Belonging to clubs is too costly.”
Male, 15 years

Equipment “Schools should buy hockey sticks from school fees to
make the sport accessible.”
Male, 15 years.

7.3.4 Recommendations

Respondents were also asked what would help them become more physically active and a number of suggestions were made which included:

- Facilities that are not available at school should be offered in the community and should be organized so that there is some form of control.
- Certain activities should be introduced at libraries, as this is a place of safety.

- To prevent vandalism and to offer more safety, there should be security at the sports facilities.
- It is best that sports be offered at schools as an extra-mural activity but transport from school must be provided as walking home later than normal school dismissal time is not safe.
- More role models should come to schools and give motivational speeches about the importance of physical activity.
- Teachers with skills to promote sport and physical activity should be re-introduced at schools.
- Sports days should be advertised at schools as schools advertise school carnivals.
- Physical education periods should be re-introduced at schools. There should be more such periods per week or they should be longer to be effective.
- The police should be involved in controlling the gangs so that it is safe to go to the available sporting facilities.
- Parents should be involved as coaches at schools for the wider expertise in various sporting codes.
- Sports afternoons should be organised in the communities.

7.4 DISCUSSION

According to Catford and Nutbeam (1984), health promotion seeks to improve or protect health through behavioural, socio-economic, biological and environmental changes. It embraces the concepts of disease prevention as well as the notion of positive health. Health education is seen as a core component of health promotion. In order for health professionals to promote good health in communities, they need to have a clear understanding of the communities' beliefs, expectations and barriers. This understanding will assist in ensuring that health education programmes are relevant and well received. The results of the current study offer insight into the perceived benefits of physical activity as well as the barriers that are encountered and possible solutions to the problem. In line with other studies, findings from this study suggest that the high school learners are aware of the importance of physical activity (Mitchell 1996).

Clear gender differences emerged as to the learners' motivation for participation as well as their views on the benefits of physical activity. Male learners focused on the competitive aspect, confidence building and challenges faced whereas the female learners focused on the socialising aspect as well as on image building. The strong cognitive, psychological, social and coping strategies that were highlighted as benefits by the learners have the potential to help health professionals design programmes that would encourage participation. These findings are similar to those highlighted by Mulvihill et al. (2000) and O'Dea (2003).

Participation in physical activity by the young people is influenced by various factors. These could be both positive and negative factors. The barriers identified in this study could be classified into four main themes namely, physical, psychosocial, environmental and financial. The current study indicates that learners seemed eager to participate but it was evident that there were definite constraints that prevent them from participating. This is similar to findings from other studies, which identified barriers to physical activity participation as a lack of practical and material resources, poor body or self image as well as lack of time (Mitchell 1996; Taylor, Yancey, Leslie, Murray, Cummings, Sharkey, Wert, James, Miles and McCarthy 1999; Mulvihill et al. 2000).

7.5 SUMMARY

The study highlights clear barriers to participation in physical activity by the learners. This information is relevant for various stakeholders such as the Department of Education, Health and Sports and Recreation. In addition, the study also highlights the critical role of physical education in schools as learners face to many barriers to physical activity participation in the community. Physical education can contribute directly to the physical health and fitness of the learners as well as assisting the learners in making informed decisions about the value of leading a physically active lifestyle. This narrative of views from the learners themselves will assist the researcher in formulating a relevant health promotion programme for this community.

CHAPTER EIGHT

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

8.1 DISCUSSION

This study originated from concerns about the perceived levels of physical inactivity among the youth of the Belhar community in the Western Cape. The study aimed to assess the daily habitual physical activity patterns of learners in the four high schools in the selected local community through a 24-hour recall over a period of seven consecutive days. This was used to determine the physical activity levels of the learners. In addition, the study assessed some of the components of health-related fitness of the learners. The study also explored the views of the learners on their participation in physical activities.

The cross-sectional data of physical activity levels showed that over 80% of the learners' time was spent in sedentary activities. In addition, about 32% of the high school learners (28% of male learners, n=477; and 36% of female learners, n=474) in this community were classified as being physically inactive. Fifty-four percent of the physically inactive learners identified environmental safety as an obstacle to participation in physical activity. In most of the components for health-related fitness, it was found that less than 50% of the inactive learners were able to meet the norms for various health-related fitness tests. In addition, 41% of the physically inactive learners smoked cigarettes while 45% of the same group drank alcohol.

When the learners were questioned about their views on physical activity participation, a number of barriers to participation in higher levels of physical activity were identified. The barriers identified could be classified into four main themes, namely physical, psychosocial, environmental and financial. The feelings of self-consciousness about the body and their view that they had too little time due to homework and housework were common among the older girls. Financial constraints were a common barrier for both boys and girls. In addition, issues concerning vandalism, bullying and lack of discipline were also raised specifically around physical education/activity at schools.

Chronic diseases are of the largest cause of death in the world, led by cardiovascular disease and followed by cancer and diabetes mellitus (WHO 2003b). These leading diseases share key risk factors such as tobacco use, unhealthy diets, lack of physical activity, and alcohol use (WHR 2002). The study also identified that physically inactive learners were engaged in health risk behaviours like smoking and drinking. The outcome of this study thus suggests that the problem of physical inactivity in the Belhar community should be of great concern as it places the learners at a higher risk of developing chronic diseases of lifestyle, as they grow older. The personal, social and economic costs of the chronic diseases of lifestyle with accompanying disability as well as possible loss in the quality of life may be high. If the numbers from this study is extrapolated for the province as well as nationally, it could become a large concern for the government. If all of these are coupled with the rising threat of HIV/aids, the

combined impact may be devastating on the nation, unless effective preventive and promotive strategies are put in place. The complex disease pattern places high demands on the health services currently undergoing transformation in the face of shrinking budgets and other infrastructure demands. Little recognition is given to magnitude of the burden of chronic diseases of lifestyle and their risk factors. Yach, Hawkes, Gould and Hofman (2004) stated that the increased burden of chronic diseases, in countries that also have a high infectious disease burden, is straining their health services. The need thus arises for an appropriate intervention programme to be put in place before the future impact of the current picture becomes a major public health concern.

Currently in South Africa, government has recognised the need for planting the seed of health consciousness in the minds of our learners. There are many initiatives underway to promote healthy lifestyles and physical activity among young people. Based on the Youth Risk Behaviour Survey conducted in South Africa in 2002, the promotion of healthy lifestyles has been placed on the health agenda (Ministry of Health, South Africa 2004). Multi-stakeholder discussions have been taking place with a view to formulate a country strategy for the promotion of healthy lifestyles. The revival of a national school sports programme is closely aligned to this mass participation programme. The Ministers of the Departments of Sport and Recreation and Education have decided to join forces to introduce an effective programme called Sports School in 2005. The Department of Education has elected to take responsibility for the curricular

aspects of the programme, which includes the re-introduction of Physical Education at schools. In addition, the introduction of the health-promoting schools concept in various provinces has allowed for schools to set up structures that co-ordinate activity and projects to promote health in schools.

This thesis contributes to a clearer understanding of issues related to physical inactivity in this study population. It highlights the need for the monitoring and surveillance of physical activity levels and other risk factors for chronic diseases of lifestyle and it highlights the need for the planning of an intervention relevant to this community. It can be seen that even though government departments are aiming at implementing regional, provincial and national programmes, the effectiveness of these programmes is questioned if key stakeholders are not involved in the decision-making process.

8.2 RECOMMENDATIONS

Based on the work presented, the following recommendations are made specifically for the community. Broader recommendations are also included.

1. Chronic diseases of lifestyle need to be placed on the political and health agenda of the Belhar community.
 - All stakeholders need to be informed about the evidence of chronic disease risk factors in this community.
 - Knowledge about risk factors and the impact thereof needs to be disseminated to the Belhar community.

2. Measures to control risk factors for chronic diseases of lifestyle need to be implemented in this community.
 - Multisectoral action must be taken to tackle chronic diseases.
 - A study to evaluate the financial cost of the burden of chronic diseases of lifestyle needs to be undertaken.
 - A community sports day that could become an annual event on the community calendar could be organised by the youth, as this will assist in empowering them.
3. Community partnerships should be established with tertiary institutions to conduct research to monitor the impact of recommendations made for this community.
4. Awareness programmes should be initiated by existing forums in the community, such as the Belhar Health Forum and Belhar Police Forum. Issues such as public safety, risks of substance abuse and law enforcement in schools should be targeted

Local authority and provincial recommendations:

1. Initiatives like those of the Departments of Sport and Recreation and Education should be maintained and expanded upon.
2. A multi-sectoral workshop should be held to encourage a multi-sectoral approach to physical activity promotion. One of the key strategies for the future should be a more organised approach to physical activity across sectors and in developing initiatives that are

linked. All key stakeholders, including the target groups and communities, should be involved at the planning stages of programmes.

3. Several specific settings could be identified through which intervention could be administered if multisectoral. These include primary care practice settings, schools with emphasis on secondary schools, mass media campaigns and community-wide interventions. In addition, research should influence policy to promote physical activity.

Figure 8.1 presents a model that illustrates how healthy youth and physically active lifestyles can be encouraged. It represents a flower with its petals and roots. The model is firmly rooted in the community and thus encourages community participation and community capacity building. The model uses a holistic approach and sees the school on a continuum of services connected to the larger community. The stem indicates that Health Schools activities are dependent on research and ongoing evaluation, thus the link to a tertiary institution such as the University of the Western Cape.

The petals identify the key elements associated with the schools, such as access to health and social supports. Schools can refer families to effective health and social services available in the community especially with the prevalence of health risk behaviours amongst the youth. The second petal,

Integrated Instructional Strategies, allows for integration of classroom learning into the home and community environments. Curriculum 2005 allows academic activities around health promotion to become integrated into the learners' homes and communities. The third petal focuses on healthy physical and social environments. This is a clear need expressed by the youth, and the schools can be the basis for cultivating a culture that respects and tolerates healthy living as schools are the one place through which all youth have to pass through. The fourth petal highlights community partnerships. This study population is grounded in a community rich in community organisations. The school is thus seen as the hub with strong links to all the community organisations. Finally, the promotion of healthy lifestyle behaviour should become the vision of the schools in this community. Schools can empower learners and their families with the knowledge, attitudes, skills and behaviour that are needed to promote healthy, active lifestyles. This can be done through education, policy development and role modelling.

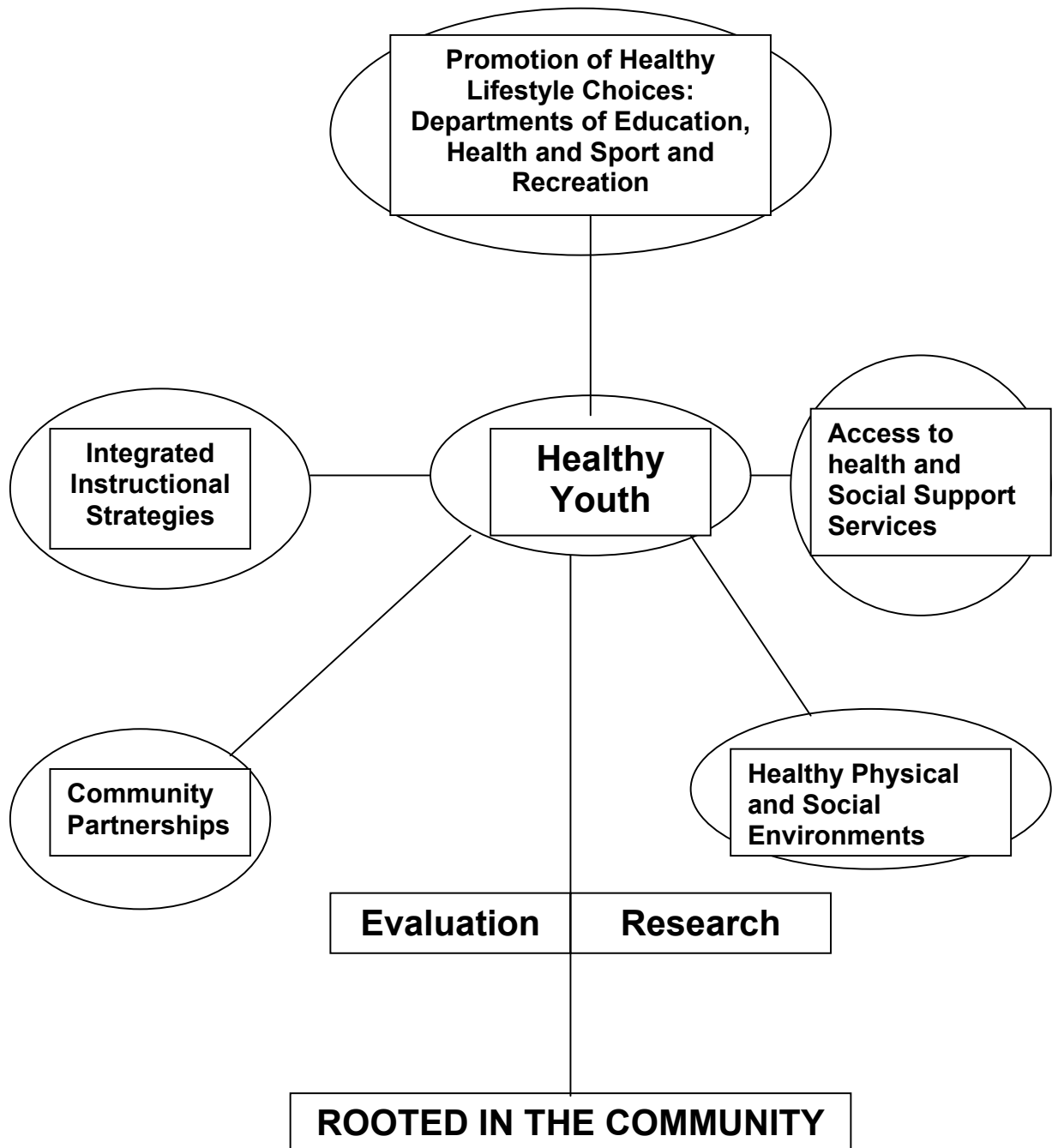
Thus the vision of this model is to have healthy youth, schools and communities. The goals of the model are to:

- increase the understanding between health and education
- strengthen intersectoral partnerships at both the local and the provincial level
- increase the visibility of health in the schools and the community
- empower the community to actively participate in the improvement of their health status

- increase access to health promotion and protection, disease prevention and intervention services

This model acknowledges that the neighbourhood has an effect on the health status of the population. In addition, it acknowledges that families and communities are partners positioned to positively influence the health of children and adolescents. Finally, priority issues that should be addressed include physical activity, nutrition and diet, safety, substance abuse, sexual health and mental health.

FIGURE 8.1 HEALTHY SCHOOLS MODEL (BASED ON THE HEALTHY SCHOOLS INITIATIVE IN CANADA)



8.3 LIMITATIONS OF THE STUDY

1. Reliability testing of the instruments was not within the scope of this study due to financial constraints
2. Manual evaluation of the fitness tests were done instead of using the computer program that facilitates the process
3. Although norms were used in the fitness testing, they were not based on South African normative data.

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6. DO YOU SUFFER FROM ANY MEDICAL ILLNESS THAT MAY IN SOME WAY LIMIT DAILY PHYSICAL ACTIVITY?

If yes, How often do you drink?

- 1. Yes 2. No

If yes, specify:.....

7. DO YOU PARTICIPATE IN PHYSICAL EDUCATION AT SCHOOL?

- 1. Yes 2. No

If yes, how often?

- 1. once a week for more than 20 minutes
- 2. once a week for less than 20 minutes
- 3. 2-3 times per week for more than 20 minutes/session
- 4. daily
- 5. other, specify.....

8. DO YOU PARTICIPATE IN EXTRA-MURAL ACTIVITIES?

- 1. Yes 2. No

If yes, state which:.....

9. HOW MANY MEMBERS IN YOUR FAMILY?

- 1. 2 2. 3
- 3. 4 4. Other, (specify).....

10. WHAT IS YOUR STATUS IN YOUR FAMILY?

- 1. Eldest 2. Youngest
- 3. 2nd 4. Other, (specify).....

11. WHAT IS YOUR PARENTS' OCCUPATION?

Mother:

- 1. Unemployed 2. Teacher 3. Labourer
- 4. Machinist 5. Self-employed 6. Other (specify).....

Father

1. Unemployed
2. Teacher
3. Labourer
4. Machinist
5. Self-employed
6. Other (specify).....

12. WHAT IS THE HIGHEST EDUCATION STATUS OF YOUR PARENTS?

Mother:

1. No formal education
2. Primary Education
3. Secondary Education
4. Tertiary Education
5. Other (specify).....

Father:

1. No formal education
2. Primary Education
3. Secondary Education
4. Tertiary Education
5. Other (specify).....

13. WHAT IS THE TOTAL INCOME OF YOUR PARENTS?

1. Less than R1000 per month
2. R1001 – R2000 per month
3. R2001 – R3000 per month
4. More than R3000 per month

14. IN WHICH SECTION OF BELHAR DO YOU LIVE?

1. Old Belhar
2. Extension 13
3. Musicals
4. Self-help
5. Other, specify.....

15. HOW WOULD YOU CLASSIFY YOUR NEIGHBOURHOOD?

1. Safe
2. Unsafe

16. LIST THE RECREATIONAL FACILITIES AVAILABLE IN YOUR AREA?

1.
2.
3.
4.
5.

17. DO YOUR PARENTS PARTICIPATE IN ANY FORM OF PHYSICAL ACTIVITY?

1. Yes
2. No

**PART 2
SECTION B: ANTHROPEMETRY**

Name: _____

Weight: (kg)

Height: (m)

Blood Pressure: (mmHg)

Pulse Rate:

SKINFOLD	1	2	Average
Biceps			
Triceps			
Subscapular			
Suprailiac			
Calf			
Thigh			
Abdominal			

RESULTS	
Sum of skinfolds	(mm)
% body fat	(%)
Estimated fat mass	(kg)
Lean muscle mass	(kg)

WHR

	1	2	Average
Waist (cm)			
Hip (cm)			

FLEXIBILITY

Sit and Reach Test:

1	2	Average

MUSCLE STRENGTH and ENDURANCE

Sit ups/minute:

Push ups/minute:

CARDIOVASCULAR FITNESS

Heart Rate at rest: (bpm)
Recovery Heart

rate:.....(bpm)

Multistage Shuttle Run (Bleep test)

Shuttle Run	Score
1	
2	
3	
4	
5	
6	

Date:

The Principal
School

Dear Sir/Madam

Re: Physical activity and physical fitness testing of high school learners in Belhar research project

A research project into the testing of physical activity and physical fitness levels of high school learners in Belhar is currently being undertaken. The principal researchers are Mrs José Frantz (University of the Western Cape) and Ms Mary Mwangi , a student in the Department of Physiotherapy, University of the Western Cape.

The aims of the project are to determine the physical activity patterns of high school learners over a one-week period and to determine the physical fitness levels of these learners. Fitness testing will be done at the school by the researchers mentioned above.

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.

Your Sincerely

Jose Frantz

Appendix 5

Date:

Dear parent\guardian.

Re: Physical activity levels and physical fitness testing of high school learners in Belhar research project

A research project into the testing of physical activity levels and physical fitness levels of high school learners in Belhar is currently being undertaken. The principal researchers are Mrs José Frantz (University of the Western Cape) and Ms Mary Mwangi , a student in the Department of Physiotherapy, University of the Western Cape.

The aims of the project are to determine the physical activity patterns of high school learners over a one-week period and to determine the physical fitness levels of these learners. The researchers mentioned above and trained research assistants will do fitness testing at the school.

The child is expected to complete a questionnaire and all testing will be non-invasive. Strict confidentiality will be observed regarding all information from your child. The participants will also be treated with the utmost respect at all times. 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 your consent and return it to the school.

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

Signature

Date

Yours Sincerely

José Frantz

Appendix 6

Date:

Dear learner

Re: Physical activity levels and physical fitness testing of high school learners in Belhar research project

A research project into the testing of physical activity levels and physical fitness levels of high school learners in Belhar is currently being undertaken. The principal researchers are Mrs José Frantz (University of the Western Cape) and Ms Mary Mwangi , a student in the Department of Physiotherapy, University of the Western Cape.

The aims of the project are to determine the physical activity patterns of high school learners over a one-week period and to determine the physical fitness levels of these learners. The researchers mentioned above and trained research assistants will do fitness testing at the school.

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

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

Signature

Date

Yours Sincerely

José Frantz

Appendix 7:

STATION ONE

Resting heart rate and Blood Pressure measurements

Procedure

Resting heart rate and blood pressure

- subject must sit for at least 5 minutes prior to testing
- 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 must be recorded as well as the resting pulse rate
- Blood pressure reading must be done twice at one minute intervals

STATION TWO: Anthropometric measurements

Weight:

Procedure:

- Ask learners to remove all excess clothes and to stand only in a training shorts and t-shirt.
- the weight of the subject must be recorded in kilograms

STATION THREE

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

Procedure:

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

STATION FOUR

Waist to Hip ratio (WHR)

Waist:

With abdomen relaxed, a horizontal measure is taken at the level of the narrowest part of the torso just below the bottom part of the rib cage using a tape measure. The learner should be standing upright.

Hip:

While subject stands erect, a horizontal measure is taken at the level of maximum circumference of the hips/buttocks.

Procedure:

- subject should stand with feet together and the arms at the sides
- measure waist and hip circumference
- be sure that the tape is horizontal and around the entire circumference
- the tape should be pulled snugly but should not cause an indentation in the skin
- record scores to the nearest millimeter
- take duplicate measures
- record average of the scores

STATION FIVE

Skin fold measurements

The areas to be measured included the triceps, suprailiac crest and calf.

Procedure

- Measurements must be taken on the right side of the body with participant in standing
- Skin fold sites must be carefully identified, measured and marked
- With caliper in right hand, grasp the skin fold with thumb and index finger of left hand
- Place caliper halfway between crest and base of fold
- Gently and fully release caliper pressure
- Maintain pinch while reading dial
- Take duplicate measures at each site
- Re-measure if 1st and 2nd reading is not within 1-2 mm
- Record average score

Triceps

The arm must be held freely along the side of the body. A vertical fold must be made on the posterior midline of upper arm, midway between the acromion and olecranon process.

Iliac crest

The skin fold pinch is taken at a site immediately above the iliac crest. The fold is an oblique line following the natural angle of the iliac crest.

Calf

A vertical pinch is made at the point of largest circumference on medial side of the calf.

STATION SIX

Flexibility

Flexibility must be measured using the sit and reach test that measured combined shoulder, trunk and hamstring flexibility. The test will be conducted using a specially designed sit and reach box.

Procedure:

- Subjects must wear shorts and t-shirts and be barefoot
- Subjects must sit facing the flexibility box with knees fully extended and feet slightly apart
- Feet must be flat against the board
- The subject must be told to extend the arm straight forward with the hands placed on top of each other
- Reach directly forward, palms down as far as possible along the measuring scale
- Movement should be slow and controlled
- No fast, jerking motions
- Tester must ensure that subject's knees do not bend
- The extended position must be held for one to two seconds while reading is recorded. The score recorded must be the distance of the fingers beyond the toes.
- Duplicate measures must be taken to the nearest cm
- An average measurement must be recorded

STATION SEVEN

Muscular Strength and Endurance

This station measures muscular strength and endurance using the pushup test to assess the upper body muscle strength and endurance.

Male pushup test

Procedure:

- The body is rigid and straight as for a push up with toes tucked in and hands approximately shoulder-width apart, straight under the shoulders and with fingers facing forward (the toes are the pivot point).
- The tester places a fist beneath the subject's chest
- The subject starts from the up position with arms fully extended and lowers himself down until his chest touches the fist of the tester.
- The subject's back remains perfectly straight throughout
- The subject then raises himself back up to the starting position. Once the subject has returned to the starting position, it is counted as one repetition.
- Rest is allowed in the up position only
- The score is the total number of pushups performed in one minute

Female Pushup test

Procedure:

- Subject assumes the bend-knee position for a pushup (the knees are the pivot point)
- Hands are slightly ahead of her shoulders in the up position and will be directly below the shoulders in the down position
- The subject lowers herself down to approximately fist distance from the floor
- Her back remains perfectly straight throughout
- Subject then raises herself back up to the starting position
- Rest is allowed in the up position only.
- The score is the total number of pushups recorded per minute

STATION EIGHT

Sit up test

The one-minute sit up test will be used to measure abdominal strength and endurance. The starting position must be subject's back on the floor, knees bent to a 45 degree angle, feet 6-9 cm from buttocks and feet flat on the floor, and hands behind head with elbows facing outward.

Procedure

- Subject curls head and upper back upward, until chest touches the thighs.
- Elbows remain facing outward with fingers laced and held behind head
- The feet and buttocks must remain on the floor during the entire curl up
- Subject then returns back to starting position
- Subject may rest in starting position
- The total number of complete sit ups is recorded per minute

STATION NINE

Cardiorespiratory Fitness Assessment

Beep test/PACER test

This test involves continuous running between two lines 20m apart in time to recorded beeps. The time between recorded beeps decreased with each level. The initial running velocity will be 8.5 km/hr, which increases by 0.5 km/hr each minute/level. The athletes score recorded will be the level and number of shuttles reached before they are unable to keep up with the recorded beeps.