

**Monitoring the Change of Health Behaviour of
Learners in Selected Health Promoting Schools in
KwaZulu-Natal**

By

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**A thesis submitted in part-fulfilment of the requirements for the
degree of Doctor of Philosophy in the Faculty of Health Science at the
University of KwaZulu-Natal**

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Date Submitted: February 2009

DECLARATION

I declare that “Monitoring the Change of Health Behaviour of Learners in Selected Health Promoting Schools in KwaZulu-Natal” is my own work, that it has not been submitted, or part of it, for any degree or examination at any other university, and that all sources I have used or quoted have been indicated and acknowledged by means of complete references.

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DEDICATION

To my mum, thank you for all your love, patience, and support.

ACKNOWLEDGEMENTS

I wish to place on record my sincere thank-you and appreciation to the following individuals and institutions that have made this study possible.

Professor Y. Coopoo from the Centre for Exercise Science & Sports Medicine, University of Witwatersrand, for his invaluable guidance, support, and thorough supervision in the shaping of this thesis.

To all the participants who so willingly participated in the study with total commitment.

To the school health nurses who assisted throughout the intervention process.

A special thank you to Mrs Lynette Julius from the Department of Health for all your support, guidance, encouragement and most of all, your friendship.

A grateful thanks to the KwaZulu-Natal Departments of Health and Education for their financial support and guidance throughout the duration of the study.

To my husband Divasan for his love, patience, and support.

Finally, to friends, family and colleagues for your encouragement, guidance, and "words of wisdom."

ABSTRACT

Introduction: *The opportunity for children to be physically active during school hours is rapidly decreasing in schools worldwide. Nutrition and physical activity intervention studies have been designed to incorporate health-related Physical Education (PE) concepts and uses physical activity in PE classes as the primary outcome. This study evaluated the effects of a nutrition and physical activity (NAP) intervention incorporated within classroom-based lessons, during lunch-breaks and after school.*

Methods: *A convenient sample of eleven (three urban; four peri-rural; and four rural) primary schools in KwaZulu-Natal, South Africa participated in an 18-month school-based intervention programme. Learners (n=798) aged 10-15 years completed a NAP questionnaire and participated in a battery of fitness tests pre- and post-intervention. Principals and educators volunteered and were trained to implement the intervention in their respective schools. Educators were interviewed pre- and post-intervention. The NAP intervention was designed to introduce various methods of physical activity and healthy nutritional habits within the school existing curriculum. Incremental changes and instructional strategies were made to lessons and not the entire lesson plan changed. Classroom-based intervention materials were developed to provide cost-effective and more importantly a sustainable intervention. Nutritional changes were*

implemented in school tuck-shops with regard to food and beverages sold to learners.

Results: *Post-intervention results showed that physical activity participation among learners ranged from 45-215 minutes per week of moderate to vigorous physical activity during school hours, excluding lunch-breaks. A significant increase ($p < 0.05$) in number of sporting activities learners engaged in during PE/Life Orientation lessons was demonstrated. Minimal increases in flexibility (sit-and-reach test) scores and significant ($p < 0.05$) increases in abdominal strength (sit-ups) for both boys and girls were measured post-intervention. Educators reported that learners were motivated to participate in physical activity, including indigenous games and various sports (cricket, football, netball, volleyball) during lunch-breaks. Furthermore, school nutrition policies were developed as a result of the intervention.*

Discussion and Conclusions: *Findings show that a school-based physical activity intervention can promote positive short-term effects on learners PA participation. A multi-component behavioural health intervention can improve learners' health behaviour and increase physical activity participation during formal instruction and lunch-breaks. Further research needs to assess the long-term effects of the intervention.*

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

The global prevalence of chronic, non-communicable diseases is on the rise with developing countries experiencing the greatest burden and in which cardiovascular disease is already the leading cause of mortality (Sen & Bonita, 2000; Yusuf, Reddy, & Ôunpuu, 2001). Similarly, the number of persons with diabetes is projected to double between 2000 and 2030, with over 80% or 300 million from developing countries. This increase in the prevalence of chronic diseases including obesity, unhealthy diet, smoking and physical inactivity in the developing world has been attributed to changes in lifestyle associated with development and urban migration (Wild, Roglic, Green, Sicree, & King, 2004). The urgent need to address these risk factors in both developed and developing countries is reflected in the World Health Organisation Global Strategy on Diet and Physical Activity for Health (World Health Organisation, 2004).

Importantly, these risk behaviours have shown to track from childhood, with Body Mass Index (BMI) levels in childhood strongly predictive of adult obesity (Freedman, Khan, Mei, Dietz, Srinivasan, & Berenson, 2002). South Africa is a country of paradox, where obesity in children co-exists with stunting and early nutritional deprivation. For example, in primary school children 22% of girls and 17% of boys are overweight or obese (Armstrong, Lambert, Sharwood, & Lambert,

2006). In children under the age of nine years overweight and stunting are equally prevalent, and the risk of obesity in stunted children is nearly two-fold higher, with potentially long term negative health consequences (Steyn, Labadarios, Maunder, Nell, & Lombard, 2005).

A change in dietary patterns in recent decades, including an increased consumption of fizzy-drinks and candy and a decreased consumption of fruit and vegetables in many countries has been implicated in the increase in childhood and adolescent obesity (Frazao, 1999; French, Story, & Jeffery, 2001). In addition, physical activity amongst learners in schools has declined as a result of an increase in time watching television, the advent of the household computer and a decrease in the opportunities for physical activity in schools and communities (Robinson & Godbey, 1997; Frazao, 1999).

Consequently, it is important to note that patterns of healthy nutritional habits and physical activity acquired during childhood and adolescence are more likely to be maintained throughout one's life span, thus providing the basis for active and healthy aging (Sallis & Patrick, 1994; Caspersen, Nixon, & DuRant, 1998; Bouchard, 2001; Williams, Hayman, Daniels, Robinson, Steinberger, Paridon, & Bazzarre, 2002)

South African children also demonstrate unhealthy eating habits with school tuck-shop choices favouring cool drinks, chips and fried cakes (70%) and urban primary school learners report eating fruit or vegetables less than three times per week (Temple, Steyn, Myburgh, & Nel, 2006). Of concern is that many schools rely on income generated from these tuck-shops for supplemental income and informal vendors are also very common, and typically sell foods of low nutritional value, high in fats and sugars.

Similarly, studies (Reddy, Panday, Swart, Jinabhai, Amosun, James, Monyeki, Stevens, Morejele, Kambaran, Omardien, & Van den Borne, 2003; McVeigh, Norris, Cameron, & Pettifor, 2004) suggest that 40% of children and youth are participating in little or no moderate to vigorous activity each week. With only just over half of high school learners reporting regularly scheduled physical education classes, less than 60% of these engage in vigorous activity during the actual classes, and in fact, over 30% do not participate (Reddy et al., 2003). In primary school learners, engagement in physical education classes is even lower than in high school (McVeigh et al., 2004).

Schools are an established setting for health promotion activity, and this setting may influence health related beliefs and behaviours early in life before they are established as adult patterns (Tones & Tilford, 2001). An additional potential

benefit is that by improving the health of school children, educational performance and learning may be enhanced (Symons, Cinelli, James, & Groff, 1997).

Therefore, school-based physical activity interventions are advantageous since programmes can become institutionalised into the regular school curriculum, staff development and other infrastructures (Stone, McKenzie, Welk, & Booth, 1998).

1.2 The Purpose of the Study

The World Health Report of 2002 (World Health Organization, 2003) on "Reducing Risks, Promoting Healthy Living" represents one of the largest research projects ever undertaken by the World Health Organisation (WHO). It collaborates with experts worldwide and data collected and analysed can be used to predict global health for many years to come. The report describes the amount of disease, disability and mortality in the world today that can be attributed to a selected number of the most important risks to human health.

The World Health Report of 2002 further states that non-communicable diseases cause 60% of global deaths and 47% of burden of disease. In terms of burden of disease the top ten risk factors, globally and regionally, are - underweight, unsafe sex, high blood pressure, tobacco consumption, unsafe water, sanitation and hygiene, iron deficiency, indoor smoke from solid fuels, high cholesterol and obesity that can lead to disease. The 60% and 47% estimates are expected to rise to 73% and 60% respectively by 2020 (World Health Organisation, 2003).

Physical inactivity was listed among the major risks contributing to non-communicable diseases, global mortality and morbidity. The global burden of disease, in particular high blood pressure, high cholesterol and obesity is influenced by physical inactivity either directly or through its impact on other major risks. Tobacco use and poor diet along with physical inactivity are also major risk factors for chronic diseases (World Health Organisation, 2003).

Taking into consideration the results from the World Health Report of 2002, "The Move for Health Initiative" was recommended as part of the solution to help improve health globally. The aims of this initiative were in particular at promoting sustained national and local physical activity initiatives, policies, and programmes and at increasing regular participation in physical activity of various population groups, men and women, of all ages and conditions, in all domains (leisure-time, transport, work) and settings (school, community, home, workplace) (World Health Organisation, 2003).

A series of consultations on the Move for Health Initiative/Day were undertaken in the last quarter of 2002 during meetings and global events involving many partners and representatives of State Members including World Health Organisation Collaborating Centres, United Nations Agencies, International Olympic Committee, International Council for Sport Sciences and Physical Education and the World Heart Foundation.

A strong national and local political commitment and support was an essential prerequisite for the launch and sustainability of such a health initiative at country level. Numerous countries worldwide have initiated and driven this concept, including South Africa. South Africa is currently working on a Healthy Lifestyle Programme for the nation to improve its people's health status.

There are four elements to the healthy lifestyle programme, namely,

1. Good nutrition
2. **Regular physical activity**
3. Combating misuse of alcohol and tobacco control
4. As well as promoting safe sexual behaviour

In South Africa, "Move for Health" has been launched. This is a national and global initiative, promoting physical activity as part of a healthy lifestyle for all. The "Move for Health" initiative was implemented to serve as an umbrella for countries to continue relevant activities for promoting physical activity and healthy lifestyles/behaviours.

1.2.1 The Move for Health initiative in South Africa

The South African Department of Health, has incorporated "Move for Health" initiative into its broader Healthy Lifestyles Programme. In 2004, a multi-sectoral national task team was established to drive this programme. In this regard there has been much support and commitment from Private Health Sector partners,

Non-Governmental Organisations, Community Based Organisations and Institutions of Higher Learning.

As part of the Healthy Lifestyles programme, "**Vuka South Africa – Move for your Health**" was initiated. This initiative can be seen as an opportunity to lobby for health, fitness and psychological benefits received from physical activity.

The focus of the current study centres around the Vuka South Africa - Move for your Health initiative. Move for Health refers particularly to the need for daily amounts of cumulative moderate to vigorous physical activities of any type that each individual can perform anywhere to improve health. In addition, it refers to how individuals, communities and nations can promote their health and well being through healthy lifestyles.

International groups recommend that children should participate in at least 30 minutes of moderate to vigorous physical activity on most days, (Sallis & Patrick, 1994) although other consensus panels have recommended one (Dietary Guidelines Advisory Committee, 2000; Cavill, Biddle, & Sallis, 2001) or more (Corbin & Pangrazi, 1999) hours of physical activity per day for children. A basic function of physical education is to engage learners in moderate to vigorous physical activity, a requirement for experiencing both health and motor skill development benefits (McKenzie, Sallis, Faucette, Roby, & Kolody, 1993). By providing opportunities for

physical activity, quality physical education can make important contributions to public health (Sallis & McKenzie, 1991).

With this health initiative in mind, the purpose of this study is to determine the effects of a nutrition and physical activity intervention on learners in selected schools in KwaZulu-Natal.

1.3 Statement of the Problem

Unhealthy diet and a decrease in physical activity among learners in schools have confirmed the need for health behaviour change and or modification.

1.4 Rationale

Being overweight has become a major public health problem in South Africa. This is as a result of physical inactivity and unhealthy dietary patterns. The South African Demographic Survey (Department Of Health & Medical Research Council, 2002) reveals that 23% of men and 57% of women aged 15 years and older were found to be overweight.

Amongst youth, 17.2% of adolescents were found to be overweight in the Youth Risk Behaviour Survey (YRBS) conducted in our public schools in 2002 (Reddy et al., 2003). Significantly more females (25%) than males (6.9%) are overweight. The YRBS further reveals that the South African adolescents are physically inactive

and 25% (1 in 4) of them watch television for more than three hours per day. Girls are at greater risk for physical inactivity than their male counterparts.

1.4.1 Physical activity

There is an increased prevalence of inactivity or sedentary living in South African children and youth. Our youth are at an increased risk of being inactive due to a number of factors, including a lack of safe playing areas and sporting facilities, a lack of opportunities available to be active, the increased use of technology-based entertainment and insufficient physical activity during the school day. Since attitudes to life-long physical activity and health are determined in part by both the maternal attitude to activity and exercise in the home environment, as well as the learners' experiences of participation in physical activity, sport and play at school, it is clear that there is a need for a nationwide intervention in an attempt to curb this exponential rise in sedentary behaviour.

Additional data (Reddy et al., 2003) shows that 9% of the South African youth are classified as underweight, 11.4% of youth are classified as stunted, whilst 17.2% of youth are overweight and a further 4% are classified as obese. The WHO (2004) states that both being underweight and overweight feature in the top ten risks in terms of the global burden of disease. Since both under- and over-nutrition develops over time, the prevention of these disorders is the most effective means for controlling them. Thus, key intervention strategies need to begin with school children.

Appropriate regular physical activity provides children with substantial physical, mental and social health gains and helps to maintain optimal health and function capacity throughout the individual's lifespan.

1.4.2 Nutrition and nutritional status

Studies from populations throughout the world have demonstrated a strong association between obesity and chronic diseases, especially diabetes type II, hypertension and cardiovascular diseases (Enas & Mehta, 1995). There is good evidence that obesity which begins in infancy and childhood, persists into adulthood, since BMI levels in childhood are strongly predictive of adult obesity (Dietz, 1998). In the Bogalusa Heart Study, overweight children (BMI > 95th percentile) at 2-5 years were found to be four times as likely to become overweight adults (Freedman, Khan, Serdula, Dietz, Srinivasan, & Berenson, 2005).

A high caloric dietary intake is the main risk factor for obesity in both children and adults. This, together with a high total fat intake, high saturated fat intake, high refined carbohydrate and free sugar intake, low fibre intake and low intake of fruits and vegetables; has been classified as a typical "western diet" which contributes to the development of numerous chronic diseases, including cardiovascular diseases and diabetes (World Health Organisation, 2003). With increased urbanisation in developing countries, traditional diets are rapidly being displaced by the "western diet". Overweight is already a problem of significance in many developing

countries. In South Africa, 16% of 13 year olds are overweight and obese (BMI \geq 25) and this increases to 26.4 % in 19 year olds and to 56% in urban black women (Reddy et al., 2003).

Collectively, these findings (Dietz, 1998; Reddy et al., 2003; World Health Organisation, 2003; Freedman et al., 2005) suggest that school and community programmes that promote regular participation in physical activity and optimal nutritional choices in children and youth could be amongst the most effective strategies for reducing the public health burden of chronic diseases associated with sedentary lifestyles. Programmes or interventions that provide children and youth with the knowledge, attitudes, motor skills, behavioural skills and confidence to participate in physical activity may establish a lifelong commitment to an active lifestyle.

1.4.3 Motivation for a school-based intervention

Schools are an established setting for health promotion activity with the theoretical advantages of influencing health related beliefs and behaviours early in the 'health career' before they are established as adult patterns. Children represent a large population who are present and hence accessible over prolonged periods, in a setting which is relatively sheltered and where education and learning is the norm. Influencing children in their formative years is a potential mechanism for influencing the emerging culture and health beliefs of society (St Leger, 2004).

Hence, schools can be seen as the ideal setting through which the health of the whole school community can be improved.

1.5 Objectives of the Study

The following objectives of the study were identified:

- to complete pre- and post-intervention testing
- to design and develop a realistic and sustainable school-based nutrition and physical activity intervention collaboratively with school educators
- to promote the development of school policies regarding physical activity and healthy nutrition

1.6 Significance of the Study

This study would contribute to the body of knowledge providing effective preventive measures to counter chronic diseases of lifestyle among primary school learners, thereby promoting good health.

It would provide a basis for future school-based nutrition and physical activity interventions in schools.

Evidence for stake-holders in the KwaZulu-Natal and South African Departments of Education and Health to incorporate school-based nutrition and physical activity interventions as part of the current school curriculum will be generated.

1.7 Hypothesis

- *Primary hypothesis*

A school-based physical activity intervention can increase the physical activity levels of learners.

- *Secondary hypothesis*

Nutrition and physical activity school policies can promote healthy nutritional choices and increase physical activity participation amongst learners during school hours.

1.8 Delimitations

Pilot study: Principals (n=4), selected educators (n=10) and learners (n=256) in grade six from two Health Promoting Schools and two Non-Health Promoting schools in KwaZulu-Natal volunteered to participate in this study for a period of six months.

Larger Study: Principals (n=11), selected educators (n=26) and learners (n=798) in grade six from eleven Health Promoting Schools in KwaZulu-Natal volunteered to participate in this study for a period of 18 months.

1.9 Limitations

The convenient sample for this study was not representative of all urban, peri-urban and rural school children in South Africa, therefore generalisations cannot be made.

Questionnaires were based on self-reports. This method can result in problems like memory bias, comprehensibility and concentration problems, however, each participant was personally attended to during the questionnaire completion.

Motivation is always a limitation when field tests are part of the testing programme, however, the researcher and research assistants attempted to motivate all participants equally.

1.10 Assumptions

- It is assumed that the information pertaining to the learner questionnaire was reliably reported by all participants.
- It is assumed that the participants performed physical fitness tests to their best ability during the testing procedures.
- It was further assumed that any minor degrees of non-compliance among the participants would not be sufficient to reduce the significance of the findings.

1.11 Definition of Terms

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

Aerobic capacity:	The capacity of a person to perform exercise over long periods of time.
Agility:	The ability to change the body's position, and requires a combination of balance, coordination, speed, reflexes and strength.
Anaerobic energy:	Energy that is produced without the use of oxygen.
Anaerobic power:	The maximal amount of anaerobic energy that can be produced per unit of time.
Anthropometry:	The study of human body measurement including height, weight, skinfold measurements and girth measurements.
Asthma:	A disease characterised by airway constriction, often leading to difficulty in breathing.
Battery:	A series of tests or test items.
Blood pressure:	The force exerted upon the walls of the blood vessels by the blood.
Body Composition:	Concerns the percentages of muscle, fat and body tissues.

Cardiovascular:	Of or pertaining to or involving the heart and blood vessels.
Cardiac Cycle:	The sequence of events occurring during one complete heartbeat.
Cholesterol:	A waxy, fatty substance found in the blood. Increased levels are associated with coronary artery disease.
Chronic diseases:	Diseases such as coronary artery disease, diabetes and hypertension occurring for a long duration or recurring frequently.
Coronary Artery	
Disease:	A disorder in which the cardiac muscle receives an inadequate amount of blood due to a disruption of its blood supply.
Diabetes:	A disease resulting from insulin deficiency in which there is an excessive amount of glucose in the blood.
Ergonomics:	The study of the relationship between workers and their environment.
Explosive Power:	The ability to gather maximum strength in a very short period of time.
Fitness tests:	Measures used to determine an individual's ability to perform specific activities involving the muscles and systems of the body.

Flexibility:	The ability of a joint or a series of joints to move through a pain-free range of motion.
Hypertension:	Also referred to as high blood pressure. A pathology that results in higher resting blood pressure due to genetic or lifestyle inefficiencies.
Intervention:	A set of activities designed to change the nutrition and physical activity behaviour of learners.
Learning Area:	A subject taught in the school curriculum, such as English, Mathematics.
Mean:	The arithmetic average of a set of scores.
Muscular Endurance:	The ability of a muscle or group of muscles to sustain repeated contractions against a resistance for an extended period of time.
Non-communicable disease:	A non-communicable disease is a disease which is not infectious. Such diseases may result from genetic or lifestyle factors. E.g. hypertension, diabetes, asthma.
Norms:	Performance standards recently derived and based on a large number of scores.
Nutrition:	The intake of food, considered in relation to the body's dietary needs.
Obesity:	The condition of being extremely overweight.

Overweight:	An individual's body composition with more body fat than is optimally healthy.
Physical activity:	Is any task/movement that causes the body to work harder than normal.
Physical fitness:	The functioning level of an individual's muscular strength, muscular endurance, cardiovascular endurance, power and flexibility.
Reliability:	The degree to which a measure is consistent and unchanged over a period of time.
Sample:	Any subgroup of a population.
Stadiometre:	An instrument used for the measurement of height.
Validity:	The degree to which interpretations of test scores lead to correct conclusions.

1.12 Abbreviations

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

ACSM	American College of Sports Medicine
BMI	Body mass index
bpm	Beats per minute
cm	Centimetres
DoE	Department of Education
DoH	Department of Health
EE	Energy expenditure
kg	Kilograms
km	Kilometres
HPS	Health promoting school
LO	Life Orientation
MPA	Moderate physical activity
MVPA	Moderate to vigorous physical activity
n	Sample size
p	Probability
PA	Physical activity
PE	Physical education
r	Correlation

SD

Standard deviation

VPA

Vigorous physical activity

WHO

World Health Organisation

CHAPTER TWO

LITERATURE REVIEW

In this chapter, South African learners will be profiled regarding their nutritional and physical activity (PA) status. Current literature regarding school-based nutrition and PA interventions will be presented. The physical fitness test battery administered in this study will also be described. Literature reviewed will be divided into the following sections:

Section A provides data on South African learners' nutrition and PA profiles.

Section B describes PA interventions. Furthermore, interventions designed specifically for females will also be described.

Section C describes a combination of nutrition and PA interventions as well as nutrition interventions only.

Finally, section D provides background information on the Eurofit physical fitness test battery.

SECTION A

2.1 Introduction

Good health is a major resource for social, economic and personal development and an important dimension of quality of life. Political, economic, social, cultural, environmental, behavioural and biological factors can all favour health or be harmful to it. Health promotion action aims at making these conditions favourable through the advocacy for health (World Health Organisation, 2004).

According to the Ottawa Health Charter (World Health Organisation, 1986), health promotion is the process of enabling people to increase control over and to improve, their health. To reach a state of complete physical, mental and social well-being, an individual or group must be able to identify and to realise aspirations, to satisfy needs and to change or cope with the environment. Health can therefore be seen as a resource for everyday life, not the objective of living.

High blood pressure, raised cholesterol levels, diabetes and the diseases linked to them has been thought to be more prevalent and common in industrialised countries. Unfortunately, as determined by the World Health Organisation (2003) report, these factors are now becoming more prevalent in developing nations, where they create a double burden in addition to the remaining, unconquered infectious diseases that have always or currently afflict poorer countries.

Physical activity is widely recognised as a mode to improve or increase an individual's health status. Performing the appropriate PA and sports activity can provide individuals of all ages and conditions with a wide range of physical, social and mental benefits. Obesity is killing about 220 000 men and women per year in the United States of America (USA) and Canada alone and about 32 000 of men and women in 20 countries in Western Europe (World Health Organisation, 2003). Obesity and overweight are important determinants of health and lead to adverse metabolic changes including, increase in blood pressure, unfavourable cholesterol levels and an increase in the resistance to insulin in the body. The risks of coronary heart disease, stroke, diabetes mellitus and many forms of cancer are thus raised (World Health Organisation, 2003).

For adults, a physically active lifestyle can provide numerous health benefits spanning a wide range of health and well-being outcomes. Benefits include reduced morbidity and mortality, increased psychological well-being and the increased ability to meet physical work demands. Overall, a physically active lifestyle contributes to an increased quality of life (Sallis & Patrick, 1994), allowing the individual to carry out the activities of daily living and to engage in leisure time activities.

With regard to children, regular practice of PA helps children and young individuals, build and maintain healthy bones, muscles and joints, helps control

body weight, helps reduce fat and develop efficient function of the heart and lungs. It also attributes to the development of movement and co-ordination and helps prevent and control feelings of anxiety and depression (World Health Organisation, 2004).

2.2 Current Overweight, Obesity, Nutrition and Physical Activity Trends among Youth in South Africa

South Africa's youth, i.e. children and adolescents under the age of 20, comprise of approximately 43% of the country's total population of 44.8 million and almost 12.5 million children are enrolled in schools (Statistics South Africa, 2003). The population of the South African National Youth Risk Behaviour Survey 2002 (Reddy et al., 2003) comprised of 10 699 public school learners from grades eight, nine, ten, and eleven in the nine provinces with the majority of the sample (78.7%) aged between 14 and 18 years inclusive, while 8.4% were below 14 years and 12.9% above 18 years. The report suggests that the school environment offers an ideal social context to obtain information about young people and their behaviours and is also an appropriate locale for future health interventions.

With regard to obtaining information, the following overweight, obesity, nutrition and PA results were obtained from the South African National Youth Risk Behaviour Survey of 2002:

2.2.1 Overweight and obesity

Nationally 17.2% of learners were overweight. Significantly more females (25.0%) than males (6.9%) were overweight. The prevalence of being overweight is significantly higher among grade ten (25.1%) and grade eleven learners (18.7%), than among grade eight (12.8%) and grade nine learners (13.6%). Although the variation by age was not significant, the highest prevalence of being overweight was in the 19 years and older age group (20.7%), and the lowest prevalence in the 13 years and younger age group (12.8%). KwaZulu-Natal (22.9%) produced the highest provincial prevalence of learners who were overweight. The national average for obesity was 4.0%. Significantly more females (5.3%) than males (2.2%) were obese.

2.2.2 Nutrition

Results during the week preceding the survey revealed nationally that 57.8% of learners had eaten fresh fruit frequently (four or more days). Significantly fewer learners in the Eastern Cape (39.5%) had eaten fresh fruit frequently in the week preceding the survey compared to the national average. KwaZulu-Natal (66.4%) had a prevalence of learners who had eaten fresh fruit in the past week that was significantly higher than the national average.

Across the country 58.2% of learners had eaten fresh vegetables that were cooked or were in a salad frequently (four or more days) during the week preceding the survey.

Nationally, 38.8% of learners had eaten fast foods or 'luxuries' like a hamburger, fried chicken, boerewors rolls, hotdogs, hot chips, 'gatsby', pies, vetkoek or polony rolls frequently (four or more days) during the week preceding the survey. There were no significant differences between male and female learners. KwaZulu-Natal learners (46.5%) had a significantly higher prevalence than the national average.

Almost half (47.4%) of the learners had eaten cakes and or biscuits frequently (four or more days) during the week preceding the survey. The Northern Cape (55.6%) and KwaZulu-Natal (55.1%) had the highest provincial prevalence of having eaten cakes/biscuits, with KwaZulu-Natal's prevalence being significantly higher than the national average. Fifty-two percent of learners had eaten chocolates or sweets or drank fizzy-drinks such as Coca-cola ('Coke') frequently, i.e. on four or more days during the seven days preceding the survey.

2.2.3 Physical activity

For the purposes of the survey, learners are considered to have participated in sufficient vigorous physical activity (VPA) if learners reported having engaged in

activities such as soccer, netball, rugby, basketball or running for 20 minutes or more on at least three of the seven days preceding the survey.

Moderate physical exercise involved participation in activities for at least 30 minutes that would not make the participant sweat or breathe hard. Learners are considered to have participated in sufficient moderate PA if they reported having engaged in activities such as walking, slow bicycling, skating, pushing a lawn mower, mopping, polishing or sweeping the floors for 30 minutes or more on at least five of the seven days preceding the survey (Centers for Disease Control and Prevention, 2002).

Insufficient PA is not participating in enough vigorous or moderate physical exercise as defined above.

Physical activity during physical education classes on the school timetable will also be presented.

2.2.4 Sufficient vigorous physical activity

The national average for learners who had participated in sufficient VPA in the week preceding the survey was 44.6%. Significantly more males (57.1%) than females (34.7%) participated in sufficient VPA.

Grade 11 learners (38.6%) had a significantly lower prevalence of sufficient VPA when compared to grade eight (46.9%) and grade nine (48.3%) learners. Learners aged 13 years or younger (50.0%) had a significantly higher prevalence than learners aged 19 years or older (39.8%).

Free State (52.0%) had the highest provincial prevalence of learners that participated in sufficient VPA, while KwaZulu-Natal (38.3%) demonstrated the lowest.

2.2.5 Sufficient moderate physical activity

Nationally 33.5% of learners had engaged in sufficient moderate PA in the past week, with male learners (57.1%) showing a significantly higher prevalence than female learners (34.7%). Limpopo Province (37.9%) had the highest prevalence of learners who participated in sufficient moderate physical activity while the Eastern Cape (28.3%) had the lowest.

2.2.6 Insufficient or no physical activity

Results showed that nationally 37.5% of learners participated in insufficient or no PA. Significantly more females (43.0%) than males (30.5%) participated in insufficient or no PA. This higher prevalence of insufficient or no PA for females compared with males was significant within the "Black" and "Coloured" groups.

Gauteng (31.2%) had the lowest provincial prevalence of learners who participated in insufficient or no PA, while the Northern Cape (46.2%) reported the highest.

2.2.7 Physical education classes on the timetable

Nationally 54.3% of learners had physical education (PE) on their school timetable on one or more days in the week preceding the survey, with no significant

difference between male and female learners. Significantly fewer "White" learners (37.6%) had PE on their school timetable compared to "Black" learners (56.7%). Significantly more grade eight (61.6%) than grade ten (42.6%) and grade 11 learners (50.6%) had PE on their school timetable. Learners aged 13 years or younger (62.4%) had a lower prevalence than learners aged 16 years (49.8%) and 17 years (49.8%).

Northern Cape (40.6%) had the lowest provincial prevalence of PE on their school timetable. KwaZulu-Natal (59.7%) had the highest provincial prevalence.

2.2.8 Activities during physical education classes

The national average of learners that engaged in VPA during an average PE class (such as soccer, running, rugby, netball, basketball or cricket) was 52.8%. Significantly more males (60.8%) than females (46.5%) engaged in VPA during an average PE class.

Significantly more grade eight (60.3%) and grade nine learners (60.5%) engaged in VPA in PE classes than grade ten (42.8%) and grade 11 learners (42.8%), while there was no significant variation by age.

2.2.9 Summary

Overall results from the Youth Risk Behaviour Survey (Reddy et al., 2003) showed a decline in the healthy eating habits and PA participation among learners in South Africa. KwaZulu-Natal presents with the highest prevalence of overweight learners.

However, on the contrary, these learners have the highest number of PE lessons scheduled on their school timetable.

As we move into the 21st century, alarming health trends are emerging, suggesting that schools need to renew and expand their role in providing and promoting PA for young people (Pate, Davis, Robinson, Stone, McKenzi, & Young, 2006). Hence, numerous intervention studies have been implemented in schools to help increase children and adolescents PA levels.

SECTION B

2.3 Physical Activity Interventions

2.3.1 Introduction

Physical activity interventions in children and adolescence are usually designed to change PA behaviour. The school-setting presents a number of opportunities to intervene with learners for the purpose of increasing PA (Ward, Saunders, & Pate, 2007). Regular, if not daily, PE is paramount to increase moderate to vigorous physical activity (MVPA). An analysis of research-based PA interventions were among the more effective approaches (Centres for Disease Control and Prevention, 2001) to increase PA among learners.

2.3.2 Physical activity versus grade

The magnitude and source (e.g. school, week) of variability in PA during indoor elementary school PE lessons taught by specialists in 20 schools in Minnesota and Texas, USA was examined by Levin, McKenzie, Hussey, Kelder, and Lytle (2001). Vigorous physical activity (VPA), moderate to vigorous physical activity and estimated energy expenditure (EE) during PE lessons as a cohort of students moved from third to fifth grades. Findings showed that PE lesson length remained constant as the cohort moved from each grade (32.5 minute to 33.6 minute), but student PA (VPA, MVPA and EE) during lessons increased, as did time engaged in game play.

2.3.3 Physical education lessons in the morning versus physical education lessons in the afternoon

The first Australian direct observational data was presented on activity of year three and four (7-10 years old) children during PE. Analysis of data used 13,080 records from 231 lessons from 18 randomly selected schools. Activity was analysed in relation to lesson context (focus of lesson), child gender, school year of child, educator gender, lesson duration and start time. Results revealed that children spent 36.7% of a lesson in MVPA and 12.9% in VPA. Most of the lessons were spent in the context of management/instruction (37.4%), followed by games (25.0%), skill (21.4%) and fitness (14.7%). The highest level of MVPA was observed in the fitness lesson context (61.9%), followed by skill (46.4%), games

(42.6%), and management/instruction (17.1%). Moderate to vigorous PA was significantly higher for boys than girls. However, children participated in less PA during PE lessons timetabled in the afternoon, compared to PE lessons timetabled in the morning (Barnett, van Beurden, Zask, Brooks, & Dietrich, 2002).

2.3.4 Modifying physical education lessons

In 2003 (Van Beurden, Barnett, Zask, Dietrich, Brooks, & Beard), the above-mentioned 18 schools participated in a "Move it Groove it" collaborative health promotion intervention. This quasi-experimental one-year evaluation involved 1045 year three and year four children (7-10 years-old) in nine intervention and nine control schools. The pre- and post-observational surveys assessed children's fundamental movement skills; MVPA and VPA; and educator-and-lesson-related contextual covariates. Conclusions showed that this was the first study to demonstrate that by modifying existing PE lessons, significant improvements in fundamental movement skills mastery can be gained without adversely affecting children's MVPA and VPA.

2.3.5 Physical activity intervention studies

McKenzie, Sallis, Prochaska, Conway, Marshall, & Rosengard (2004) developed, assessed and implemented the Middle School Physical Activity and Nutrition (M-SPAN), an intervention to increase PA in public middle-school learners during PE classes. Twenty four schools (approximately 25 000 learners) in Southern

California, USA participated in this randomised trial. A major component in the intervention schools (n=12) included a two-year PE programme which consisted of curricular materials, staff development and on-site follow-up. The remaining 12 control schools continued with their usual programmes. Learner's activity and lesson context were observed in 1849 PE lessons with the use of a validated instrument during baseline and intervention years one and two. Results showed that the intervention significantly ($p=0.02$) improved learner MVPA activity in PE, by approximately three minutes per lesson. By year two of the intervention, an accumulative increase of 18% of MVPA was calculated. The study concluded that a standardised programme can increase learners' PA in middle-school, without increasing the frequency or duration of PE lessons. Additionally, the programme components were well-received by educators and has the potential for generalisation to other schools.

Similarly, the PA levels of high school students during PE lessons were assessed by Fairclough and Stratton (2004). Sixty two boys and 60 girls wore heart rate telemeters during PE lessons. Percentages of lesson time spent on MVPA and VPA over a 12-week period were recorded. Results showed that boys engaged in MVPA for $39.4\% \pm 19.1$ of lesson time compared to the girls' value of $29.1\% \pm 23.4$. Furthermore a 4% difference in VPA was observed between the two sexes. Results suggested that PE may make a more significant contribution to young people's

regular PA participation if lessons are planned and delivered with MVPA goals in mind.

The sustainability of the health-related PE programme ("SPARK") was independently evaluated in 111 elementary schools in seven states of America. Similar to the M-SPAN the main components in the SPARK programme were an active PE curriculum, staff development and on-site support. The PE curriculum was designed as a practical source for both classroom educators and PE specialists and it provided developmentally appropriate yearly units and lesson plans. Surveys were mailed to schools that had received SPARK curriculum books, training and follow-up (response rate=47%). Up to 80% of the schools that adopted SPARK PE had reported sustained use up to four years. The study documents that a research-based PE programme can be disseminated to schools in a range of geographic locations, adopted and successfully sustained (Dowda, Sallis, McKenzie, Rosengard, & Kohl, 2005).

In Belgium, Europe, a similar intervention based on the SPARK programme was evaluated by Verstraete, Cardon, De Clercq, and De Bourdeaudhuij (2007). The SPARK programme was adjusted to the educational system and the culture of the country. Participating elementary schools (n=16) were randomly assigned to the intervention group (n=8) and the control group (n=8). Pre-test measures were performed on all children of the fourth and fifth grades (399 boys and 411 girls).

Post-test measures were performed on all children (373 boys and 391 girls) of the fifth and sixth grades. The accelerometer data showed that MVPA levels decreased less in the intervention schools than in the control schools. Children in the intervention schools reported significantly more moderate PA in leisure time than the controls. However, no overall improvement of physical fitness and no effects on the psychosocial correlates of PA were found. The study concluded that the comprehensive PA promotion programme was successful in preventing a decline in children's total activity levels.

"JUMP-in" is a systematically developed primary school-based intervention that focused on the use of theory, environmental changes, parental influences and cooperation with multilevel parties in intervention development. The effects of the intervention were evaluated with a quasi-experimental pre-test/post-test research design. Grades four, five and six (n=510) from four intervention schools (n=369) and two control schools (n=141) in Amsterdam were monitored for an intervention period of one school year. Data on PA and its determinants were gathered by a newly developed questionnaire that allowed PA scores to be calculated in minutes. The results from the study indicated that the project was effective in influencing PA among children in grade six. No significant effect was found in children from grades four and five. The JUMP-in study showed the importance of intervention designs that focus on a theory-based mix of relevant environmental and social cognitive factors (Jurg, Kremers, Candel, Van Der Wal, & Du Meij, 2006).

A study by Rodríguez, Santonja, López-Miñarro, Sáinz de Baranda, and Yuste (2008) aimed to test whether an improvement in flexibility scores (sit-and-reach test) could be achieved in elementary and secondary school learners by performing hamstring stretching exercises during PE lessons. The experimental group (n=49) participated in a programme of hamstring stretching exercises twice a week during PE lessons for a school term of 32 weeks. The control group (n=41) comprised of learners that participated in the usual school PE lessons and did not participate in the hamstring stretching programme. The sit-and-reach test scores were measured pre- and post-intervention. The elementary experimental group showed low (+1.95 cm) or no significant improvement in the scores while the secondary experimental group showed significantly improved scores (+7.22 cm). Both elementary and secondary control groups showed a reduction in scores, -4.38 cm and -2.31 cm, respectively. In conclusion, a five-minute hamstring flexibility intervention programme can prevent decreased hamstring muscle extensibility and therefore should be incorporated into physical activities at school.

Naylor, Macdonald, Warburton, Reed, and McKay (2008) assessed the impact of an active school model on children's PA. A large randomised controlled trial design was used to evaluate the effects of the Action Schools! British Columbia (AS!BC) on PA and selected chronic disease risk factors. Five hundred and fifteen children (9-11 years) participated for 11 months in the intervention. PA was determined by the use of pedometers. The AS!BC aimed at providing children with 150 minutes of

PA per week. Educators included 15 minutes per day or 75 minutes per week of additional PA in addition to two 40 minute PE classes per week. It was concluded that the positive effect of the AS!BC model on particularly boys PA is important in the light of the current global trend of decreased PA.

2.3.6 Summary

The literature presented thus far has reported that learner PA increases as the grade increases, MVPA is significantly higher during PE lessons conducted in the morning than in the afternoon and a multicomponent PA intervention including curriculum material and staff development can increase learners PA participation.

However, these studies have shown the effects of school-based interventions on combined male and female PA participation. In the USA in 2003, 33.4% of high school learners did not engage in sufficient amounts of MVPA per week (Grunbaum, Kann, Kinchen, Ross, Hawkins, Lowry, Harris, McManus, Chyen, & Collins, 2004). Overall, a greater number of females (40.1%) than males (26.9%) did not participate in sufficient amounts of PA. With the increase of female PA decreasing, there appears to be a need to separate male and female PA interventions.

2.3.7 Male versus female interventions

The purpose of this study (Trinh, Rhodes, & Ryan, 2008) was to elicit salient Theory of Planned Behaviour (Ajzen, 1991) beliefs from an independent sample (study one) and then use these specific beliefs to evaluate gender differences related to PA intention and behaviour (study two). Study one comprised of 25 students from grade nine (12 girls, 13 boys) recruited from a PE class at a middle-income secondary school in Victoria, British Columbia, Canada. Questionnaires were completed by all students focusing on PA during free time for at least 30 minutes per time, everyday of the week. Behavioural, normative and control beliefs regarding PA were also analysed. For the second study, an independent sample of 157 students (97 boys, 60 girls) from grades nine to 12 were recruited from 15 other PE classes at the same secondary school. Behavioural, normative and control beliefs were also assessed as well as PA behaviour, such as average PA during free time. Results depicted that there were no significant belief correlates in common for PA behaviour for both boys and girls; instead, there were significant differences in the correlates of PA by gender. Therefore, findings suggested that PA interventions focusing on the adolescent population in general may not be as effective as interventions focusing on the needs of boys and girls separately.

Similarly, the findings from National Youth Risk Behaviour Survey (USA) found that 40% of high school girls compared to 27% of high school boys failed to achieve

modest PA recommendations (Grunbaum et al., 2004). Thereafter, selected intervention studies have begun to focus on increasing the PA of female learners.

2.3.8 Female intervention studies

In South Carolina, USA, the Lifestyle Education for Activity Program (LEAP) uses a health team approach with participatory strategies to provide training and support, instructional capacity building and opportunities to adapt school instructional programmes and supports to local needs. The LEAP intervention sought to test the effectiveness of a school-based programme on the PA levels of high school girls. The intervention targeted changes in instructional programmes and the school environment. Twelve schools underwent a comprehensive intervention to increase PA while another 12 schools were used as controls. The intervention was implemented for more than two years and two different groups of ninth grades were exposed to the PE component of LEAP and changes in the school environment (policies and practices that promote PA). Results showed that educators reported successful implementation of most components of the intervention and demonstrated optimism for sustainability. Overall, results indicated that a facilitative approach to intervention implementation can be used successfully to engage school personnel, change instructional programmes and the school environment to increase the PA levels of high school girls (Ward, Saunders, Felton, Williams, Epping, & Pate, 2006).

The objective of the following study (Dunton, Schneider, & Cooper, 2007) was to determine whether individual factors influenced rates of PA change in response to a school-based intervention in sedentary adolescent females. The intervention consisted of in-class PA and health education. Demographic, physiological, behavioural and psychosocial variables were assessed at the beginning of the study to gather baseline data. Participants (n=63) also reported weekly leisure-time PA via an interactive internet website throughout the nine-month study. Findings of the study demonstrated important implications with regard to the design of school-based interventions targeting sedentary adolescent females. Results suggested that special measures should be taken to tailor such interventions according to participant's initial level of cardiovascular fitness. Components that will meet the psychosocial needs of the participants need to be included in the intervention. For example, results showed that adolescent girls with lower levels of friend support and higher internal barriers benefited most from the intervention. Overall, certain physiological and psychosocial characteristics were linked to adolescent girls' response to a PA programme delivered in a school setting.

Taymoori et al. (2008) conducted randomised controlled trials to examine the effects of two six-month tailored interventions on potential determinants of PA and PA behaviour. Students (n=161) were all female Iranian high school girls from grades nine and ten. The intervention was divided into three conditions based on:

Pender's Health Promotion Model (HP) (Bandura, 1986; Pender, Murdaugh, & Parsons, 2002); an integration of the health promotion model and selected constructs of the Transtheoretical Model (TTM) (Prochaska & Velicer, 1997) and a control group. Interventions included each student receiving four 45-60 minute group educational sessions. The four sessions for both the HP and TTM intervention groups focused on perceived benefits and barriers to PA and goal setting exercises. In addition, each student received 20-25 minutes of individual counselling based on personal responses from baseline questionnaire data during weeks four, ten and 18 of the intervention. Results showed a significant interaction between group and time for perceived benefits, self efficacy, interpersonal norms and social support. Behavioural processes and PA behaviour indicated that both intervention groups significantly increased across a 24-week intervention, whereas the control group did not. This study provided the first evidence of the effectiveness of a PA intervention based on Pender's HP model combined with selected aspects of the TTM on potential determinants to increase PA among Iranian high school girls.

The primary aim of Trial of Activity for Adolescent Girls (TAAG) was to test an intervention to reduce by half the observed decline in MVPA experienced by adolescent girls (Webber, Catellier, Lytle, Murray, Pratt, Young, Elder, Lohman, Stevens, Jobe, & PR, 2008). TAAG was designed to overcome limitations in previous intervention studies following guidelines proposed by the Centers for

Disease Control (National Center for Chronic Disease Prevention and Health Promotion, 1997). Middle school girls in 36 schools in six geographically diverse areas of the USA participated in this study. Schools were randomised equally into intervention or control schools. Random, cross-sectional samples were then drawn within schools, namely, grade six (n=1721) in 2003, grade seven (n=3504) in 2005 and grade nine (n=3502) in 2006. This two-year (fall 2003 to spring 2005) study-directed intervention targeted schools, community agencies and girls to increase opportunities, support, and incentives for increased PA. Trial of Activity for Adolescent Girls health education included six lessons in each of the seven and eight grades designed to enhance behavioural skills known to influence PA participation. The TAAG PA class promoted MVPA for at least 50% of class time and encouraged educators to promote PA outside of class. A TAAG "Programme Champion" component was developed to foster sustainability after the two-year staff directed intervention where one or several individuals in the school or community would take ownership of the programme. PA was assessed by accelerometry. Results indicated that after the staff directed intervention there were no significant differences in MVPA between grade eight girls of the control schools. However, following the Programme Champion directed intervention girls in the intervention schools were more physically active than girls in the control schools. There were no differences in percent body fat or fitness levels. It was concluded that a school-based, community-linked intervention modestly improved PA in girls.

2.3.9 Summary

Studies have shown an increase in PA participation among learners as a result of various interventions. However, it would appear that there is a need to separate male and female PA interventions particularly at high school level due to the physiological and psychosocial characteristics linked to adolescent girls' which correlates to their responses to PA programmes delivered in school settings.

2.3.10 Physical education specialists versus non-PE specialists

A two-year (Sallis, Kolody, Faucette, & Hovell, 1997) study evaluated a health-related PE programme for fourth and fifth grade learners (n=955) and was designed to increase PA during PE classes and outside of school. Seven schools were assigned to three conditions in a quasi-experimental design. Health-related PE was taught by 1) PE specialists, 2) trained classroom educators and 3) the control where PE was taught by untrained classroom educators. Results showed that learners spent more minutes per week being physically active in specialist-led (40 minutes) and educator-led (33 minutes) PE classes than in control classes (18 minutes; $p < 0.001$). After two years, girls in the specialist-led condition were superior to girls in the control condition on abdominal strength and endurance ($p < 0.001$) and cardio-respiratory endurance ($p < 0.001$). However, there were no effects on PA outside of school. The study concluded that a health-related PE curriculum can provide learners with substantially more PA during PE classes. Improved PE classes can potentially benefit 97% of elementary school learners.

Numerous PA intervention studies are conducted during PE lessons and or within the school curriculum. The following studies attempted to increase PA during lunch-breaks/recess.

2.3.11 Marking of playgrounds increases physical activity during lunch-breaks/recess

The primary aim of this investigation by Stratton and Mullan (2005) was to assess changes in primary school children's MVPA and VPA, before and after their school playgrounds were painted with multicoloured markings. Baseline data were collected for four weeks prior to the playgrounds being painted. Playground markings included bright fluorescent colours of castles, dragons, clock faces, mazes, fun trails, hopscotch, letter squares, snakes and ladders and various animals. Senior primary schools included markings for netball, football and short tennis and targets for game related skills. Ninety nine children from four intervention schools and four control schools participated in the study. Moderate to vigorous PA and VPA was measured using short-wave heart rate telemetry. A significant interaction was evident for MVPA and VPA in intervention schools as a result of the playground markings. It was concluded that multicoloured playground markings can be a low-cost method of increasing children's daily PA levels in the short-term. If these increases were sustained, then school playgrounds with multicoloured markings would be a valuable contribution to PA recommendation for children.

Similarly, Ridgers, Stratton, Fairclough, and Twisk (2007), investigated the impact of a playground redesign intervention across time on children's recess PA levels using combined PA measures to evaluate the potential influence of covariates on the intervention effect. The playground redesign was based on sporting playground zonal design. This involved the division of the playground into three specific colour-coded areas: 1) a red sports area, 2) a blue multi-activity area and 3) a yellow quiet play zone. Recess activities were supervised by educators and lunch-time assistants. Children's PA levels were quantified using heart rate telemetry and accelerometry. Fifteen intervention schools (n=256) located in high areas of deprivation in a large city in England and 11 (n=222) matched socio-economic control schools participated. Results showed statistically significant intervention effects across time (July 2003 to January 2005) for MVPA and VPA assessed using both heart rate and accelerometry. Therefore, increases observed were sustained over time and not attributable to the novelty effect of the intervention.

2.3.12 Provision of equipment to increase physical activity during lunch-breaks/recess

A random sample of seven elementary schools participated in a study that investigated the effects of providing game equipment on children's PA levels during recess. Four intervention schools including 122 children and three control schools including 113 children participated in this study. Physical activity levels were

measured using accelerometers before and three months after providing gaming equipment. Equipment included, jump ropes, juggling bean-balls, plastic hoops and badminton racquets. During the recess, children's MVPA significantly increased in the intervention group from 38% to 50% and VPA increased from 10% to 11%. Children's MVPA in the control group decreased from 44% to 39% and VPA also decreased from 11% to 5%. At morning recess, providing children with gaming equipment was effective in increasing children's MVPA (from 41% to 45%), while a decrease from 41% to 34% was evident in the control group. Findings suggested that by promoting PA through game activity provision during recess/lunch-break periods can contribute to reach the daily activity levels recommended for good health (Verstraete, Cardon, De Clercq, & De Bourdeaudhuij, 2006).

Beighle, Morgan, Le Masurier, and Pangrazi (2006) examined the pedometer-determined PA (steps and activity time) of learners during recess and outside of school. Third, fourth and fifth grade learners (n= 121 boys and n=150 girls) wore sealed pedometers during a 15-minute recess period and outside of school for four consecutive school days. Results indicated that children spent the majority (>60%) of their recess time engaged in PA and a smaller proportion of their outside of school time participating in activity (\approx 20%). Additionally, boys accumulated more steps and activity time during both discretionary periods examined.

2.3.13 Summary

Literature has shown that the introduction of multicoloured playground markings is a successful, cost-effective measure that can increase learner PA participation during lunch-breaks/recess. Furthermore, Beighle et al. (2006) has reported that learners appear to participate in increased PA during lunch-breaks/recess than after school. Hence, it would deem appropriate for primary schools to paint multicoloured markings on school playgrounds to assist with PA promotion among learners during lunch-breaks/recess.

2.3.14 Physical Activity Intervention and Task Behaviour

Selected intervention studies have shown that increasing time for structured PE did not reduce students' academic achievement and may have even contributed to it (Shephard, Volle, Lavallee, LaBarre, Jequier, & Rajic, 1984; Sallis, McKenzie, Kolody, Lewis, Marshall, & Rosengard, 1999). Van der Mars (2006) recently reviewed studies in this area and concluded that on the basis of the best available knowledge, it appears that (1) increased time in PE does not impede students' classroom academic performance, (2) increased time in PE may contribute slightly to academic performance, and (3) decreased time for PE in favour of academic work does not necessarily result in improved academic performance.

Mahar, Murphy, Rowe, Golden, Sheilds, & Raedeke (2006) evaluated the effects of a classroom-based PA programme (Energisers) on children's in-school PA levels

and on-task behaviour during academic instruction. The PA levels of 243 learners from a public school in North-Carolina, USA were assessed during school hours. Pedometers were used to determine and compare the daily in-school activity levels of learners (n=135) who were part of the intervention to the PA levels of the control (n=103) group. Results showed that learners in the intervention group took significantly ($p < 0.05$) more in-school steps (5587 ± 1633) than the control group learners (4805 ± 1543). After the Energisers programme was systematically implemented, learner's on-task behaviour was systematically improved. A statistically significant ($p < 0.017$) improvement in on-task behaviour of eight percent between pre- and post- intervention was observed. The study concluded that a classroom-based PA programme was effective for increasing daily in-school PA and improving on-task behaviour during academic instruction.

2.3.15 Summary

Although literature has grown within the past few years with a diversity of intervention modalities and results, Marcus et al Marcus, Williams, Dubbert, Sallis, King, Yancey, Franklin, Buchner, Daniels, and Claytor (2006) believes that fewer studies have been conducted amongst children and adolescents as compared to adults (18-65 years). Most interventions targeting children and adolescents have been school-based, and reviews of these studies have been inconsistent and at best modest short-term increases in PA during school hours. Moreover, studies that have exhibited PA increases, have not generalised outside the school setting,

make healthful food choices and develop lifelong healthy eating patterns (Story, Lytle, Birnbaum, & Perry, 2002).

2.4.2 Combined nutrition and physical activity interventions

The "Go for Health" programme (Simons-Morton, Parcel, Baranowski, Forthofer, & O'Hara, 1991) was designed to influence the school environment in terms of effect on students diet and PA at school. Two of the four elementary schools from a single Texas district, USA, were assigned to intervention conditions and the other two to control conditions. Third and fourth grade learners were assessed annually during three spring data collection periods. The intervention comprised of the following components: classroom health education; vigorous PE; and low-fat, lower-sodium school lunches. Programme effects were assessed by analysing the nutrient contents of lunches, conducting 24-hour dietary recalls and observing students PA during PE. Analysis of school lunches showed declines from baseline post-test in the two intervention schools of 15.5% and 10.4% for total fat, 31.7% and 18.8% for saturated fat and 40.2% and 53.6% for sodium. Observation of PA during PE lessons indicated an increase in the intervention schools baseline to post-test in the percentage of time children engaged in MVPA from less than 10% of class time at baseline to about 40% of class time post-test. Post-test results were higher in the intervention schools as compared to the controls. This efficacy study demonstrated the feasibility of substantially modifying school lunches and school PE to improve children's dietary intake and PA behaviour at school.

Gortmaker, Cheung, Peterson, Chomitz, Cradle, Dart, Fox, Bullock, Sobol, Colditz, Field, & Laird (1999) evaluated the impact of a school-based interdisciplinary health behaviour intervention on diet and PA among children in grades four and five. The "Eat Well and Keep Moving" intervention materials were implemented in six public elementary schools in Baltimore, USA. Eight matched control schools were selected prior to implementation. Intervention and control schools were matched in average school enrolment, percentage of students receiving free/reduced cost lunches, percentage of students that were African American and reading and math achievement scores. Measures of dietary intake and PA were collected using both repeated 24-hour recalls and the student food activity survey. Results showed that the percentages of total fat and saturated fat were reduced among students in intervention compared to control schools. There was an increase in fruit and vegetable (F&V) and fibre and vitamin C intake. However, there was no evidence for a difference in VPA. Therefore, the "Eat Well and Keep Moving" intervention indicates effectiveness in improving the dietary intake of students.

The study of Hopper, Munoz, Gruber, and Nguyen (2005) examined the efficacy of a school-based exercise and nutrition programme with a parent component. Third grade children (n=238) from six elementary schools participated, with three schools randomly assigned to a programme group and the other three schools to a control group. The programme group received a health-related fitness school-

based programme and a home programme that required parents and children to complete activities and earn points for nutrition and exercise activities. The control group received their traditional physical education and nutrition education programme. Univariate analysis of variance on pre- and post-test scores were completed on the following variables: height, weight, body mass index, skinfold, blood cholesterol, mile run, exercise and nutrition knowledge, calories, protein, carbohydrates, total fat, saturated fat, dietary cholesterol, fibre, sodium, percentage of calories from carbohydrates and percentage of calories from fat. At pre-test, the treatment and control groups did not significantly differ on the measures using schools as the unit of analysis. Girls scored significantly higher than boys on skinfold and pre-test knowledge. At post-test, the treatment group scored significantly higher than the control group on exercise and nutrition knowledge and significantly lower than the control group on total fat intake. There was no improvement in physiological measures, including blood cholesterol. The study demonstrated that schools can adjust curriculum to meet some health needs of students and achieve modest changes in exercise and nutrition knowledge and diet. The family component of the programme provided a practical approach to improving PA and nutrition behaviours for elementary school educators who teach many participants in a crowded curriculum.

In another study 62 boys and 66 girls were recruited from ten Young Men's Christian Association (YMCA) based after school care sites and eight PE classes

from a YMCA-affiliated charter school (51 boys and 62 girls) in the USA. A 12-week PA and health behaviour change protocol (Youth Fit for Life) for African American pre-adolescents (9-12 years) was delivered in three-day/week at the after care sites and two-day/week at PE classes. Sessions per week were for forty minutes each and included cardiovascular activities in the form of non-competitive games and tasks for at least 20 minutes. General health and nutrition information topics were also addressed with learners. Results showed improved body mass index, body composition and strength, flexibility and endurance were displayed amongst learners. Multiple regression analyses indicated that the changes in scores of physical appearances, physical self-concept, exercise self-efficacy and perceptions of the overall self explained a significant portion of the variance in changes in voluntary PA sessions over the 12-week intervention (Annesi, Faigenbaum, Westcott, Smith, Unruh, & Hamilton, 2007).

Slawta and Deneui's (2009) study described the inclusion of "Be a Fit Kid" in the fourth grade curriculum. Be a Fit Kid is a fitness-emphasised PA and heart-healthy nutrition education programme for elementary school children. Five parent-education lessons were offered and nutrition workbooks were distributed to parents. Following a ten-week intervention, significant improvements in fitness, body fat, nutrition knowledge, dietary habits and levels of lipids and lipoproteins were observed in the intervention group compared with baseline levels. Changes in fitness, body fat and nutrition knowledge were significant when compared with the

control group. These findings suggested that comprehensive PA and nutrition programmes included in the school curriculum may be effective for improving cardiovascular health and reducing future risk for lifestyle-related diseases.

2.4.3 Nutrition interventions

Children consume about one third of their daily energy at school, mostly from cafeteria food and bag lunches. A cross-sectional study of foods sold at student stores in middle schools was conducted by Wildey, Pampalone, Pelletier, Zive, Elder, & Sallis (2000). Twenty four San Diego County (California) USA, public middle schools, grades six through eight (age 11 to 13) from nine school districts participated in a four-year intervention study, Middle School Physical Activity and Nutrition (M-SPAN). The schools represented a diversity of ethnic groups and socio-economic levels. The M-SPAN evaluated whether environmental changes at school can improve dietary habits and PA. The results presented are based on the nutritional aspect only. Foodservice staff and vendors were requested to supply low-fat foods to cafeterias and student stores. Fourteen of the 24 schools had stores that sold food and were run by student organisations. Stores were open daily for about 90 minutes. Results during a week (5-day) of nutritional assessment of sold food items presented the following results. Snacks averaged 8.7 g fat and 23.0 g sugar. Overall, 88.5% of store inventory was high in fat and/or high in sugar. Sugar candy accounted for one-third of store sales. Chocolate candy was highest in fat content: 15.7 g. It was concluded that adolescents need opportunities to supplement main meals; however, student

stores in middle schools sell primarily high-fat, high-sugar snacks. Therefore, key intervention possibilities include limiting sales of chocolate candy and substituting low-fat varieties of cakes, cookies, chips and crackers.

The Sandy Lake, Canada, school-based diabetes programme is a culturally appropriate intervention for students in the third, fourth and fifth grades. A pre-test/post-test single sample design (Saksvig, Gittelsohn, Harris, Hanley, Valente, & Zinman, 2005) during the 1998-1999 school year. One hundred and twenty two students completed four measurements, namely, anthropometry, 24-hour dietary recall and two questionnaires at baseline and follow-up. The curriculum component of the intervention focused on knowledge and skills development related to healthy eating, PA and diabetes education. The environmental component developed a school-wide policy banning high-fat and high-sugar snack foods in schools. The school meal component offered to each kindergarten to fifth grade student a breakfast snack programme that included a glass of 1% milk, fruit, cheese and a rice cake. Results showed that increased exposure to a culturally adapted one-year school-based intervention with environmental components is associated with an increase in knowledge about foods low in fat, overall health knowledge, dietary self-efficacy and with meeting the dietary fibre intake recommendation per age group. Physical activity results were not reported.

Similarly, a pilot study conducted by Fahlman, Dake, McCaughtry, and Martin (2008) suggested that significant positive changes in both nutrition knowledge and behaviours in middle school children can occur when the nutrition component of the curriculum is delivered by trained professionals. The Michigan Model (MM) Nutrition Curriculum comprising of eight lesson plans consists of components related to nutritional knowledge such as food groups, food pyramid, food labels, advertising and body image was utilised for the intervention. The lesson plans also contained components specifically designed to target nutritional risk behaviours such as increasing fruit, vegetable and dairy consumption and healthy eating at fast-food restaurants. A pre/post-assessment quasi-experimental design consisting of eleven intervention schools (n=407) and seven control schools (n=169) participated in the study. The nutrition lesson plans were taught for one month to classes by 17 educators certified by the state of Michigan. A valid and reliable questionnaire was used to determine pre-post differences. Results showed that the intervention group increased nutrition knowledge post-test. Subsequent post-hoc analysis revealed that the intervention group was significantly more likely to eat fruit and vegetables and less likely to eat junk food than the control group. Learners in the intervention group also felt more confident to eat healthy food options. However, further research needs to be conducted to determine the long-term impact of the study.

2.4.4 Nutrition interventions to increase fruit and vegetable consumption

In an extensive review (Rasmussen, Krølner, Klepp, Lytle, Brug, Bere, & Due, 2006) of children and adolescents, F&V intake, the availability and accessibility of F&V was identified as the strongest determinants. Several intervention studies have been carried out to help increase the F&V consumption among youth and adolescents.

In order to increase the F&V intake in Norway, a School Fruit subscription programme is now offered to all Norwegian elementary and junior high schools. The purpose of a study by Bere, Veierød, Skare, and Klepp (2007) evaluated the long-term effects of the Norwegian School Fruit programme, three years after it was implemented. Fruit is provided at no cost to the pupils. A total of 1950 (85%) sixth and seventh grade pupils from 38 randomly selected Norwegian elementary schools participated in the study. Nine schools were selected as intervention schools and participated in the programme for a school year (October 2001 until June 2002). A baseline questionnaire survey was conducted in September 2001 and follow-up surveys were conducted in May 2002 and May 2005. Fruit and vegetable intake was assessed by a written 24-hour recall (reporting F&V intake at school and F&V intake all day) and by four food frequency questions (reporting usual F&V intake). The pupils in the free fruit group significantly ($p=0.001$) increased their F&V intake compared to pupils in the control group as a result of

the intervention. Sustained significant ($p=0.001$) effects on F&V intake three years after the end of the intervention were also observed.

Similarly, two primary school-based interventions were aimed at increasing children's F&V consumption. Both had proven effective 1) a free daily F&V distribution scheme for all the learners 2) a multicomponent, age specific programme consisting of a classroom curriculum, parental involvement and an environmental component. Forty eight educators completed a questionnaire that evaluated the programme at the end of the interventions. Both programmes were evaluated favourably and at least half of the educators were willing to use the programmes the following year. The multicomponent programme as compared to the free distribution programme was less fully implemented and that the implementation of activities had decreased over time. Educators that used the multicomponent programmes experienced more social pressure to implement the programme and rated it more complex and risky as compared to the free-distribution programme. It was concluded that the free-distribution programme has the greatest potential for being adopted by educators, but that efforts need to be made to acquire funding for the F&Vs. Hence, until resources are made available, the multicomponent programme appears to be a good alternative if improved as suggested (Reinaerts, De Nooijer, & De Vries, 2007).

Schwartz (2007) aimed to isolate and test the influence of having cafeteria staff verbally prompt children to take a fruit serving when purchasing school lunch. Three hundred and nine and 337 students were enrolled at the intervention and control school respectively. Both schools participated in the same district-wide food service programme therefore the same foods were available at each school every day. Results suggest that a relatively simple intervention that verbally prompts children to take a fruit option in their school lunch may lead to a substantially greater fruit intake. Observations also showed that when fruit and juice were simply made available approximately 60% of children chose one or the other (38% took fruit and 22% chose juice). This number increased to over 90% when children were prompted to take fruit or juice by a staff member (62% took fruit and 29% took juice). While nutrition education is important, it is possible that the most efficient and effective way to improve children's nutrition is to change their food environment. In the intervention school where fruit was available and children were verbally prompted to take fruit as part of their lunch, significantly more children were observed consuming the fruit than the control school where fruit was available, but there was no verbal prompt.

A study by Tak, Te Velde, and Brug (2008) provided evidence that behaviour change was preceded by changes in certain determinants of F&V intake. Potential determinants of F&V intake (e.g. liking of fruit, parental facilitation of vegetables, family rules for eating vegetables and the availability at home of vegetables)

appear to be important to induce behaviour change. Data were used from two intervention studies among primary school children aged 10-11 years old at baseline in the Netherlands: the Schoolgruiten Project (n=344) and the Pro Children Study (n=258). Children completed questionnaires, including questions on usual F&V intake frequency, availability of F&V, knowledge of F&V and parental influences for eating F&V. Results showed that determinants of F&V intake that appear to be important to induce behaviour change were liking of F&V, facilitation by parents of F&V, family rules for eating F&V and availability at home of F&V. Furthermore, changes in F&V intake frequency also induced changes in the liking of F&V and knowledge of recommended intake levels of fruit.

2.4.5 Food preparation

Including children in food preparation activities has long been advocated as a method to encourage children's consumption (Cosgrove, 1991).

The study by Cullen, Watson, Zakeri, Baranowski, & Baranowski (2007) assessed the impact of attaining goals to prepare fruit juice or vegetable recipes on learner's F&V consumption as part of a 10-week F&V intervention for grade four learners. Approximately 70% of eligible fourth grade students (n=1578) from 26 elementary schools from Houston Texas, USA agreed to participate in this study. Thirteen schools were randomised to intervention groups (Squire's Quest!) and the remaining 13 to control groups. The Squire's Quest! intervention is a classroom-

based curriculum that may increase fruit, vegetable and juice consumption. At six of the 10 sessions, students (n = 671) selected a fruit juice or vegetable recipe to prepare at home before the next session. Students returned parent-signed notes reporting their child's goal attainment. Baseline and post-consumption were assessed with up to four days of dietary recalls. Analyses included regression models predicting post-consumption from the number of fruit-juice or vegetable recipe preparation goals attained, controlling for baseline consumption. In general, girls and Hispanic students achieved the most recipe preparation goals. Post-vegetable consumption was highest for students reporting the highest baseline vegetable consumption and who achieved two or three vegetable recipe preparation goals. This study was one of the first to demonstrate that home recipe preparation was correlated with dietary change among children .

2.4.6 Nutrition policies

A recent study (Foster, Sherman, Borredaile, Grundy, Vander Veur, Nachmani, Karpyn, Kumanyika, & Shults, 2008) conducted in ten schools in Philadelphia, USA, examined the effects of a multicomponent School Nutrition Policy Initiative on the prevention of overweight and obesity among children in grades four to six over a two-year period. A sample of 1349 learners was assessed at baseline, 921 (510 intervention and 411 control) were reassessed at year one and 844 (479 intervention and 365 control) were reassessed at year two. An effective component of the intervention included a nutrition policy. In each of the

intervention schools, all the foods sold and served were changed to meet the nutritional standards based on the Dietary Guidelines for Americans (e.g. all beverages were limited to 100% juice, water and low-fat milk). Prior to these changes cool-drinks/sodas, chips and other drinks were sold in vending machines. The intervention resulted in a 50% reduction in the incidence of overweight. Significantly fewer children in the intervention schools (7.5%) than in the control schools (14.9%) became overweight after two years. The data suggested that a multicomponent school-based intervention can be effective in curbing the development of overweight among children in grades four to six. However, it was recommended that intervention programmes begin earlier than grade four due to the already high prevalence of overweight and obesity.

2.4.7 Summary

The literature has shown the effectiveness of school nutrition interventions on learner's eating behaviour patterns. Nutrition interventions should include limiting food sold at the schools or substituting with low-fat varieties of chips, drinks etc.; nutrition education; free fruit distribution, depending on the availability of funds; verbal prompting to encourage healthy choices and parental involvement.

However, interventions to increase F&V consumption among children should additionally aim at both environmental factors such as greater availability of F&Vs and personal factors as preferences, liking, self-efficacy and knowledge levels

concerning nutrition. These factors are interwoven and by increasing exposure, preferences and liking might be increased and thereby the intake, especially of vegetables (Kristjansdottir, Thorsdottir, De Bourdeaudhuij, Due, Wind, & Klepp, 2006).

SECTION D

2.5 Physical Fitness Testing

2.5.1 Introduction

A physical fitness test is a test designed to measure physical strength, agility and endurance. Tests are commonly employed in educational institutions as part of the PE curriculum, in medicine as part of diagnostic testing and as eligibility requirements in fields that focus on physical ability such as the military or police. Throughout the 20th century scientific evidence emerged demonstrating the usefulness of strength training and aerobic exercise in maintaining overall health, and more agencies began to incorporate standardised fitness testing. In the USA the President's Council on Youth Fitness was established in 1956 as a way to encourage and monitor fitness in schoolchildren. In 1982, FITNESSGRAM was developed and is mandated by a number of states (Wikipedia Contributors, 2008). The Eurofit physical fitness test battery (Eurofit, 1993) is a standardised test battery devised by the Council of Europe for children of school age and has been used in many European schools since 1988.

2.5.2 The Eurofit physical fitness test battery

The Eurofit physical fitness test battery (Eurofit, 1993) is a set of nine physical fitness tests covering flexibility, speed, endurance and strength. The test is designed so that it can be performed within 35 to 40 minutes using very simple equipment. A similar Eurofit for adults was published in 1995.

The following ten tests from the Eurofit Manual are the standard tests recommended for testing school age children.

1. Anthropometry: height, weight, index, percent body fat from skinfold thickness
2. Flamingo Balance: single leg balance test
3. Plate Tapping: tests speed of limb movement
4. Sit-and-Reach: flexibility test
5. Standing Broad Jump: measures explosive leg power
6. Handgrip : measures static arm strength
7. Sit-Ups in 30 seconds: measures trunk strength
8. Bent Arm Hang: muscular endurance/functional strength
9. 10 x 5m Shuttle Run: measures running speed and agility
10. 20m endurance shuttle-run: cardio-respiratory endurance

Tsigilis, Douda, and Tokmakidis (2002) examined the test-retest reliability of the Eurofit motor fitness tests performed by university students. A total of 98 undergraduate students who were enrolled in physical education departments in

Greece participated. All Eurofit motor fitness tests and anthropometric measurements were obtained twice with one week between the two measurements. Intraclass correlation coefficient indicated satisfactory coefficients above 0.70 for most tests. The only exception was the plate-tapping test, which yielded a low value ($r=0.57$). Further, the majority of the Eurofit test battery fitted well within the 95% confidence interval and only three Eurofit motor fitness test items (flamingo balance, plate tapping, and sit-ups) presented a confidence limit below the value of 0.70. These findings indicated that the Eurofit test battery yielded reliable data for undergraduate students. However, modifications should be considered to improve the reliability of certain test items, for application to undergraduates.

Furthermore, local (Monyeki, Kemper, & Makgae, 2008) and international (Przeweda & Dobosz, 2003; Serbescu, Flora, Hantiu, Greene, Laurent Benhamou, & Courteix, 2006; Saar & Jürimäe, 2007) studies have also employed the Eurofit test battery to determine fitness levels and thus confirmed the test battery's validity and reliability.

2.5.3 Summary

Selected tests from the Eurofit physical fitness battery were selected for the current study. These tests will be described in detail in the following chapter.

2.6 Overview

The researcher believes that school-based interventions are necessary to curb the prevalence of overweight and obesity in schools. Taking into consideration the literature presented, the ideal would appear to be a combination of PA and nutrition interventions. In primary schools, boys and girls can participate in the same intervention. However, at high school level it appears that separate interventions are necessary for males and females due to varying physiological and psychosocial differences between males and females.

Physical activity interventions are more likely to be more effective when delivered by PE specialists or trained educators as compared to non-specialist/trained educators. Another important component with regard to nutrition is the implementation of nutrition policies within the school. Policies can include nutrition education; verbal prompting of healthy food choices by educators particularly when learners purchase consumables at school and healthier food substitutions or alternatives. Overall, school-based interventions have proved to be effective in modifying learners' health behaviours, although parental involvement plays a significant contribution to ensure sustainable positive health behaviour.

“The need to increase PA levels of children and youth is clear. Equally clear is the need to accompany all PA interventions with appropriate methods of measuring PA and related factors in order to identify the interventions that are

most likely to improve the health and fitness of children and youth.” (Ward et al., 2007, p. 165).

CHAPTER THREE

METHODOLOGY

This chapter describes the study's theoretical framework, research design, data collection methods, ethical consideration and fitness tests protocols.

A pilot study was implemented prior to the larger study. The sample selection, target groups and intervention settings, phases and statistical analysis will be described separately for the pilot and larger study respectively. The training workshops for educators, intervention and data collection methods will be described thereafter. The chapter concludes with the fitness tests procedures and instruments used for the data collection process.

3.1 Theoretical Framework

Researchers generate theories to help answer questions and to provide a way to identify important influences on behaviour. A theory is a set of statements or principles used primarily to explain a phenomenon but also to predict future outcomes (Ward, Saunders, & Pate, 2007). By identifying influences on behaviour, effective health promotion programmes can be designed to target those influences and for the purposes of this study thereby increase physical activity (PA) and change unhealthy nutritional habits.

No single theory can explain an entire field, especially with regard to the complex phenomenon of human behaviour. However, the most widely used theory for understanding PA is the social cognitive theory (SCT). The SCT is largely the result of Albert Bandura's (1986) work and is one of the most successful theories commonly used to guide the development of PA programmes in youth. Bandura (1986) believed that the environment and the individual affect one another in a process called reciprocal determinism. Triadic reciprocity (Figure 3.1) is a model of the idea of reciprocal determinism, in which three broad factors influence one another:

- 1) cognitive or personal factors within the individual,
- 2) behavioural skills of the individual, and
- 3) environmental factors.

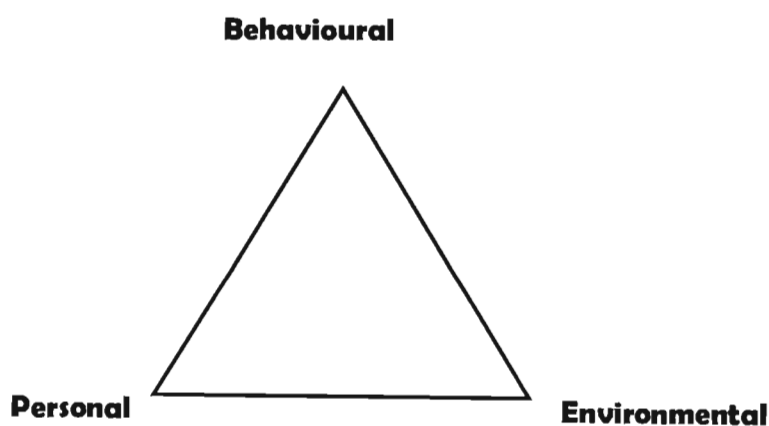


Figure 3.1: Model of triadic reciprocity (Bandura, 1986)

With regard to Bandura's (1986) study, to understand or to influence a learner's PA behaviour, the learner's experiences, current behavioural skills and the context or setting in which the learner is expected to be active, must be considered.

Additionally, several major influences on youth PA have been identified (US Department of Health and Human Services, 1996; Sallis, Prochaska, & Taylor, 2000). For example, such influences as confidence operate from outside the individual; others such as social support originate with friends and family; and opportunities for PA in the community are factors outside the individual. These influences can be organised into levels using an ecological model (Figure 3.2).



Figure 3.2: The ecological model of influence

This helps categorise the constructs from multiple theories into five influences, namely,

1) individual (also called intrapersonal),

- Addressing obesity and other chronic diseases begins by changing everyday behaviours that relate to eating and PA, i.e. changing individual's knowledge, attitudes and beliefs. This is performed through interconnected social relationships — including families, schools, communities and government — individuals can find the support and guidance that is needed to start making more healthful choices.

2) interpersonal,

- Includes family or a group of friends, a book club or a biking club, almost everyone belongs to some sort of group. Interpersonal groups are an important way to encourage more healthful behaviours, providing individuals with the knowledge and support that is needed to make good nutrition and PA choices.

3) organisational,

- Organisations include schools, places of employment, places of worship, sports teams, and volunteer groups. Organisations can help members make better choices about healthful eating and PA through changes to organisation policies and environments as well as by providing health information.

4) environmental or community, and

- A community is like a large organisation, able to make changes to policy and the environment to provide residents with access to healthful foods and places to be physically active. Changes to zoning ordinances, improvements to parks and recreation facilities, creating ways to distribute free or inexpensive fruits and vegetables. These are only a few of the many ways community residents, groups, and organisations can work together to improve nutrition and PA.

5) policy or society

- This all-encompassing category involves individuals, organisations, and communities working together for change. New nutrition and PA legislation, state-wide school policies, media campaigns and partnerships with business and industry are just some of the ways a comprehensive strategy to address obesity and other chronic diseases takes shape on a large scale (McLeroy, Bibeau, Steckler, & Glanz, 1988; Centers for Disease Control and Prevention, 2007).

An ecological model emphasises the importance of considering multiple levels of influence and the role of the environment on behaviour (Sallis & Owen, 2002). Experts recommend using a multilevel approach to understand and promote PA, which means that influences on PA other than individual influences should be considered (Ward et al., 2007). Therefore, multilevel interventions or programmes that target these influences are more likely to be effective in changing behaviour than those that do not, assuming that resources are sufficient to implement a

multilevel programme (Sallis, Pinski, Grossman, Patterson, & Nader, 1988; Sallis et al., 2000).

This study employs Bandura's SCT and the model of triadic reciprocity together with an ecological model approach.

3.2 Research Design

This empirical study presents with the following two research designs:

1. Quasi-experimental research design:

a) Pre- and Post-Test Control Group Design (Pilot study)

Outcome evaluation research aims to answer the question of whether an intervention has been effective or successful. The main aim is to establish whether the intended (and unintended) outcomes of the programme have materialised (Mouton, 2005).

b) Nonequivalent Control Group (Larger study)

This design is frequently employed in the real-world settings where groups cannot be randomly formed. The design is as follows:

$$\begin{array}{ccc} O_1 & T & O_2 \\ \hline O_1 & T & O_1 \end{array}$$

O = Level of performance

T = Treatment

Researchers will compare O_1 to O_3 and declare the groups equivalent if this comparison is not significant. However, if the groups differ when compared, analysis of covariance (ANCOVA) is applied to adjust O_2 and O_4 for initial differences (Thomas & Nelson, 1990).

2. Participatory/action research design

Studies that involve participants as an integral part of the design. Qualitative methods are mainly used to gain understanding and insight into life-world of participants (Mouton, 2005).

3.3 The Pilot Study

A pilot study was conducted prior to the larger study.

3.3.1 Aims

The pilot study aimed to provide:

- documentation on barriers and enabling factors for the school-based Nutrition and Physical Activity (NAP) intervention.
- feedback from all participants to adapt or improve the intervention was necessary for the larger study.
- feedback from learners regarding the questionnaire as the questionnaire was not tested in KwaZulu-Natal.

3.3.2 Sample selection

A convenient sample selection of two health promoting and two non-health promoting primary schools in the Pietermaritzburg/Umgungundlovu Health district was selected by the KwaZulu-Natal Department of Health (DoH). These four primary schools were selected based on their easy accessibility and close proximity to each other (not more than 50 km away from each other). This was additionally advantageous to the researcher with regard to monitoring and further developing the intervention. Schools were jointly confirmed to be part of the pilot study by representatives from the DoH and KwaZulu-Natal Department of Education (DoE).

A health promoting school (HPS) can be defined as a school which is constantly strengthening its capacity as a healthy setting for learning, working and living. A school receives this status when various criteria are reached. These criteria are determined by the DoH and a school is awarded health promoting status by the DoH. Important classifications of a HPS's can include:

- Developing its curriculum and life skills programmes to address its health needs.
- Striving to improve the health of the school personnel, families and the community members as well as learners.
- Striving to create a healthy environment in its broadest sense, through school health education (Life Orientation) and provides health promotion programmes for staff, learners and the community.

Additionally, the DoH believed that HPS's would be more receptive to an intervention as compared to non- HPS's.

3.3.3 Target groups and intervention settings

Principals (n=4), selected educators (n=10) and learners (n=256) in grade six from four schools in the Pietermaritzburg/Umgungundlovu Health district in KwaZulu-Natal volunteered to participate in this study. Grade six learners were selected as research (Sallis, Prochaska, Taylor, Hill, & Geraci, 1999) has shown that reliability and validity increase as children become older. Grade seven learners were not selected as it would be difficult to further monitor the progress of the learners as these learners would be in secondary school the following year.

Schools were further categorised according to their location and access from the city/town centre. Urban (n=2), within the city/town centre; peri-urban (n=1), located in the city/town outskirts; and rural (n=1), more than 50 km from the city/town, including non-tarred or dirt road access. A school-based intervention was implemented in each school for a period of five months.

3.3.4 Phases

Phase one

- School visits by the researcher to inform the school principals and educators about the study.

- Training of provincial nurses to assist in questionnaire administration, fitness testing and data collection.
- Interviews with principals and educators regarding their knowledge and attitudes towards PA. Teaching methodologies of PA were also explored.
- Educators attended a three-hour training workshop prior to the implementation of the five-month NAP intervention. Short courses on learner's health, PA and nutrition were included.

Phase two

- Questionnaires and fitness tests were administered on learners.
- Educators implemented the NAP intervention for a period of five months in schools.
- At least two monthly follow-up visits to schools by the researcher and school health nurses (research team) were performed to monitor the NAP intervention.

Phase three

- Redistribution of questionnaires to learners.
- Reassessment of physical fitness of learners.
- A focus group session with principals and educators to gain feedback regarding the strengths and weaknesses of the intervention. Officials from the DoE and DoH were also present during this session. Challenges experienced during the implementation of the intervention were described and recommendations to improve the programme were provided.

- Certificates (Appendix One) for the most improved learners post-intervention physical fitness tests scores per school were presented.

Phase four

- Findings were presented to DoE and DoH.

It is important to note that the total duration of the NAP project was for a period of six months. The NAP intervention was implemented by the trained educators for a duration of five months in the respective school.

Figure 3.3 illustrates the primary tasks and sequence of events of phases one to three.

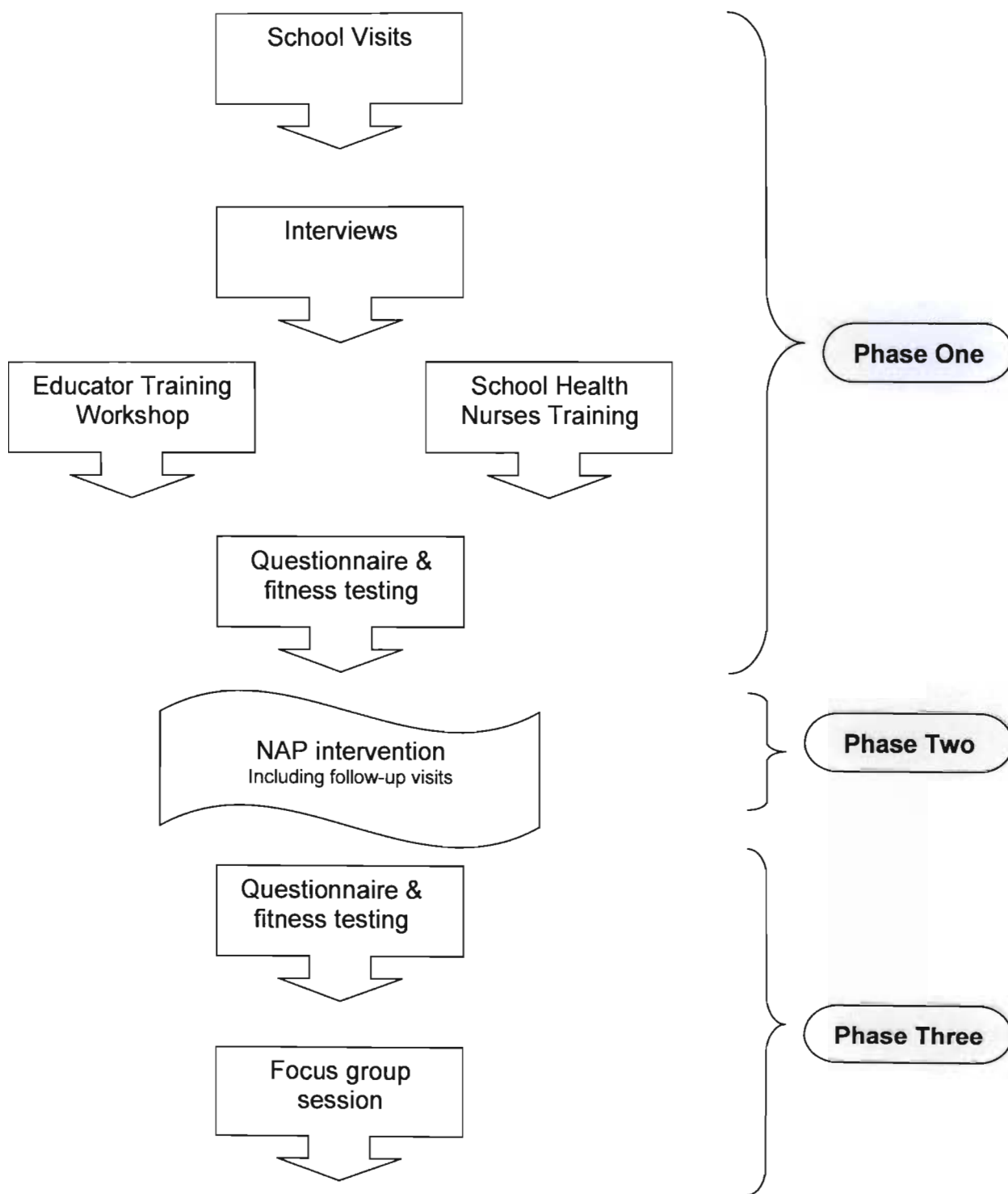


Figure 3.3: Phases and sequence of events of the study

3.3.5 Statistical analysis

The data were analysed by a computerised statistical programme known as Statistical Package for the Social Sciences (SPSS) Version 15. Descriptive (means and standard deviations) and inferential (paired t-tests and chi-square tests of independence) statistics were used to test significant differences pre- and post-intervention.

A significant test shows that there is a difference in that particular measure post-intervention. With regard to inferential statistics, the paired t-test and chi-square tests of independence are used to test paired data. A level of significance of 0.05 was applied for inferential analyses, unless stated otherwise.

Paired t-test

This test is used on paired data: before and after measures – to test whether the differences (pre- to post-intervention) are equal to zero. If the test is found to be significant, it shows that there is a difference in the measures from before to after. For this test to be valid, it requires the paired differences to follow a normal distribution. When paired differences did not follow a normal distribution, the chi-square test of independence was applied.

Chi-square test of independence

The advantage of this test is that there are no requirements of normality. A problem that can arise is the following:

When the sample size is small, calculated expected frequencies often turn out to be small. For validity, the chi-square test assumes that each cell has an expected frequency of five or more. The Fisher's exact test is applied when one wants to conduct a chi-square test but one or more of the cells has an expected frequency of five or less. Fisher's exact test has no such assumption and can be used regardless of how small the expected frequency is. If found to be significant, this test can show that the responses to questions are dependent on the 'before and after' measures of the intervention.

These statistical methods were appropriate for this study as the researcher aimed to test the hypotheses i.e. to determine whether the implementation of the intervention would result in health behaviour modification among learners. Hence, such statistical tests were selected to conclude if significant changes occurred as a result of the intervention.

Interviews and the focus group session transcripts were coded and common themes were expressed.

3.4 The Larger Study

Feedback and recommendations from the focus group session during the pilot study was taken into consideration regarding modifications to the intervention. The pilot study was then implemented on a larger scale.

3.4.1 Sample selection

The province of KwaZulu-Natal is divided into three areas, with eleven districts in total. Currently, ten out of the eleven districts have identified two or more HPS's in each district. For this study, three districts were identified with the following number of HPS's (Table 3.1).

Table 3.1: Sample selection

	Name of district	No. of HPS's
1.	Ugu/ Port Shepstone	5
2.	Umgungundlovu/Pietermaritzburg	6
3.	Sisonke/Ixopo	4
	Total	15

The following districts had been purposively and jointly selected by the DoH and DoE based on the accessibility and willingness to participate in **this study**. All 15 HPS's were willing to participate in the study. However, four schools did not enrol grade six learners. Therefore 11 schools participated in this study. Figure 3.4

depicts the selection and division of the 11 schools. Nine intervention and two control schools were randomly selected. On completion of the study, the control schools would be provided with intervention materials and training.

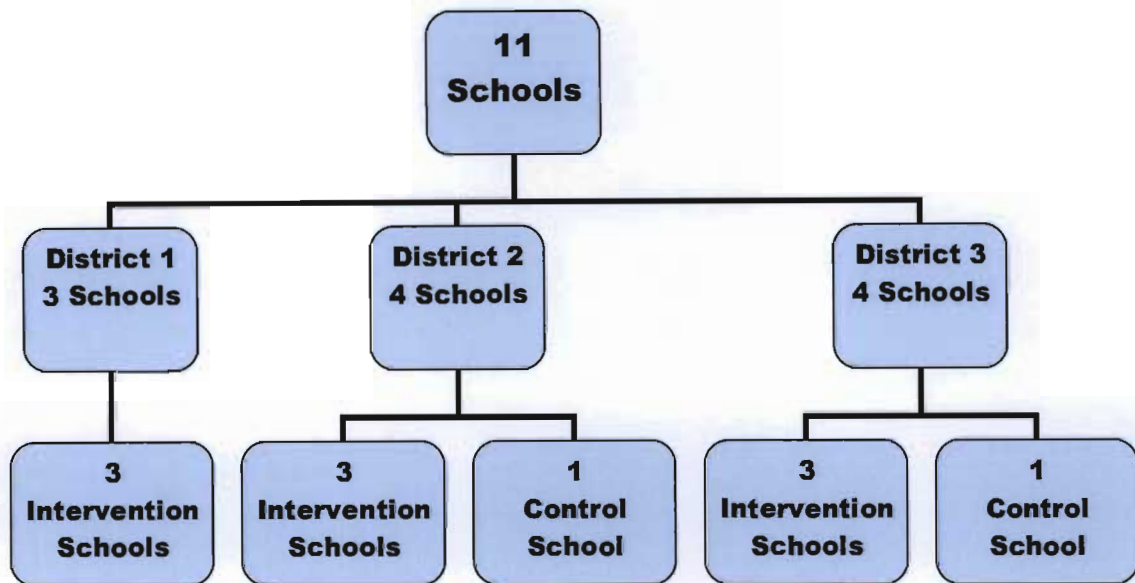


Figure 3.4: Division of the sample

3.4.2 Target groups and intervention settings

Principals (n=11), educators (n=26) and learners (n=798) in grade six from 11 schools in KwaZulu-Natal were selected to participate in the NAP intervention for a period of 10 months. However, the total duration of the research project was 18 months. Seven rural, three peri-urban and a single urban school were selected.

3.4.3 Phases

Phase one

- School visits by the researcher to inform the school principals and educators about the study.
- Interviews with principals and educators regarding their knowledge and attitudes towards PA. Teaching methodologies of PA were also examined.
- Educators attended a four-hour training workshop on learning and implementation of the NAP intervention. Short courses on learner's health, PA and nutrition were included.

Phase two

- Questionnaires and fitness tests were administered on learners.
- Educators implemented the NAP intervention for a period of ten months.
- A second training workshop for principals and educators was conducted during the 6th month of the NAP intervention.
- A focus group session with principals, educators and the school health nurses during the 6th month of the NAP intervention.
- At least two monthly follow-up visits to schools by the researcher and school health nurses (research team) were performed to monitor the intervention.

Phase three

- Redistribution of questionnaires to learners.
- Reassessment of physical fitness of learners.

- A second focus group session with principals, educators, school health nurses, DoH and DoE officials two weeks following the ten month NAP intervention.

Phase four

- Findings presented to DoE and DoH.

3.4.4 Statistical analysis

The data analysis was similar to that of the pilot study. The SPSS, Version 15 computer programme was also utilised for analysis. Descriptive and inferential statistics were used to test significant differences pre- and post- intervention. Additionally, ANCOVA was also applicable when comparing pre-test and post-test scores for fitness tests.

Analysis of covariance

In this study, learners were not randomly assigned to groups but were found in pre-existing intact groups (schools). Since the existing research setting is not disrupted, the external validity of the design is improved. This design is, however, more sensitive to internal validity problems.

With ANCOVA, the dependent variable is the post-test score; the independent variable is the grouping variable - in this case the control/intervention grouping; and the covariate is the pre-test score.

The following is assumed for ANCOVA:

- Interval level dependent variable
- Categorical independent variable(s)
- Continuous, interval level covariate
- Covariates are linearly related to the dependent variable
- Homogeneity of variances of the dependent and of the covariate for each independent group. This is tested by Levene's test. This is a very conservative test so one can assume that variances are equal if $p > 0.001$ (not $p > 0.05$). If this fails then test the variances with the Fmax test i.e. largest variance/smallest variance ≤ 10 .
- Dependent variable should not be related to the independent variable
- Multivariate normality - dependent variable should be normally distributed in each category of the independent variable. F-test is robust for moderate departures from normality so long as kurtosis is non-extreme (from -1 to +2) and sample size > 5 .
- Groups formed by categories of the independent variable should be equal or similar in sample size.

Therefore, ANCOVA was applicable to test whether the post-test fitness scores were different for the two groups - control and intervention groups. The pre-test score was used as the covariate in each case.

Furthermore, interviews and focus group sessions were coded and common themes were expressed. Data will be graphically and tabularly presented.

3.5 Training Workshops for Educators

Prior to the onset of the school-based intervention, training workshops were held. The researcher conducted workshops for school educators on a voluntary basis. A three-hour session during the pilot study and two, four-hour sessions during the larger study were provided. Grade-appropriate learning materials were designed and developed to incorporate nutrition and PA into selected learning areas, namely, English, Mathematics, Natural Science, Social Science and Life Orientation. Workshops were "hands on" with educators actively engaging in practical sessions. At the end of the sessions, educators were given booklets containing classroom-based physical activities.

3.6 The Intervention

The NAP intervention was designed to introduce various methods of PA and healthy nutritional habits within the school's existing curriculum. Classroom-based intervention materials were developed to provide cost-effective and more importantly a sustainable intervention. The key strategy was to integrate the NAP intervention into the school curriculum by means of an inter-learning areas (intergration of learning areas) approach via trained educators. Educators were trained to lead intervention activities, were provided with copies of all the activities

and were allowed to choose which activity and when necessary to include such activities within particular lessons. The intervention was designed to be implemented by the school personnel with minimal external support to enable implementation following the study to be practicable and realistic. The intervention was divided into the following three components:

3.6.1 Physical activity

The training workshops empowered educators with the knowledge and skills to promote PA within and outside the classroom efficiently and effectively.

Classroom activities included modifying current lesson plans in selected subject curricula, particularly in Life Orientation. Physical activities such as stretches, games, and role-playing were to be included within lessons.

A one-minute PA, prior to each lesson was encouraged to be performed daily by the learners and supervised by educators. The activities could vary from basic stretches to rotating arms to jogging on the spot. The activity was to be performed continuously for a minute while learners are at their designated seat for that particular lesson.

Equipment for sport and games will be provided during lunch-breaks for learners to encourage PA. Educators on duty will distribute and supervise activities.

The mode, frequency and duration of physical activities were regularly recorded by the educators, excluding the lunch-breaks. Each educator received a diary where activities were recorded.

3.6.2 Nutrition

Schools were to increase the availability of healthy products (market low-fat food, fruit, juices and water) and decrease the availability of unhealthy products (fizzy-drinks, selected sweets and chips) at all school tuck-shops if applicable. Educators were to advise and prompt learners to purchase healthier food and drink options from school tuck-shops (larger study). Learners in the pilot study were also provided with water-bottles. Educators encouraged and prompted learners to fill bottles only with water, drink water throughout the day, and ensure that at least by the end of the school day, the water has been consumed.

3.6.3 School policies

The intervention aimed to establish a health promoting environment in the schools through physically active and healthy learners, educators and principals. Therefore, school staff and learners were encouraged to engage in policy change efforts, such as developing a nutrition policy banning fizzy-drinks in school.

3.7 Data Collection Methods

A triangulation of data collection methods were selected for this study. Triangulation is broadly defined as synthesis and integration of data from multiple sources through collection, examination, comparison, and interpretation. By first gathering and then comparing multiple datasets to each other, triangulation helps to counteract threats to validity in each (Institute for Global Health, 2007). Figure 3.5 highlights both the qualitative and quantitative data collection techniques employed for this study.

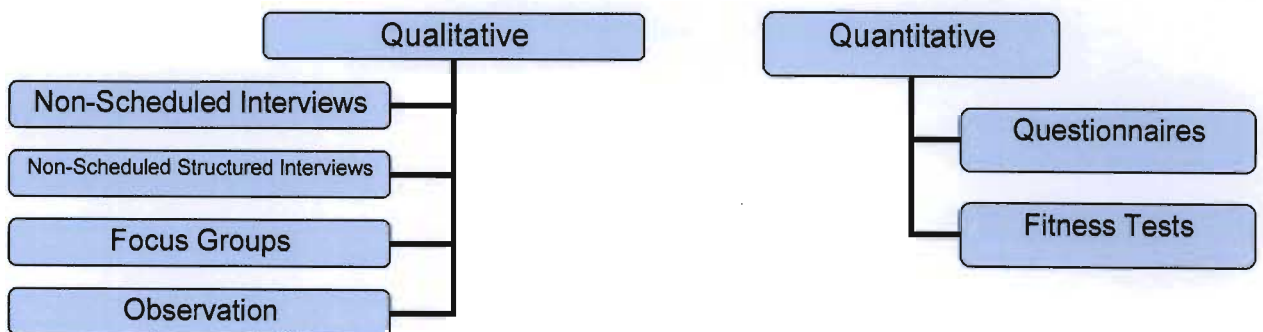


Figure 3.5: Data collection methods

3.7.1 Qualitative methods

1. Non-scheduled interviews

The interviewees are allowed to express their views broadly on a certain issue. Interviewees are free to expand on the topic as they see fit, to focus on certain aspects, to relate to their experiences etc. The interviewer would only intervene if clarification is needed or further explanation, but would not ask probing questions.

This technique is useful in exploratory research. No comparison is sought between responses of different participants (Bless, 1995).

Principals and selected educators and learners were interviewed using this particular technique during the initial visit by the researcher. The topic discussed PA participation within the school curriculum and general questions pertaining to the schools nutritional programme/feeding scheme/tuck-shop.

2. Non-scheduled structured interviews

The interviewer has a much more precise goal and the types of questions to be answered by all interviewees are fixed. A list of issues which has to be investigated is compiled prior to the interview. This technique is a non-scheduled interview in the sense that the interviewer is free to formulate other questions as judged appropriate for the given situation. Participants are not confronted with already stated definitions or possible answers, but are free to describe their own definitions, to describe a situation or to express their particular views and answers to problems (Bless, 1995).

Selected educators were interviewed using this technique during follow-up visits. The researcher explored the importance of physical activity and healthy nutrition at the schools (Appendix Two).

3. **Focus groups**

This is another technique used to interview participants. In many cases it is useful to interview several participants together. The focus group enables participants to share their experiences and to reach some kind of consensus about the topic. This is particularly useful in participatory and action research where members of the group are equal participants in the planning and implementation of research (Bless, 1995).

The focus group interviews (Appendix Three) between the researcher and principals, selected educators DoE representatives, DoH nurses and representatives were scheduled two weeks post-intervention for the pilot study and during the sixth month (larger study) of the intervention as well as two weeks post-intervention. Information regarding the progress and implementation of the intervention were discussed. Each school shared their successes, challenges and recommendations.

4. **Observation**

Field work observation was conducted. The researcher observed the learners and the school environment/setting during lunch-breaks. Notes and photographs were documented during and after lunch-breaks.

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3.7.2 Quantitative methods

1. Questionnaires

Grade six learners completed a questionnaire based on their PA and basic nutritional knowledge, attitudes and practices pre- and post-intervention. The self-report questionnaire was divided into three sections, namely, demographics; physical activity participation in school and after school; and nutrition (Appendix Four).

The questionnaire was developed in conjunction with the University of Cape Town and was administered in the rural communities in Limpopo and in Alexandra Township in Gauteng. The questionnaire was part of the Discovery Healthy Lifestyle Project or otherwise known as Health Nutz.

2. Physical fitness tests

Learners participated in the Eurofit (1993) Physical Fitness Test Battery pre- and post-intervention. Selected tests were reliable and valid for purposes of this study. Table 3.2 indicates the tests selected for the evaluation of the fitness indices. Learner's physical fitness test scores were recorded on a data sheet (Appendix Five) pre- and post-intervention.



Table 3.2 **The physical fitness test battery**

Component	Selected Test
1. Morphological Indices	<ul style="list-style-type: none">➤ Height➤ Body Weight➤ Body Mass Index
2. Flexibility	<ul style="list-style-type: none">➤ Sit-and-Reach
3. Speed and Agility	<ul style="list-style-type: none">➤ 10 x 5 m Shuttle
4. Muscular Endurance	<ul style="list-style-type: none">➤ 30-sec Sit-up
5. Explosive Power	<ul style="list-style-type: none">➤ Standing Broad Jump

3.8 **Qualification of Research Assistants**

The researcher and trained DoH school health nurses were responsible for the data collection from the selected schools. At least three school health nurses from each district were trained by the researcher to administer the questionnaires and fitness tests. School health nurses attended two three-hour training workshops. The first workshop was scheduled a week prior to the implementation of the pilot study and a second was scheduled a week prior to the larger study. The researcher ensured that the data collection teams familiarised themselves with test procedures and scoring before school visits. The school health nurses also assisted the researcher with the monitoring of the intervention in each school as nurses frequently visited these schools in their districts.

3.9 Ethical Considerations

The KwaZulu-Natal DoH and DoE, as well as the national DoE supported this study. Ethical clearance (Approval Number: HSS/0024/07D) for this study has been granted by the University of KwaZulu-Natal.

Learners provided written informed assent and their parent/guardian gave written informed consent (Appendix Six). Principals and educators completed informed consent forms (Appendix Seven). In terms of confidentiality, complete anonymity of principals, educators and learners is not possible as records will need to be consulted in order to contact them, but their identities will be coded and these codes will only be available to the researcher. Only participants' coded identities will appear on questionnaires and interview transcripts and only the research team will have access to these questionnaires and transcripts. Apart from the time they are being transcribed, the recordings of interviews, along with the questionnaires, will be kept in the possession of the researcher and will be destroyed five years after the completion of this study. In order to further protect participants' anonymity, no connection will be made between their responses and the facility at which they are placed.

The benefits of this study were highlighted to participants. They were assured that their participation in this study is voluntary and that it is greatly appreciated. It was also made clear that participating in this study, or the choice *not* to be

involved in this study, would not affect their future academic and/or professional career in any way.

Although the majority of these ethical issues were addressed in the consent forms provided for participants, these were also reiterated verbally where possible.

3.10 Description of the Fitness Tests Protocols

3.10.1 Testing environment

Testing procedures were conducted at the school in an appropriate environment e.g. in the classroom or school hall. Each test was standardised and all equipment was calibrated before tests were performed. Equipment such as stadiometres, Detecto digital scales and sit-and reach boxes were provided by the research team. The same equipment was used for testing at all schools. The researcher ensured that the test procedures and administration were alike throughout the testing, to promote validity and reliability. The same measuring instruments were used throughout the testing programme.

It was recommended that the learners wore suitable clothing and training shoes (if applicable) during testing. Learners completed a circuit comprising of various stations (Figure 3.6), with each station measuring a particular fitness component. Prior to the testing, the fitness tests were discussed and demonstrations were held at each station. The reason for performing each test and the correct technique was

explained to the learners to ensure test reliability. Learners were also familiarised with the equipment used for testing.

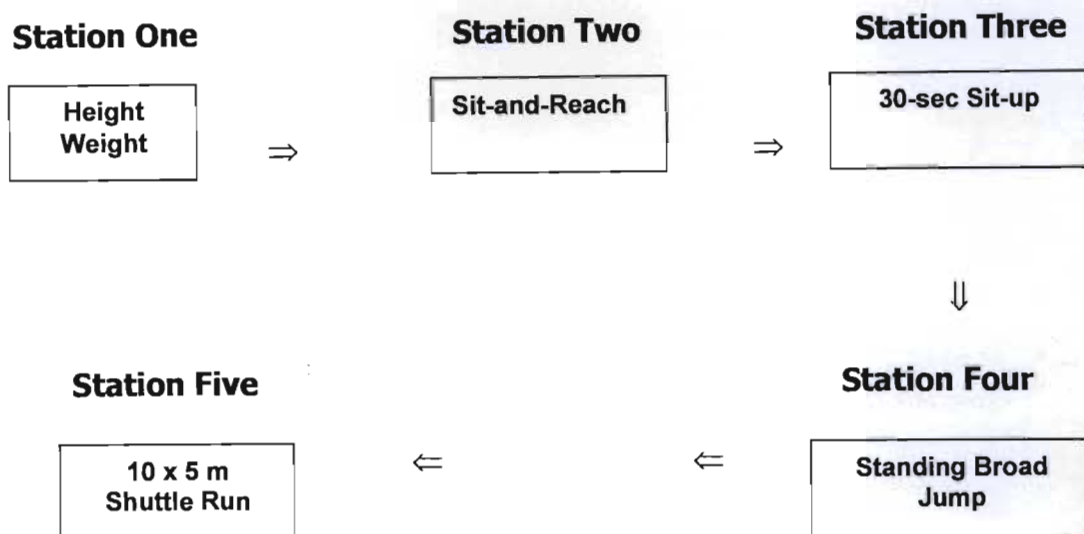


Figure 3.6 Circuit for fitness components

A general warm-up was performed by all learners prior to starting any testing sessions.

The completed tests results were recorded by the researcher and or trained school health nurses. The researcher stressed the importance of accuracy when recording fitness tests results. The questionnaire was also completed by all learners in the classroom prior to the fitness testing.

In this section the testing methods, techniques and protocols will be described for each test.

3.10.2 Standing height (Eurofit, 1993)

➤ **Purpose**

To record the height of each learner

➤ **Equipment**

A Stadiometre

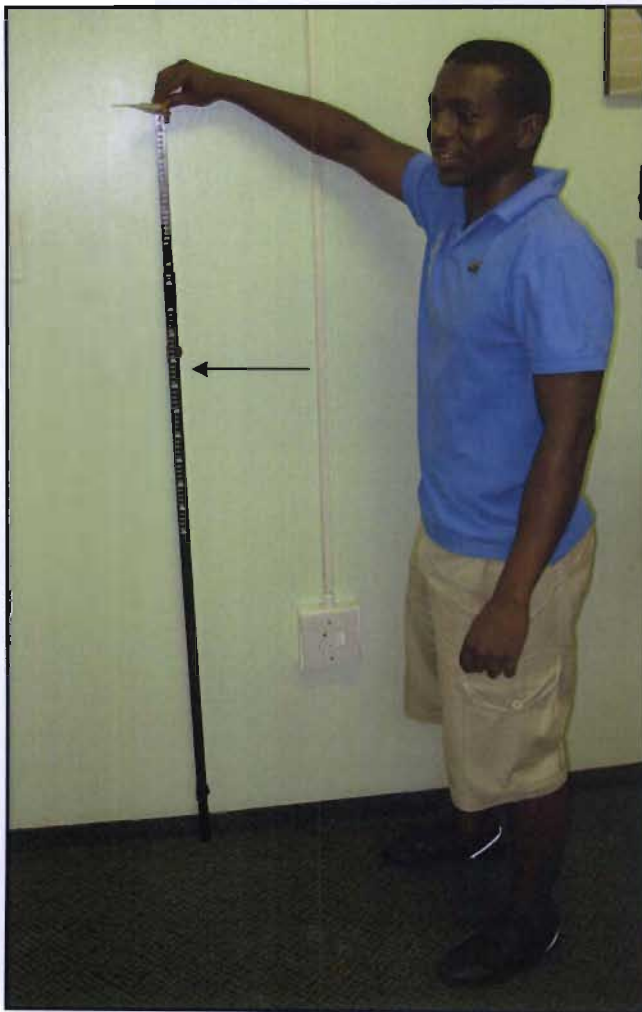


Figure 3.7: A stadiometre

➤ **Method**

The height of each learner (barefoot) was measured. The learner stood with his/her heels, buttocks and upper part of the back resting against the stadiometre, with arms hanging naturally by the sides. The height determined was at the highest point of the head, looking straight ahead.

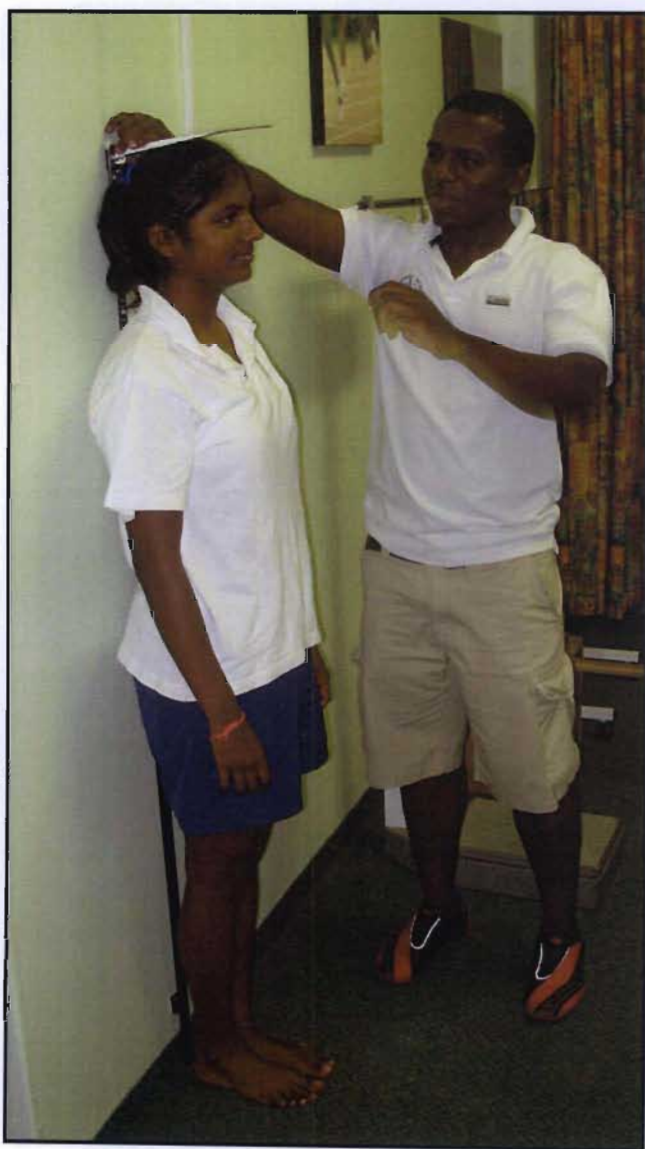


Figure 3.8: Height measurement

➤ ***Interpretation***

The height was recorded in centimetres (cm) to the nearest 0.5 cm.

3.10.3 Body weight (Eurofit, 1993)

➤ ***Purpose***

To record the weight of each learner

➤ ***Equipment***

A Detecto Digital Scale



Figure 3.9: A Detecto digital scale

➤ **Method**

The scale registers at zero before the learner steps on. The weight of each learner was measured without wearing shoes. The learner stands vertically on the platform of the scale (Figure 3.10).



Figure 3.10: Weight measurement

➤ **Interpretation**

The weight was recorded in kilograms (kg) to the nearest 0.5 kg.

3.10.4 Body mass index (Eurofit, 1993)

➤ **Purpose**

To provide an indication of the relationship of weight to height

➤ **Method**

The body mass index (BMI) was computed with the following equation:

$$\text{BMI} = \frac{\text{Weight in kilograms}}{(\text{Height in metres})^2}$$

➤ **Interpretation**

BMI is classified according to the standard Centre for Disease Control charts of children's Body Mass index (BMI). This is the recommended method to judge if a child is overweight, obese, normal or underweight (Report of the World Health Organization Consultation of Obesity, 1997).

According to the BMI and Age charts (Appendix Eight), if the BMI score is higher than the 85th percentile or 95th percentile lines, then the boy/girl's result is in the overweight and obese thresholds. Any values of BMI between the 5th and 85th

percentiles are considered to be within the Normal range for a girl/boy child, not overweight or underweight.

3.10.5 Sit-and-reach test (Eurofit, 1993)

➤ Purpose

The sit-and-reach test was designed to measure hip and trunk flexion and the ability to stretch the hamstring and lower back muscles

➤ Equipment

The measuring box was 33 cm high with an overhang of 50 cm

➤ Method

Each learner sits on the floor with legs out straight ahead. Feet (shoes off) are placed with the soles flat against the box, shoulder-width apart (Figure 3.11). Both knees are held flat against the floor by the tester to prevent knees from bending. With hands on top of each other and palms facing down, the learner reaches forward along the measuring line as far as possible (Figure 3.12). The furthest position that was reached by the learner and held for at least three seconds was recorded.



Figure 3.11: Starting position for the sit-and-reach test

➤ ***Interpretation***

The furthest point reached by the finger-tips of both hands was the score recorded. The measurement was recorded in centimetres, with 15 cm coinciding with the toes of the learner. If the finger-tips reach unevenly, the hand reaching the shorter distance was recorded. The learner repeated the test twice, with the highest reading of the two (rounded to the nearest centimetre) recorded as the final score.



Figure 3.12: End position for sit-and-reach test

3.10.6 30-second Sit-ups (Eurofit, 1993)

➤ ***Purpose***

To provide an indication of trunk muscle strength

➤ ***Equipment***

Stopwatch

➤ ***Method***

The learner was positioned with his/her knees bent at 90°, feet flat on the ground, hands behind head and both shoulder blades touching the floor. A helper sat opposite the learner and held his/her feet on the ground. The learner sat-up and

touched both knees with his/her elbows then returned to the starting position. The protocol required that the feet remained on the ground throughout the testing.



Figure 3.13: Starting position for sit-ups



Figure 3.14: End position for sit-ups

➤ ***Interpretation***

This motion from the starting position was repeated as many times as possible during 30 seconds. If the elbows did not touch the knees, the shoulder blades did not touch the ground or the hands were moved from behind the head, the repetition was not counted.

3.10.7 Ten x 5m shuttle run (Eurofit, 1993)

➤ ***Purpose***

To provide an indication of speed and agility

➤ ***Equipment***

Stopwatch, measuring tape, marker cones, rope, a flat non-slip surface

➤ ***Method***

The course was set-up, with marker cones and/or lines placed five metres apart. Two pieces of rope placed along the ground at these points, clearly indicated the start and finish lines of the five-metre distance. Each learner starts behind the rope on one side of the shuttle (Figure 3.15). After a countdown ("3, 2, 1, start") the learner ran as fast as possible between the cones (Figure 3.16), crossed the line with both feet, then ran back to the starting point. This is repeated five (ten shuttles) times without stopping (covering 50 metres total) in the shortest possible time.

➤ ***Interpretation***

The time taken to complete ten shuttles was recorded to the nearest 0.1 second. If a learner did not cross the line with both feet he/she was penalised 0.1 seconds. If this occurred more than once then the test was repeated following a short rest.



Figure 3.15: Starting position for 10 x 5m shuttle



Figure 3.16: Demonstration of the 10 x 5 m shuttle run

3.10.8 Standing broad jump (Eurofit, 1993)

➤ ***Purpose***

To measure the explosive power of the legs

➤ ***Equipment***

Tape measure , non-slip floor for take-off, soft landing area preferred

➤ ***Method***

The learner stands behind a line marked on the ground with feet slightly apart. A two foot take-off and landing is used, with swinging of the arms and bending of the knees to provide forward drive (Figure 3.17). The learner attempts to jump as far as possible (Figure 3.18), landing on both feet without falling backwards.

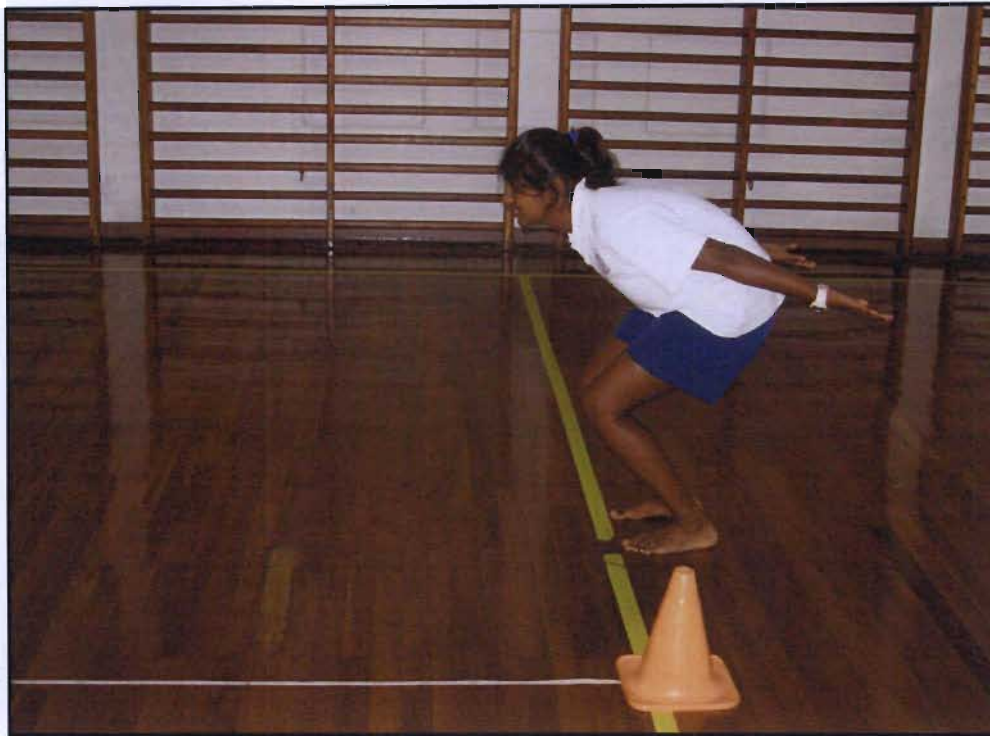


Figure 3.17: Starting position for the standing broad jump



Figure 3.18: Demonstration of the standing broad jump

➤ ***Interpretation***

The measurement (Figure 3.19) was taken from take-off line to the nearest point of contact on the landing (back of the heels). The better of the two scores was recorded in centimetres.



Figure 3.19: Recording of standing broad jump score

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter provides analyses and discussions of the results gathered in the current study. Firstly, a brief overview of the results and the discussion of the pilot study will be presented. Thereafter, a detailed description of results and discussion of the larger study will be presented.

The chapter will be divided into the following sections:

- 4.1 SECTION A - **Results of the Pilot Study**
- 4.8 SECTION B - **Discussion of the Pilot Study**
- 4.9 SECTION C - **Results and Discussion of the Larger Study**

SECTION A

4.1 Results of the Pilot Study

4.1.1 Introduction

The pilot study involved four schools (n=256 learners) that implemented and participated in the Nutrition and Physical Activity (NAP) intervention. Learners' nutrition and physical activity (PA) habits were assessed pre- and post-intervention. Learners served as their own control.

All four school principals and a minimum of two educators per school (n=10) were involved in the intervention. Participants were interviewed pre-intervention, during the intervention (follow-up visits) and at the post-intervention focus group session. The post-intervention focus group includes school health nurses and officials from the KwaZulu-Natal Departments of Health and Education Principals and educators were trained to administer and implement the NAP intervention.

Results pre- and post-intervention will be presented as a combined school sample. Individual school results will be discussed when applicable. A sub-sample of 185 (72%) questionnaires and fitness tests were analysed. Data were missing for 71 learners due to learners not attending the pre-/post-intervention measures, or inadequately filling-out questionnaires or no longer attending the school.

4.2 Demographics of the Learners

Questions regarding demographical data were completed by all learners. Results included the following:

Learners (n=185) completed questionnaires pre- and post-intervention. The learners comprised of 44% boys and 56% girls. Ages ranged from 10-15 years with 66% of learners being 12 years old at the onset of the project (Figure 4.1). The majority (83%) of learners are black. Seventy seven percent speak Zulu in the home and 17% are English speakers.

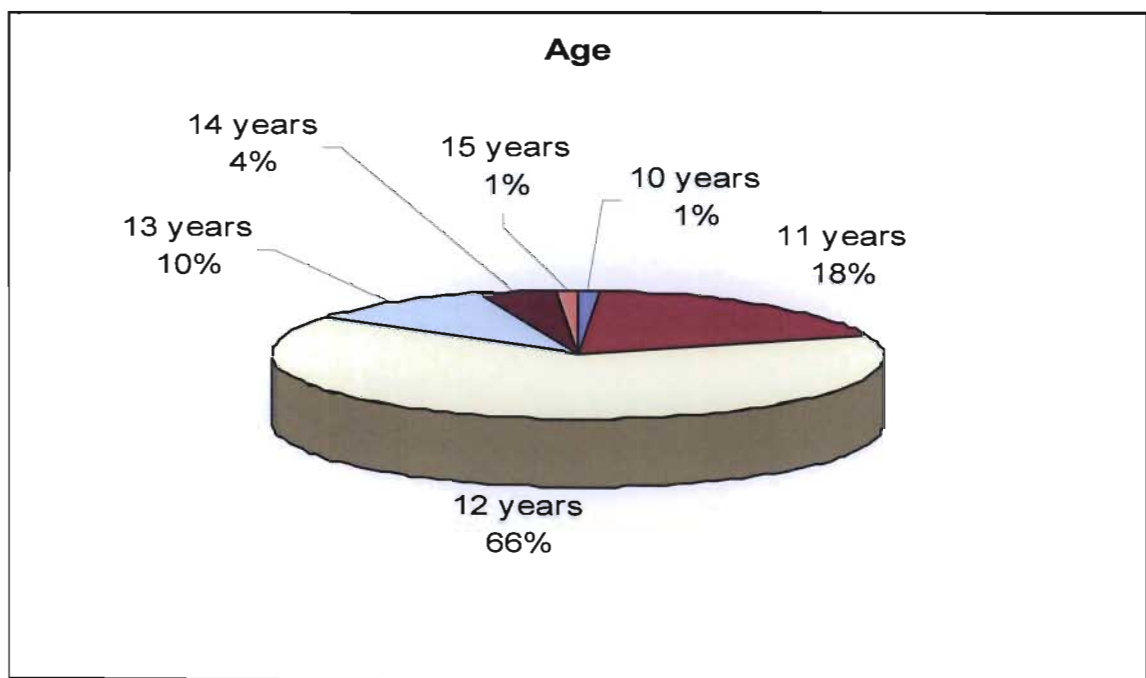


Figure 4.1: Age distribution of sample

Table 4.1 further illustrates learner demographics. Although 83% of learners live in brick homes and more than two-thirds of households have essential electrical appliances, it should be noted that an average of six individuals reside in a four-room house. Households varied from two to 20 occupants. Therefore, one can assume that the socio-economic status of the majority of learners in this study range from low to middle income groups. Sixty nine percent (n=128) of learners are travelling from distances greater than approximately a 20 km radius around their school. Learners' modes of transportation include taxi, bus, train and foot.

4.3 Physical Activity and Sports Participation Pre- and Post- Intervention

Results from the learner questionnaire determined PA and sports participation during selected time periods, namely, club/team level; Physical Education (PE)/Life Orientation (LO) lessons; lunch-breaks; and after school. Interviews with educators and principals, and fieldwork observation by the researcher during follow-up visits will also be discussed.

Table 4.1: Learner Demographics (n=185)

Demographics		n	(%)
Gender	Males	81	44
	Females	104	56
Racial group	Black	154	83
	Coloured	15	8
	Indian	16	9
Home Language	Zulu	142	77
	English	31	17
	Other (Xhosa, Sotho, Afrikaans)	12	6
Primary caregiver	Mother	105	57
	Grandmother	35	19
	Other (including brother/sister, aunt)	45	24
Type of home	Brick home	153	83
	Mud homes	17	9
	Flats	15	8
Homes consisting of four rooms, excluding the bathroom		165	89
Television sets in households		175	90
Radios in households		159	86
Refrigerator in households		168	91
Electric stove with oven in households		136	74
Cook on an open fire		43	22
Gas stove in households		43	23
Paraffin stove in households		37	28
Grow vegetables or fruit trees		144	78
Learners attend school in the same neighbourhood in which they live		57	31

4.3.1 Physical activity at club/team level during school hours

Figure 4.2 represents PA and sports participation of each learner at club/team level. It is evident that in every case, participation is significantly ($p < 0.05$) greater post-intervention than pre-intervention. The largest increases of 22% and 17% were in hockey and netball respectively. These increases were probably due to it been hockey and netball season. Incidentally, a 14% increase was found in dancing. This increase could be a direct result of the intervention as dance clubs were introduced into selected schools as part of the intervention programme.

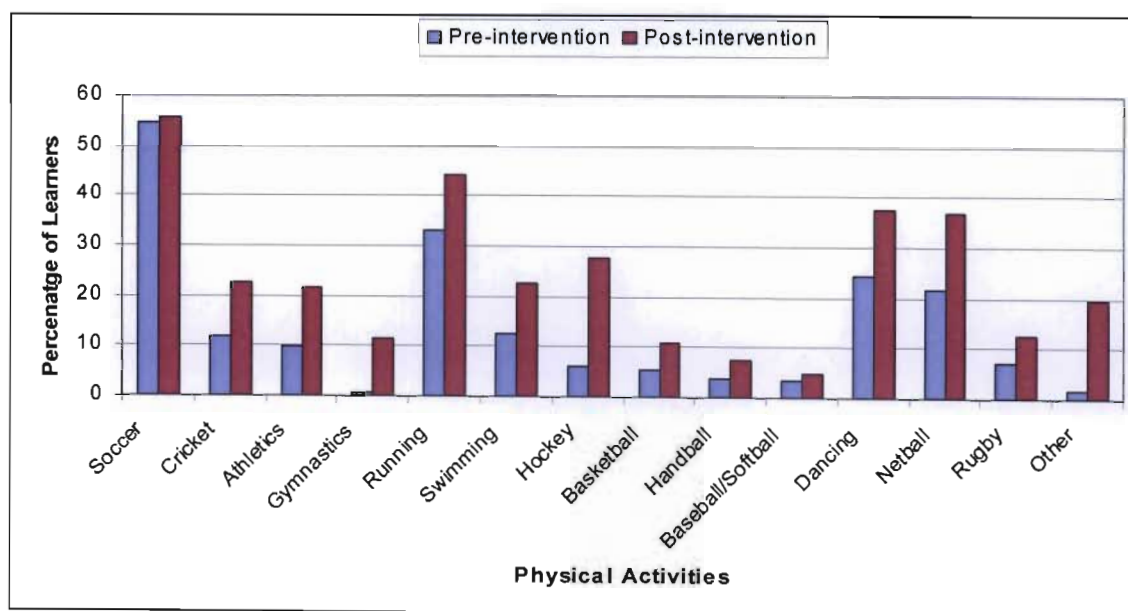


Figure 4.2: Participation of activities at club/team level

4.3.2 Physical activity during PE/LO lessons

Overall, results show that there was a significant ($p \leq 0.05$) increase in the average number of sports participated in by each learner post-intervention.

Participation has increased considerably in cricket (6% - 23%), hockey (14% - 37%) and dancing (6% - 18%). This may also be as a result of different sports being offered in PE/LO lessons at different times of the year.

Subsequently, the frequency of participation in physical activities in general was that 20% of learners did exercise 'more than 5 times' per week pre-intervention, while this figure significantly ($p \leq 0.05$) increased to 43% post-intervention. In addition, the percentage of learners which 'do not participate' had been reduced from 7% to 2% post-intervention.

4.3.3 Physical activity and sports participation during lunch-breaks

Reports from educators post-intervention stated that learners were motivated to participate in PA including games and sports during lunch-breaks. As part of the intervention, educators supervised and provided learners with necessary equipment for physical activities. It was also reported by educators that when PA or sports equipment was available for learners during lunch-breaks, learners PA and or sports participation increased. The researcher also observed learners participating in numerous indigenous games or sporting activities during lunch-breaks. Educators noticed an overall increase in the enthusiasm and the number of learners that participated in games and sport. The grade six learners enthusiasm created a new culture of games and play amongst other grades.

4.3.4 Summary of physical activity participation during school hours

It was estimated that during the five months of the NAP intervention, PA participation among learners ranged from 45-215 minutes per week of moderate to vigorous physical activity (MVPA) during school hours. This calculated value reflects an accumulative integration of physical activities across various learning areas. Educators completed log books recording the frequency, duration and perceived intensity of the learners' PA during school hours, excluding lunch-breaks.

4.3.5 Physical activity and sports participation after school

Figure 4.3 shows a general increase in after school activities from pre- to post-intervention per learner. This may possibly be an effect of the intervention where educators were advised by the researcher to stress the importance of regular PA during school as well as after school hours. There was a positive ten percent increase in the number of learners performing chores around the house. Additionally, learners participating in PA 'more than 5 times' per week after school had significantly increased ($p \leq 0.05$) from 35% to 55% post-intervention.

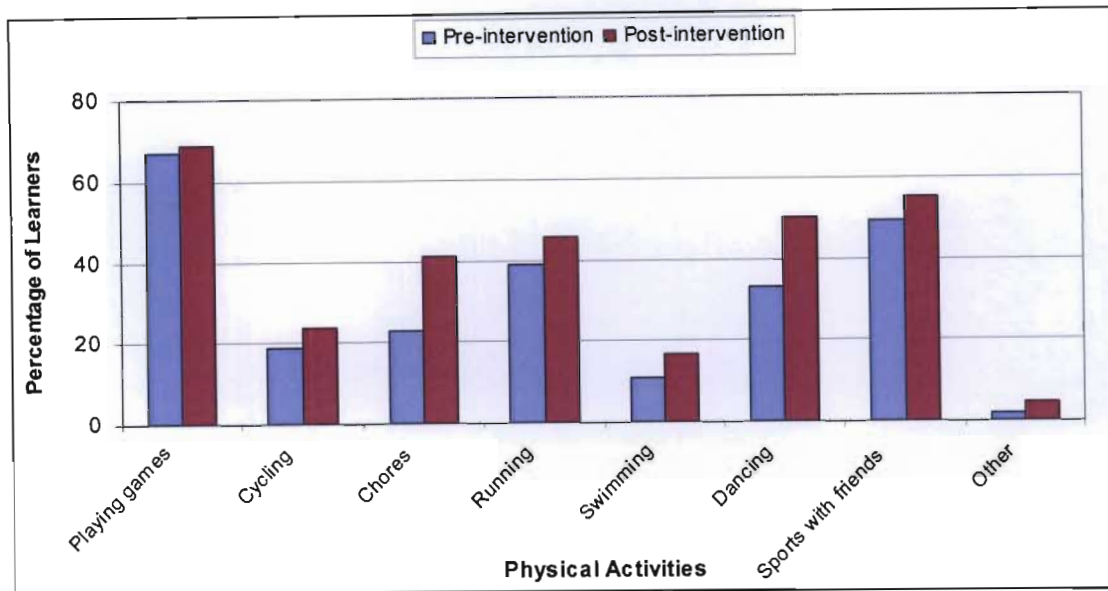


Figure 4.3: Participation in activities after school

4.4 Physical Fitness Tests

All learners completed a battery of physical fitness tests. Baseline data (Table 4.2) were collected pre-intervention and re-assessed post-intervention.

Table 4.2 shows minimal average increases in most of the categories. Increases in flexibility (sit-and-reach test) were not significant, whereas, abdominal endurance (sit-ups) showed significant ($p \leq 0.05$) increases for both boys and girls. The explosive strength component (standing broad jump) has remained unchanged at 1.30 m for the girls, with a 10 cm increase for the boys post-intervention. However, combined results for boys and girls standing broad jump indicate that the average score significantly ($p \leq 0.05$) decreased post-intervention.

Table 4.2: Average (standard deviation) fitness test scores pre- and post- intervention

Components	Pre-intervention		Post-intervention	
	Boys (n=81)	Girls (n=104)	Boys (n=81)	Girls (n=104)
Sit and Reach Test (cm)	29.11 (±6.05)	30.73 (±6.52)	29.38 (±6.45)	31.62 (±6.89)
Sit-ups	18 (±3)	15 (±4)	20* (±4)	16* (±4)
Standing Broad Jump (m)	1.50 (±0.21)	1.30 (±0.17)	1.60 (±0.21)	1.30 (±0.19)
BMI (kg/m ²)	19.15 (±0.52)	19.94 (±0.37)	19.95 (±0.63)	20.59 (±0.38)

Level of Significance:

* $p \leq 0.05$

"Overweight" and "obesity" were defined using the age and sex-specific criteria (Armstrong et al., 2006) employed by the Centre for Disease Control (CDC) and the World Health Organisation (Preventing and Managing the Global Epidemic of Obesity, 1997; Clinical Guidelines on the Identification, 1998). Body mass indexes greater than the 85th percentile is considered "at risk of overweight" and a body mass index greater than the 95th percentile is considered "obese". A positive was that all learners were below these percentiles pre- and post-intervention.

4.5 Nutritional Patterns Pre- and Post-intervention

During the initial interviews with the school principals and educators, the nutrition component of the intervention was not readily accepted by all schools as it was preconceived that change could lead to financial drawbacks. However, schools introduced gradual nutritional changes in tuck-shops and discovered that there were negligible financial implications. Educators reported a greater turnover during the intervention with healthier food and drink options being retailed at selected school tuck-shops. Learners continued to purchase food and drinks as usual from school tuck-shops although their original choices were unavailable. These alternatives appeared to be unopposed by learners according to reports from principals and educators.

The researcher also observed that healthier food and beverage choices were now available in school tuck-shops, such as low-fat yogurts and fruit as compared to pre-intervention observations. Carbonated drinks were also eliminated from menus and substituted with energy drinks and juices. As part of the intervention, learners were provided with water bottles to encourage the consumption of water throughout the school day. Principals reported that learners were motivated to carry their water bottles and regularly consume water during school hours.

4.6 Feedback from Educators regarding the Training Workshop

Educators' rated the training workshop to be useful and appropriate to the various learning areas/subjects and supported the approach of staff development.

Comments included:

"I wish we had more workshops like this. I have learnt so much."

"I never thought of all these easy games and activities that I can use during my LO lessons."

Staff development and sample material were valued by educators. Educators preferred incremental improvements in their current curricula and instructional strategies rather than the researcher providing structured curricula. Incidentally, improvements in current curricula were the approach of the NAP intervention. Educators were enthusiastic to learn and integrate new teaching strategies into their current areas of expertise. Innovative classroom PA strategies were also shared by educators particularly in English and Mathematics.

4.7 Focus Group Discussion Post-intervention

The focus group discussion was conducted two weeks post-intervention. The group comprised of school principals (n=4), educators (n=10) and the school health nurses (n=6). Department of Education and Health officials (n=4) were also present. Their presence was essential as feedback and clarity on issues such as

policy and equipment (sport, games and gardening) could be addressed and or followed-up.

4.7.1 Challenges encountered during the NAP intervention

Educators reported that the recording of learners PA during lessons in the NAP log book was time consuming. Comments included:

“There is not enough time for us to fill-in the log book at the end of each period.

We have lots of other paper work to do!”

“We sometimes forget to record the activity, but the learners remind us.”

The one-minute activity that was to be introduced at the beginning of selected lessons was not implemented. Educators expressed that this was not feasible and felt that it was unnecessary.

The vegetable garden was a challenge in a particular school. The soil in that area was not favourable for vegetation to thrive (This was a particular issue where the Department of Education (DoE) officials assisted with possible solutions).

4.7.2 Benefits of the NAP intervention

Educators and principals reported that learners enjoyed participating in PA. The learners enjoyed the new games that were introduced both in and out of the classroom. Educators also created new and innovative PA games within the classroom in various learning areas. Educators' statements included:

"I think we just needed some ideas and examples of what activities we can do during lessons and then we have expanded on some of them and even created our own."

"Teaching these activities is very enjoyable and fun for us and the children."

Two schools have held concerts for the first time as a result of the intervention.

Principals reported:

"Dancing has become a favourite amongst the learners and they wanted to show it off to the school."

"The concert involved the grade six learners but some of the other grades also took part."

During a school's sports day, the principal reported that the grade six learners from the intervention group had produced improved times or distances for various track and field events for athletics as compared to the previous year of grade six learners' recorded performance times and distances.

An awareness of healthy eating habits was observed by educators as learners were consuming more fruit and purchasing the healthier food options from the school tuck-shops.

The vegetable gardens at three of the schools were flourishing. Learners are involved with the maintenance of gardens. One of the schools has a thriving cabbage patch. Cabbages are sold to the community and this supplements the schools income as this particular school has enrolled many learners from low socio-economic families. Another school has identified disadvantaged families and donates vegetables to these families.

4.7.3 Recommendations

The responsibility to record learner physical activities during the various learning areas in log books should be the responsibility of a selected learner per class, not the responsibility of the educators.

Educators suggested that additional or advanced training workshops are planned for the future. Training should include the measurement and evaluation of the physical fitness tests that were performed by the researcher and trained school health nurses during pre- and post-assessments. Results from fitness tests conducted throughout the year can be used as part of the LO assessments for learners.

Posters illustrating various stretches and exercises should be provided to schools. These posters will be used as teaching aids during PA lessons.

It was also recommended that the school playgrounds are demarcated for games and sports events.

These recommendations will be addressed in the larger study.

4.8 Discussion of the Pilot Study

Findings show a positive short-term effect on learners PA participation. A multicomponent behavioural health intervention can improve learners' health behaviour and increase PA participation during formal instruction, lunch-breaks and after school.

In 2000, Curriculum 2005 was revised and is now referred to as the National Curriculum Statement (NCS) (Jansen, 1998; Vambe, 2005). The NCS is an outcomes-based, integrated knowledge system based on a learner-centred pedagogy that has to improve the quality of education for all in South Africa (Jansen, 1998; Botha, 2002; Todd & Mason, 2005).

A new learning area called LO in the General Education and Training (GET) Band (Grades R-9) and a new subject in the Further Education and Training (FET) Band

(Grades 10-12). The GET Band (Grades R-9) concerns itself with Health Promotion, Social Development, Personal Development, Physical Development and Movement and Orientation to the World of Work . In the FET Band (Grades 10-12) the Learning Outcomes of LO are Personal Well-being, Citizenship Education, Physical Education and Career and Career Choices (Department of Education, 2002). Thus, PE is now incorporated into the learning area known as LO. Physical education or physical development and movement are learning outcomes of LO. These learning outcomes play an imperative role in providing children with PA for at least 30-60 minutes per week during school hours. However, this duration has not reached recommended standards of PA for children (Sallis & Patrick, 1994; Corbin & Pangrazi, 1999; Dietary Guidelines Advisory Committee, 2000; Cavill et al., 2001). Thus, additional measures for increasing PA, such as the NAP intervention is suggested to help achieve PA recommendations and create an awareness of healthy lifestyles among learners.

Encouraging results were presented in the nutrition aspect of the intervention. Schools implemented changes in tuck-shops by including healthy food and beverage options and eliminating selected items such as fizzy-drinks. Furthermore, nutrition school policies were developed regarding the banning of fizzy-drinks on school property. Similarly, a study by Foster et al. (2008) also implemented nutrition policies that included eliminating fizzy-drinks and this in turn, helped curb the development of overweight learners.

School-based studies have primarily been limited to changes in curriculum as opposed to whole school policies or to environment (Wechsler, Devereaux, Davis, & Collins, 2000; Fox & Harris, 2003). A strong point of the NAP intervention was the promotion of the development of school policies, specifically nutrition policies.

The concept of meaningful and enjoyable PA or exercise at schools was introduced or re-visited and educators and learners were empowered with the knowledge of the benefits and importance of PA via the NAP programme.

The aims of the pilot study were achieved. Educators provided information on barriers and enabling factors regarding the NAP intervention as well as feedback to improve the intervention. Essential comments from learners regarding the questionnaire were taken into consideration as the questionnaire was not tested in KwaZulu-Natal. These achieved aims enabled the researcher to modify and improve the NAP intervention prior implementation of the larger study.

Incidentally, the school that showed the most improvement post-intervention was a rural Health Promoting School (HPS). The least improved school was also a rural school but not categorised as a HPS. This finding assisted the researcher, the DoE and Department of Health (DoH) officials to strengthen their beliefs that HPS's will be more receptive and willing to implement the intervention as well as ensure the sustainability of the NAP intervention.

Finally, the pilot study shows that by implementing a realistic and feasible intervention, PA participation of primary school learners can be increased during and after school.

SECTION B

4.9 Results and Discussion of the Larger Study

4.9.1 Introduction

The larger study involved participants from 11 schools. Schools were divided into nine intervention (two urban; four peri-urban; and three rural schools) and two control (one urban and one rural school) groups. Initially, 11 school principals and a minimum of two educators per school (n=26) were involved in the study. However, during the intervention phase, five schools withdrew from the study. This was due to the educators no longer teaching at the school due to illness or accepting new job offers during the duration of the study. Therefore, six schools comprising of six principals and 16 educators were involved in the Nutrition and Physical Activity (NAP) intervention. One urban, two peri-urban and three rural schools participated in this study.

Intervention school participants (n=5 principals; n=14 educators) were interviewed pre-intervention, during the intervention (follow-up visits) and at the post-intervention focus group discussion. Principals and educators were also trained to administer and implement the NAP intervention. Findings from interviews and the

educator training workshops will be presented and discussed. The control group (n=1 principal; n=2 educators) continued with activities as per normal, with the exception of learner pre- and post-test assessments.

As previously mentioned 11 schools comprising of 798 learners participated in the study. Nine intervention schools (n=633 learners) and two control (n=165 learners) schools initially volunteered to participate in the NAP intervention. Due to the withdrawal of the five schools, the remaining learners (n=427) from the six schools, five intervention (n=277) and one control (n=150) school were involved in NAP programme for duration of the study. Learners' nutritional habits and PA patterns and levels were assessed pre- and post-intervention.

Results pre- and post-intervention will be presented as an intervention group and a control group. A sub-sample of 270 (63%) questionnaires and fitness tests was analysed. Data were missing for 157 learners due to learners not attending the pre-/post-intervention measures, or inadequately filling-out questionnaires or no longer attending the school. One hundred and seventy two (n=172) learners represented the intervention group, while 98 learners represented the control group. However, demographical data will be presented as a total sample (n=270).

4.10 Demographics of the Learners

Questions regarding demographical data were completed by all learners. Overall results included the following:

Two hundred and seventy learners completed questionnaires pre- and post-intervention. The learners comprised of 54% boys and 46% girls. Ages ranged from 9-16 years with 41% of learners being 12 years old at the onset of the study. The majority (94%) of learners were black. Eighty three percent (83%) speak Zulu, 12% Xhosa and six percent (6%) speak English at home.

Table 4.3 further illustrates learner demographics. Although 80% of learners live in brick homes and have essential electrical appliances, it should be noted that an average of seven individuals reside in a four-room house. Households varied from 2-13 occupants. Fifty five percent (55%) of households have an outside non-flush toilet and only 44% of households have running water inside their homes. Therefore, one can assume that the socio-economic status of majority of learners in this study range from low to middle income groups. More than two-thirds (69%) of learners attend school in their neighbourhood.

Table 4.3: Learner Demographics (n=270)

Demographics		n	(%)
Gender	Males	147	54
	Females	123	46
Racial group	Black	254	94
	Indian	15	6
	Coloured	1	0.4
Home Language	Zulu	223	83
	Xhosa	31	11
	English	15	6
Primary caregiver	Mother	159	59
	Grandmother	41	15
	Aunt	27	10
	Other (including brother, sister, uncle)	43	16
Type of home	Brick home	216	80
	Mud homes	38	14
	Flats	14	5
	Shack	2	1
Homes consisting of four rooms, excluding the bathroom		154	57
Water supply from an outside tap only		148	56
Outside non-flush toilet		147	55
Television sets in households		230	85
Refrigerator in household		228	84
Electric stove with oven in households		150	56
Gas stoves in households		84	31
Cook on an open fire		58	22
Grow vegetables or fruit trees		192	71
Learner attend school in the same neighbourhood in which they live		175	69

4.11 Physical Activity and Sports Participation Pre- and Post- Intervention

A study by Mota, Santos, Guerra, Ribeiro, & Duarte (2003) showed that children aged 8-15 years appear to participate in four distinct periods of PA throughout the day i.e. 1) school hours; 2) lunch-time and outside-school activities; 3) period before bedtime; and 4) morning time before school period, appear as distinct periods of the day.

Similarly, the current study identified and examined PA and sports participation during three periods during school hours and a period after school. The following periods proved to be simple and reliable in terms of learners' responses from the pilot study:

- 1) club/team level;
- 2) PE/LO lessons;
- 3) lunch-breaks and
- 4) after school

It is important to note that during the sixth month of the intervention, a national school strike occurred. This disrupted the intervention progress as schools were closed for approximately six weeks. Subsequently, when schools re-opened, many schools had taken decisions to reduce the number of PA lessons in LO, as well as gradually reduce and or discontinue club sports participation in order to catch up

with work missed during the strike. Hence, PA participation among learners was reduced and or substituted with theoretical coursework in the various learning areas. This decision taken by schools may have impacted on the results of the intervention regarding learner PA participation.

On the contrary, a recent study by Trudeau and Shephard (2008) concluded that given competent educators, PA can be added to the school curriculum by taking time from other subjects without risk of hindering student academic achievement. On the other hand, adding time to academic or curricular subjects by taking time from PE programmes does not enhance grades in these subjects and may be detrimental to health.

4.11.1 Physical activity at club/team level during school hours

Results show that significantly ($p \leq 0.01$) more codes of sport were played at club/team level pre- than post-intervention in the intervention group. This may be due to schools now introducing and or selecting only specific sports to be played during the year as this concept was promoted by the NAP intervention.

It should be taken into consideration that educators that participated in this study were not PE specialists (graduated with a Sport Science degree or obtained sport-specific coaching qualifications). Their knowledge of PA and related PE components was obtained via the NAP educator training workshops.

Given that educators were not PE specialists, the NAP intervention proposed that educators select only three or four sports codes that would be played throughout the year. Educators were encouraged to gradually build on their skills in those particular sports codes. Thus, in turn, increased frequency and duration for selected codes of sport were promoted.

Therefore, results reflect that learners participated in fewer activities at club/team level post-intervention. However, a significant ($p \leq 0.05$) percentage (35%) of learners participated in club/team sport/s for 'between 30 and 60 minutes' pre-intervention as compared to the post-intervention percentage (20%). Furthermore, a significantly ($p \leq 0.05$) larger percentage (32%) of learners participated for 'more than an hour' post-intervention as compared to the pre-intervention percentage (15%).

Furthermore, Wickel & Eisenmann's (2007) study concluded that during a non-sport/PA day, learners engage in significantly more sedentary activity ($p=0.02$) and significantly less moderate ($p=0.02$) and vigorous activity ($p<0.001$) when compared with the sport/PA day. Learners averaged 110 minutes of MVPA during a day in which they participated in sport. The additional amount of MVPA accumulated on the sport day (approximately 30 minutes) was not maintained on a non-sport day.

Wickel and Eisenmann's (2007) study showed the importance and effectiveness of learners engaging in sport during school hours in relation to additional PA for that particular day. The duration of additional PA during a day when sport is played, increases when compared to a day when no sport is played. Therefore, PA or sport participation at club/team level during school hours is vital in order to promote an increase in additional PA throughout the day.

Similarly, educators in the current study had also reported similar trends. Responses included:

"On the days that we play sport with the learners, they are active throughout the day. It's as if they are on a high!"

"They even continue playing the sport during the lunch-breaks."

As previously mentioned, educators were not PE specialists. A study by Sallis, Kolody, Faucette, and Hovell (1997) compared learners PA participation during health-related PE lessons when taught by PE specialists, trained classroom educators and untrained educators (control group). Results showed that learners spent more minutes per week being physically active in specialist-led (40 minutes) and trained educator (33 minutes) PE classes than in control classes (18 minutes; $p < 0.001$). Hence, non-PE specialists can be trained to teach specific components of PE lessons and can be effective in promoting PA among learners.

The researcher believes that training and equipping non-PE specialists with PA and sport skills is the key to improve and promote increased PA levels among learners. The numbers of PE specialists are decreasing in South African schools as PE is no longer a stand-alone learning area. As mentioned in the discussion of the pilot study, PE has been incorporated into the learning area LO. Therefore, it is imperative for non-PE specialists that teach aspects of PE in LO to be adequately trained and equipped to effectively teach this specialised learning area. Hence, training workshops for educators similar to that of the NAP educator training workshops need to be offered and accessible to non-PE specialists.

Control group results show that no significant relationships exist for either the frequency or length of participation variables, although there was a significant ($p \leq 0.05$) increase of the number of sports played at club/team level.

4.11.2 Physical activity during physical education/life orientation lessons

Figure 4.4 shows increased participation in soccer, dancing and netball post-intervention. Decreases occurred in swimming, gymnastics and athletics.

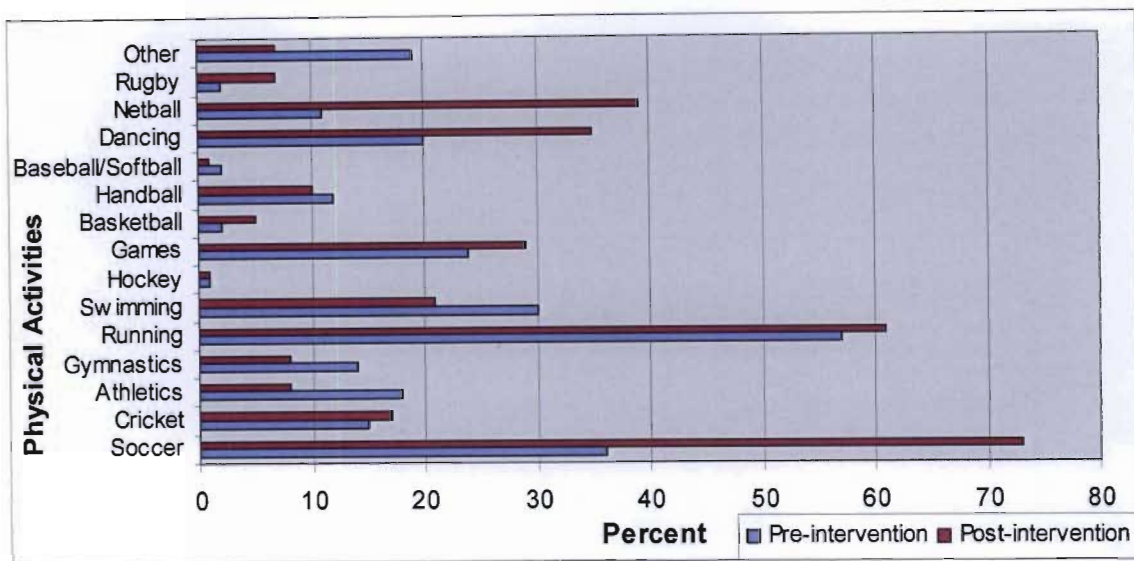


Figure 4.4: Physical activity participation pre- and post intervention (Intervention Group)

The average number of sports played pre-intervention was significantly ($p \leq 0.05$) less than the average number played post-intervention. Thus, the number of sports played or PA participation during PE/LO lessons has increased as a result of the intervention. Educators reported that the curricular materials supplied during the intervention enabled small incremental changes within lessons and consequently increased learners PA participation within lessons. Similarly, the Middle School Physical Activity and Nutrition (M-SPAN) intervention conducted by McKenzie et al. (2004) also consisted of curricular material and staff development, increased learners PA without increasing the frequency or duration of PE lessons.

In addition to sport played, PA included learners participating in gardening activities. Life Orientation lessons included teaching learners selected gardening

skills including the ability to prepare an area for crops, to plant, grow and maintain the vegetation. During the initial pre-intervention interviews, educators reported that theoretical concepts of gardening were taught to learners with minimal practical work. The NAP intervention encouraged educators to decrease selected theoretical components and consequently increase practical components of LO lessons such as gardening skills lessons.

Physical activity duration during the gardening practical lessons of LO lessons were also recorded in log books. Figure 4.5 captured learners during a morning LO lesson preparing the soil and planting seedlings.



Figure: 4.5 **Learners beginning a vegetable patch as part of the LO lesson**

Figure 4.6 illustrates learner PA participation pre- and post-intervention in the control group. Although there is a significant ($p \leq 0.05$) increase in the number of sports played among learners in the control group, only a small percentage of learners participated in activities during PE/LO lessons as compared to the intervention group.

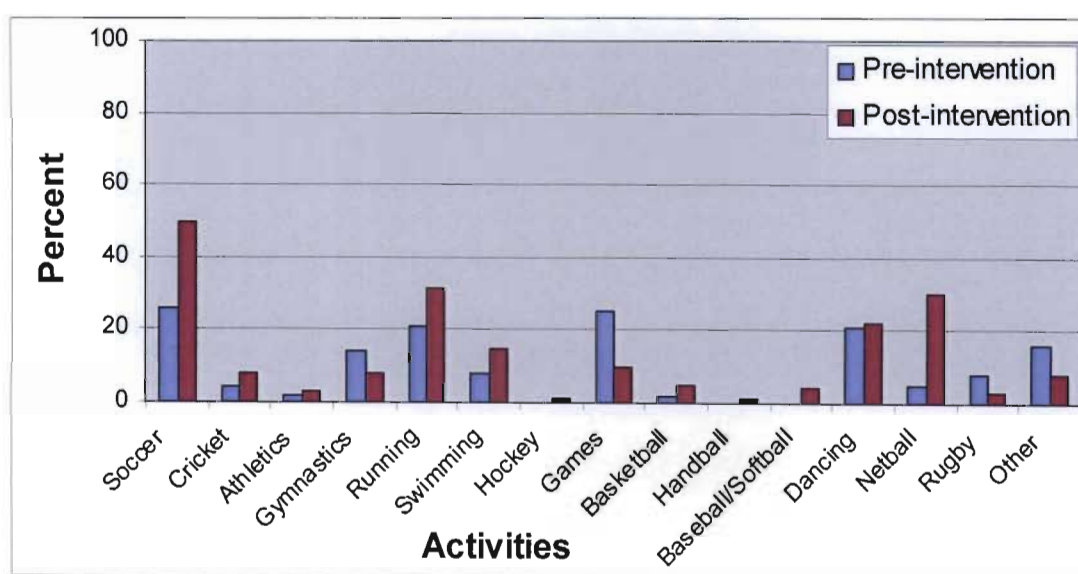


Figure: 4.6 Physical activity participation pre- and post-intervention (Control group)

4.11.3 Physical activity and sports participation during lunch-breaks

Children spend the majority (>60%) of their lunch-break/recess time engaged in PA and a smaller proportion ($\approx 20\%$) of their outside of school time participating in physical activity (Beighle et al., 2006). Therefore, with regard to PA participation during lunch-breaks, measures to sustain as well as increase PA participation

needs to be implemented. A study conducted by Verstraete et al. (2006) provided equipment for lunch-break activities and found that children's MVPA and vigorous PA significantly increased in the intervention group as compared to the control group.

Similarly, the NAP intervention followed this trend. Equipment such as footballs, netballs, skipping ropes, and tug-o-war ropes were available for learners to utilise during lunch-breaks for the intervention group. Activities were supervised by educators on duty. Statistically, no significant differences were apparent during break-time activities pre- and post-intervention. However, educators' post-intervention reports stated that there was an increase in the learners PA participation during the lunch-breaks. Learners were eager to participate in games (including indigenous games) and sport. Figure 4.7 captured learners playing netball, soccer and tug-o-war games during the lunch-break at an intervention school.



Figure 4.7: Learners participating in various activities during the lunch-break

Results from the control group show that a significantly ($p \leq 0.05$) larger number of learners 'ran and played a little' pre-intervention as compared to the number of learners that 'stood and walked around' post-intervention during lunch-breaks. This shows a decrease in PA during lunch-breaks post-intervention. Furthermore, the researcher observed minimal PA participation during lunch-breaks in the control group. Learners from grades one to three appeared to be engaged in games and PA while the grade six learners were seated for longer periods of time during lunch-breaks.

A recommendation from the pilot study was to demarcate playgrounds for games and sport. The researcher suggested that intervention schools mark playgrounds for games and sport. Resources for marking playground and fields were not provided as part of the intervention. However, selected schools marked playgrounds. Schools requested resources from the community. This initiative encouraged community involvement and created an awareness of the importance of PA participation among learners and community members. Hence, this encouraged schools to be independent and sustainable.

Similarly, studies have shown (Stratton & Mullan, 2005; Ridgers *et al.*, 2007) that playground marking is a low-cost method that can increase and sustain PA participation of learners over time and is not attributable to the novelty effect of the markings.

4.11.4 Summary of physical activity participation during school hours

In the pilot study, educators completed log books depicting the frequency, duration and perceived intensity of the learners' PA during school hours, excluding lunch-breaks. However, it was recommended that selected learners complete log books (Appendix Nine) in the larger study primarily due to time constraints. Learners completed log books and findings reflected that during the ten months of the NAP intervention, the estimated PA participation among learners ranged from

40-235 minutes per week of MVPA during school hours (an accumulative integration of physical activities across various learning areas).

Incidentally, Nader, Bradley, Houts, McRitchie, and O'Brien's (2008) study concluded that measured PA decreases significantly between ages nine and 15 years. Hence, the researcher believes that PA interventions need to be implemented at primary school level to increase learners PA levels as these years are when trends of sedentary behaviour may set in. Such trends can be lessened with the implementation of PA interventions that promote enjoyable PA participation among learners.

4.11.5 Physical activity and sports participation after school

It is evident (Table 4.4) that there has been a substantial decrease in the participation of 'dancing', 'running', 'chores at home' and 'playing games'. Results show that the average number of activities participated in pre-intervention was significantly ($p \leq 0.01$) greater than the average number undertaken post-intervention. Thus participation in after school activities appears to have decreased. Positively, the average frequency and length of participation has increased significantly ($p \leq 0.05$) from pre- to post-intervention.

Table 4.4: Physical activity and sport participation after school (Intervention group; n=172)

Activity	Pre-intervention (%)	Post-intervention (%)
Playing games	62	53
Bicycling	22	23
Chores at home	44	33
Running	62	52
Swimming	22	22
Dancing	48	38
Sports with friends	45	52
Another activity	4	17

On the contrary, the pilot study results showed overall significant increases in after school activities post-intervention, although this could have been due to the novelty effect of the intervention as it was only implemented for a six-month period.

Results from the control group show that the average number of activities decreased significantly ($p \leq 0.05$) post-intervention as well as the average length of participation had decreased.

However, on a positive note, results also show an increase in participation in 'sports with friends' and 'another activity' post-intervention. This 'another activity' included playing sport with siblings, parents or other family members. Jago, Brockman, Fox, Cartwright, Page, & Thompson (2009) believes that friendship groups affect both the initiation and maintenance of youth PA. Children belong to several groups and engage in different activities with different groups. Therefore, such groups need to be identified and simple strategies that aim to promote PA via the different friendship groups can be an effective means of promoting increased PA among learners.

The researcher believes that after school PA programmes need to be initiated and implemented in schools to promote PA among learners. Both the intervention and control groups did not offer after school programmes. Furthermore, a study in the United States of America (Dale, Corbin, & Dale, 2000) concluded that children did not compensate for school days of restricted PA opportunities by increasing activity levels after school. Results showed that after school activity levels following an active day were actually higher than after school activities following an inactive school day. If children are restricted or denied from PA during school hours due to curriculum and or school structures that decrease or eliminate PA, it appears that children will not voluntarily catch up on these lost opportunities of PA (Dale et al., 2000).

After school programmes seem to be an important contributor to the PA of attending children specifically during free-play rather than organised or structured sessions (Troost, Rosenkranz, & Dzewaltowski, 2008). Programmes can be designed to meet various objectives (weight-lose, strength, flexibility) Similarly, an after school, non-competitive programme of recreational PA of three 90 minute sessions per week can reduced adiposity in primary school children (Martínez Vizcaíno, Salcedo Aguilar, Franquelo Gutiérrez, Solera Martínez, Sánchez López, Serrano Martínez, López García, & Rodríguez Artalejo, 2008).

Therefore, supervised after school PA programmes are essential to promote and thereby increase learner PA.

4.12 Physical Fitness Tests

Learners from the intervention and control groups completed a battery of physical fitness tests. Baseline data for the following tests (Table 4.5) were collected pre-intervention and re-assessed post-intervention.

Data were missing from nine learners (seven from the intervention group and two from the control group) due to learners not completing all components of the physical fitness test battery. The intervention group results show that for each fitness test component, with the exception of the female shuttle runs, there was a significant improvement in measurements post-intervention. Overall, the boys have

also shown larger improvements in post-test scores as compared to the girls. Therefore, findings can suggest a need to separate interventions for boys and girls. Similarly, Trinh, Rhodes, & Ryan (2008) also believes that PA interventions focusing on the needs of boys and girls separately are more effective as compared to a combined gender sample intervention.

Table: 4.5 Pre- and post-test physical fitness scores (Control)

Test		Boys (n=86) (n=59)		Girls (n=79) (n=41)		Total Sample (n=165) (n=100)	
		Mean	SD	Mean	SD	Mean	SD
Sit-and-Reach (cm)	Pre-test	28.39 28.22	6.22 5.15	29.64 33.38	6.39 4.61	28.97 30.30	6.31 5.54
	Post-test	35.30** 33.28**	9.43 7.23	35.03** 33.88	9.58 6.22	35.07** 33.53**	9.47 6.80
Sit-ups	Pre-test	15 15	4 3	11 11	4 4	13 13	4 4
	Post-test	18** 17**	5 4	15** 14**	5 3	16** 15**	5 4
5m Shuttle Run (seconds)	Pre-test	46.46 48.75	5.34 3.00	48.70 53.06	5.24 4.00	47.53 50.49	5.40 4.02
	Post-test	44.71* 48.51	6.46 3.00	48.19 50.55	7.58 5.00	46.44* 49.34	7.23 4.00
Standing Broad Jump (m)	Pre-test	1.55 1.55	0.28 0.19	1.40 1.30*	0.22 0.17	1.50 1.50*	0.26 0.21
	Post-test	1.80** 1.65*	0.43 0.21	1.50** 1.40	0.27 0.18	1.65** 1.55*	0.38 0.24
Body Mass Index (BMI)	Pre-test	18.40 18.40	0.31 0.27	19.60 19.60	0.34 0.27	18.90 18.90	0.33 0.27
	Post-test	19.10 18.50	0.26 0.25	20.00 20.00	0.34 0.29	19.60 19.15	0.30 0.28

Level of Significance:

* **p<0.05**

****p<0.01**

The control group has also presented with significant changes in the sit-and-reach, sit-ups and the standing broad jump tests post-intervention. However, these changes were not as large as changes in the intervention group. Significant analysis of covariance (ANCOVA) ($F=5.351$; $df=1,232$; $p=0.022$) differences were calculated for the shuttle run test where the average score for the intervention group (46.44 sec) was significantly smaller than that of the control group (49.34 sec). Therefore, learners that had participated in the NAP intervention demonstrated improved times in the 10 x 5m shuttle run as compared to learners from the control group. Furthermore, no significant post-test changes occurred in either the boys or girls in the control group. Additionally, ANCOVA shows a significantly ($F=10.693$; $df= 1,244$; $p=0.001$) larger average score for the standing broad jump test in the intervention group (1.65 m) than that of the control group (1.55 m).

Sit-and-reach test scores have improved significantly ($p \leq 0.01$) both in the intervention and control groups although greater increases have occurred in the intervention group. Intervention group scores have significantly increased from 28.97 cm to 35.07 cm. Positive increases have occurred in both the boys and girls scores. Furthermore, the mean post-test score for the sit-and-reach test in the control group was 33.58 cm and 35.07 cm for the intervention group. Analysis of variance was significant ($F=4.116$; $df=1,215$; $p=0.044$), indicating that the post-test scores for the intervention group was greater than that of the control group,

hence, greater improvements in the intervention group may be as a result of the intervention.

A recent study by Rodríguez et al. (2008) implemented a five-minute hamstring flexibility intervention programme twice a week for 32 weeks. Sit-and-reach test scores were measured pre- and post-intervention. Results showed significant increases in hamstring muscle extensibility post-intervention. Therefore, by performing at least five minutes of stretching twice a week can improve flexibility. The NAP intervention encouraged daily stretching. The stretching programme (one-minute activity) will be discussed in a subsequent section.

Similarly, a 12-week PA intervention also showed improved flexibility, BMI, body composition and strength, and endurance amongst learners (Annesi et al., 2007). Furthermore, the relationship between physical fitness and academic achievement has received much attention owing to the increasing prevalence of children who are overweight and unfit, as well as the inescapable pressure on schools to produce students who meet academic standards. Castelli, Hillman, Buck, and Erwin (2007) demonstrated associations in total academic achievement, mathematics achievement and reading achievement, thus suggesting that aspects of physical fitness may be globally related to academic performance in preadolescents. Thus, the importance of physical fitness is further emphasised.

With regard to BMI scores, results showed that learners were not in an overweight or obese range although average scores were slightly below a healthy range. This may be due to learners' insufficient and or unhealthy eating patterns. Additionally, research (Taras & Potts-Datema, 2005) also demonstrated that overweight and obesity are associated with poorer levels of academic achievement.

4.13 Nutritional Patterns Pre- and Post-intervention

4.13.1 Food choices and nutrition

Unlike the pilot study, the nutrition component of the intervention was accepted by schools. Principals were willing to implement changes regarding healthy nutrition. However, only the urban school had a tuck-shop. Informal vendors sold items to learners at the remaining schools.

Changes at the tuck-shop were similar to those implemented in the pilot study. Carbonated drinks, pies and selected sweets and chips were eliminated and or restricted from the tuck-shop. Selected items were substituted with fruit juices, energy drinks, low-fat yogurts and fruit. Similarly, Wildey et al. (2000) believed that key intervention possibilities can included limiting sales of chocolate candy and substituting low-fat varieties of cakes, cookies, chips and crackers.

Additionally, educators were requested to prompt learners to select healthier food options. Reports from educators stated that prompting learners did influence their food and beverage choices. Feedback included:

“The kids will now buy a fruit instead of a chocolate because I had told them that the apples are much better and less in fats and calories.”

“More learners are now buying healthier foods as compared to before although we did sell some healthy food before.”

Similarly, a study conducted by Schwartz (2007) examined the influence of having cafeteria staff verbally prompt children to take a fruit serving when purchasing school lunch. Results showed that by verbally prompting children to take a fruit option in their school lunch may lead to a substantially greater fruit intake.

Fizzy-drinks like coco-cola (coke) were eliminated and replaced with fruit juices. Educators reported that learners purchase the fruit juices, with only a handful of learners had enquired about the fizzy-drinks. Furthermore, Schwartz (2007) also observed that when fruit and juice were simply made available, approximately 60% of children chose one or the other (38% took fruit and 22% chose juice). This number increased to over 90% when children were prompted to take fruit or juice by a staff member (62% took fruit and 29% took juice).

The researcher strongly believes that verbal prompting of learners to select healthier food and beverage options is a simple method that can improve learners eating patterns at school and in due course overall nutritional patterns.

Additionally, the urban intervention school has developed a nutrition policy where sweets and chocolates are not sold to learners during the afternoon lunch-break at the tuck-shop. Educators have reported that learners tend to consume sweets high in sugar and this in turn increases their energy levels and lowers concentration levels in the classroom. Discontinuing the sale of sweets and chocolates during the afternoon break has to some extent curbed the high energy levels and improved learners concentration levels during afternoon lessons.

The intervention group has also introduced a nutrition policy banning carbonated drinks. Schools have developed a specific nutrition policy that banned the consumption of all carbonated drinks at school. Educators re-enforced the harmful effects of carbonated drinks in health education lessons. Similarly, Saksvig et al. (2005) developed a school-wide policy banning high-fat and high-sugar snack foods in schools. Results showed that increased exposure to a culturally adapted one-year school-based intervention is associated with an increase in knowledge about foods low in fat, overall health knowledge and dietary self-efficacy.

Therefore, by providing healthy food and beverage options and by staff members verbally prompting learners to choose a nutritional option like a fruit, can improve learners nutritional patterns. Thus, by modifying or changing the environment (tuck-shop) and with the development of nutrition policies, positive healthy nutritional habits and patterns can be established.

Furthermore, the researcher observed that a trend of carrying water bottles had emerged in many of the intervention schools. Unlike the pilot study, water bottles were not provided to learners in the larger study due to financial drawbacks. Nevertheless, learners would fill bottles with juice or water and bring their bottles to school (Figure 4.8). Educators were also encouraged to carry water bottles. Comments from educators included:

"The learners would copy us and also bring water bottles to school."

"Learners will carry their bottles and drink water or juice throughout the day. This also stopped them from buying those cheap drinks from the vendors."



Figure 4.8: Learners with water/juice bottles

During the follow-up visits the researcher observed that informal vendors sold goods to learners during the lunch-breaks. Most of these goods were high in fats and sugars such as sweets, chips, cakes and biscuits. Educators reported that vendors are not on school property therefore it is difficult to control and monitor items sold by vendors. However, principals have requested vendors to include fruit and limit the amount of sweets sold. Selected vendors have included fruit (Figure 4.9) and this has been profitable.



Figure 4.9: A vendor selling fruit to learners

4.13.2 School food programmes

Early malnutrition and/or micronutrient deficiencies can adversely affect physical, mental and social aspects of child health. School feeding programmes are designed to improve attendance, achievement, growth and other health outcomes (Kristjansson, Robinson, Petticrew, MacDonald, Krasevec, Janzen, Greenhalgh, Wells, MacGowan, Farmer, Shea, Mayhew, & Tugwell, 2007). It is a common practise in KwaZulu-Natal for rural and peri-urban schools, specifically those with learners from low to middle socio-economic status to apply for a “feeding scheme”. Such feeding schemes are government sponsored initiatives where lunch is provided for learners in primary schools. Five of the six schools are a part of this feeding

scheme programme. The only school without a feeding scheme is the urban intervention school. The meals provided to learners comprise mainly of carbohydrates and vegetables. Figure 4.10 depicts a typical lunch menu.



Figure 4.10: A typical school lunch menu

School principals have reported that a large proportion of learners and in most cases all learners are part of the school's feeding scheme. Selected schemes may provide a tea-time snack comprising of bread and juice.

Bere, Veierød, Skare, and Klepp (2007) evaluated the long-term effects of a school fruit programme, three years after it was implemented. The fruit was provided at no-cost to the learners. Results showed that learners in the free fruit group significantly ($p=0.001$) increased their fruit and vegetable intake compared to the learners in the control group as a result of the intervention. Furthermore, sustained significant ($p=0.001$) effects on fruit and vegetable intake three years later after the end of the intervention were also observed. Therefore, the DoE should consider providing fruit to learners as part of the feeding scheme as this initiative can increase learners' fruit intake. The researcher will put forth this suggestion to the DoE.

Results of the control group in the current study show that significantly ($p \leq 0.05$) more learners than expected eat fruit/vegetables 'at least once a day' pre-intervention but only 'at least once on most days' or 'about once a week' post-intervention. Thus nutritional habits regarding fruit and vegetables appear to have worsened post-intervention in the control group.

Breakfast has been labelled the most important meal of the day, but are there data to support this claim? Rampersaud, Pereira, Girard, Adams, and Metz (2005) summarised the results of 47 studies examining the association of breakfast consumption with nutritional adequacy (nine studies), body weight (16 studies) and academic performance (22 studies) in children and adolescents. Evidence suggested that breakfast consumption may improve cognitive function related to memory, test grades and school attendance. Breakfast as part of a healthful diet and lifestyle can positively impact children's health and well-being.

Similarly, a study conducted by Gajre, Fernandez, Balakrishna, and Vazir (2008) concluded that the regular habit of eating breakfast as opposed to irregular consumption or skipping breakfast altogether had beneficial influence on attention-concentration, memory and school achievement.

More prominent results (Kosti, Panagiotakos, Zampelas, Mihas, Alevizos, Leonard, Tountas, & Mariolis, 2008) were observed for daily cereal consumption or for more than two daily servings of cereals consumed for breakfast. The consumption of breakfast cereals was associated with 33% lower likelihood of overweight/obesity, irrespective of age, sex, and PA status. Thus a solid basis for public health professionals could be built when issuing advice on weight management.

The current study found that 63% of learners consumed breakfast every morning while 25% consumed breakfast on most mornings in the intervention group. The researcher advocates the consumption of a healthful breakfast on a daily basis consisting of a variety of foods, especially high-fibre and nutrient-rich whole grains, fruits, and dairy products. Furthermore, parents should be encouraged to provide breakfast for their children. However, it should be taken into consideration that many learners in this study are from low socio-economic income groups. Nutritious meals are not readily available. Educators have reported that the meals provided by the school through the feeding scheme may be the only meal that selected learners consumed for the day. Hence, schools need to explore the availability of a school breakfast programme.

Food insufficiency is a serious problem affecting children's ability to learn. Research (Taras, 2005) indicates that school breakfast programmes seem to improve attendance rates and decrease tardiness. Among severely undernourished populations, school breakfast programmes seem to improve academic performance and cognitive functioning.

The researcher suggests that schools appeal to the DoE to include breakfast programmes as part of the feeding scheme programme. Learners in the current study, particularly those from rural schools lack basic meals and as previously

mentioned, selected learners depend on school meals as this is their only meal for the day.

4.13.3 New ideas

The NAP intervention promoted creativity and innovative ideas regarding school health promotion among educators and principals. Vegetable patches/gardens were grown and maintained at all intervention schools. One of the schools included health messages in their gardens, as shown in Figure 4.11.



Figure 4.11: A health message painted on a rock in the vegetable garden

The researcher believes that such initiatives creates an atmosphere within the school that promotes healthy eating and overall well-being among learners and staff and in turn, may extend the message of striving towards a healthy lifestyle to the community.

4.14 Feedback from Educators on the Training Workshop

Two training workshops were held during the larger study. Recommendations from the pilot study suggested that an additional workshop is presented as well as the learners' fitness testing assessments are incorporated in the training workshop.

Hence, the training of educators to administer and assess the fitness tests were included as part of the workshops. Educator comments included:

"This type of training is essential as now we can use these tests as part of LO marks."

"Now I feel like a real PE educator, fitness testing is an important part of PE. We did not do any of these tests before."

Furthermore, educators indicated that training in the assessment of PE is necessary. Findings from a study by Van Deventer (2009) also indicated that most of the LO teachers required assistance in developing learner portfolios, movement rubrics and movement matrixes.

An overall positive response from the educators and principles concerning the theoretical and specifically the practical components of the workshops was provided. Feedback included suggestions highlighting the need for additional staff development workshops and on-going support from the research team and Departments of Education and Health to be provided.

Similarly, a study (Van Deventer, 2009) conducted in the Western Cape, South Africa concluded that LO educators indicated the need for in-service education training workshops related to LO, specifically the physical education components.

The educators appreciated the sample material which was provided to each educator during the training workshop.

"These PA manuals are wonderful. They are easy to use and makes teaching PA fun for the children and us."

During the workshops, the researcher proposed to educators several lesson plans for a variety of subjects/learning areas. Educators critically analysed these lesson plans and provided vital feedback and suggestions to ensure that the lessons were feasible, practical and achievable. Reports from educators also included that the NAP intervention curriculum (including lesson plan topics and learning outcomes) were well-structured due to the fact that only incremental changes and

instructional strategies were made to lessons and not the entire lesson plan changed.

4.15 Focus Group Discussion Post-intervention

Two focus group sessions were scheduled for the larger study. However, due to the nationwide school strike, the first focus group session was cancelled. Findings for the post-intervention session will be presented.

The focus group discussion was conducted two weeks post-intervention. The group comprised of the school principals (n=6), educators (n=16) and the school health nurses (n=6). Department of Education and Health officials (n=4) were also present. As in the pilot study, their presence was essential as feedback and clarity on issues such as policy and equipment (sport, games and gardening) could be addressed and or followed-up.

4.15.1 Challenges encountered during the NAP intervention

Firstly, a major challenge was educators from four schools that had attended the NAP training workshops, began implementing the NAP intervention and had completed the first phase of the study were no longer teaching at the schools due to unforeseen circumstances. Therefore, the school principals withdrew their schools from the study.

A control school also withdrew from the study as the school principal was no longer employed at the school. In addition the school health nurses that were responsible for assisting with the NAP questionnaire and fitness testing administration were not co-operative. As previously mention this study was in collaboration with the DoH and therefore assisting with the NAP study formed part of the school health nurses work profile. Thus, this also posed as a challenge. However, this issue will be addressed by the DoH.

Another major challenge was the impact of the national strike. Due to schools trying to catch up with work, educators could not set a mutual date soon after the strike to meet for a focus group session. Hence, the scheduled sixth month focus group session was cancelled.

Fourthly, in the pilot study educators reported that recording of learners PA during lessons in the log books was time consuming, therefore it was recommended that selected learners per class should be responsible for recording PA in the log books for the larger study. This recommendation was accepted and the task to record daily PA was the onus of the learners. However, this only worked effectively in three out of the five intervention schools. Learners were not consistent with recordings. This posed a challenge for the overall calculation of learners PA throughout the intervention.

Lastly, principals observed that the nutritional component of the intervention produced moderate changes in learners' nutritional behaviour. This was particularly in the schools that had informal vendors selling goods to learners. Principals stated that they had experienced difficulty from the vendors when requests to substitute and eliminate specific goods were put forth. Responses included:

"We have asked the vendors to stop selling certain things to learners especially those red chips but they still do. They said that the learners like to buy the chips and they make money."

"I have tried so many times to get the vendors not to sell so much of sweets and chips. I have told them to also sell fruit. Some listen, others don't, but it is up to us to tell the learners why they should not buy these things."

It appears that principals have made several attempts to persuade vendors to include and or substitute healthier food choices. In some cases vendors adhered to principals requests while others did not. Incidentally, the sweets and chips sold by vendors are relatively cheap and affordable to learners as compared to the price range of fruit. This will often pose as an on-going challenge. However, educators are constantly re-enforcing the harmful effects of such purchased goods and promoting healthy eating.

As part of the solution to encourage informal vendors to retail healthier food and beverage options a similar approach to that of Scimitz Bde, Recine, Cardoso, da

Silva, Amorim, Bernardon, & Rodrigues Mde (2008) can be undertaken. Scimitz Bde et al. (2008) encouraged good eating habits in the school community within the context of promoting healthy lifestyles and preventing chronic non-communicable diseases by conducting workshops for educators and school cafeteria owners. The workshops included theoretical classes, practical activities and educational games and were evaluated on the basis of expansion and applicability of knowledge. In the implementation of the healthy cafeteria, positive results were observed when comparing the pre and post-training periods. The methodology helped expand knowledge for both educators and cafeteria owners, highlighting the school community as a prime space for promoting healthy eating.

A similar approach to empower the informal vendors with nutritional knowledge and the importance of healthy eating can be adopted. Vendors can be invited to attend similar training workshops simultaneously with educators. This initiative may help encourage and persuade vendors to sell healthier food and beverages.

4.15.2 Benefits of the NAP intervention

Physical activity

Overall reports from educators stated that the intervention was simple to administer and assisted in their professional growth and development. The learners also enjoyed participating in the physical activities both in and out of the classroom. Outdoor games were particularly enjoyable as a combination of PA and

learning in a different environment created a positive learning experience.

Feedback included:

“The learners enjoyed the outdoor learning a lot. They were willing to learn and listened to everything I said. They did not do this before when I taught certain sections.”

“The classroom activities were very good this time with the NAP changes. Learners were excited and ready to learn.”

Barnett et al. (2002) conducted a study and concluded that children participated in less PA during PE lessons timetabled in the afternoon, compared to PE lessons timetabled in the morning. Therefore, the NAP intervention encouraged principals to schedule PE/LO lessons in the morning. The selected schools were willing to try this approach. Educators stated that learners were eager to participate in morning PA lessons scheduled in the morning as opposed to the afternoon. A common response was:

“The children were alert and ready to perform tasks. In the afternoons they are lazy and jus want to go home, especially when the weather is hot.”

The one-minute activity prior to lessons was proposed to educators. This appeared to be unsuccessful in the pilot study. However, in the larger study, the principals and educators were keen to test this strategy. At the onset of each lesson, learners performed a stretch or exercise repeatedly at their desk for a minute. Selected

schools opted for the one-minute activity to comprise only of various stretches forming a stretch programme. Educators supervised and ensured correct techniques and that activities were not harmful to learners. Comments included:

“This is an excellent idea. The kids enjoy it so much.”

“If we forget about it, they make sure we still do the activities”

An emerging trend is to involve youth in the development and implementation of interventions (Kelly & Melnyk, 2008). Regarding the one-minute activity, schools reported that this activity gradually became the responsibility of the learners and not the educators. Learners would ensure that this activity was performed daily prior to lessons. Therefore, the researcher supports Kelly and Melnyk (2008) statement and suggested to educators to involve the learners in the development and implementation of selected aspects of the intervention such as policy design and classroom-based activities.

Educators reported that the activities help to settle down the learners prior to lessons. Learners’ behaviour was improved as well as their concentration levels. Initially, the one-minute activity was conducted by NAP educators at the onset of their particular lessons. As the learners became familiar with various exercises and stretches the one-minute activity was performed at the onset of all lessons. The learners ensured that the one-minute activity (Figure 4.12) was performed daily

and at the onset of all lessons and in turn, increased the duration of their overall PA.



Figure 4.12: Learners demonstrating the one-minute activity

Selected schools increased the activity from one minute, to two minutes. Once again, learners were involved in the development and implementation of the intervention i.e. to increase the activity duration. This learner involvement strengthened this component of the intervention and ensured sustainability. In other words, learners attained ownership of this activity and almost guaranteed its continuity. As a result, the average time per day of additional PA derived from this activity ranged from 19-37 minutes per day.

The NAP intervention promoted policy design and development. Consequently, one of the schools developed a one-minute activity policy. This policy ensured that all learners from all grades in the school performed the one-minute activity daily at the onset of each lesson.

Similarly, the M-SPAN project evaluated a two-year intervention where findings revealed that environmental and policy interventions to be effective in increasing PA at school among boys and girls (Sallis, McKenzie, Conway, Elder, Prochaska, Brown, Zive, Marshall, & Alcaraz, 2003).

Another effect of the NAP intervention was the introduction of a "Play Day" at one of the rural schools. Indigenous/traditional games were played throughout the day for all learners. Educators' comments included:

"The "Play Day" was a huge success. Learners enjoyed playing traditional games."

"Ever since the "Play Day" more kids are playing traditional games during the lunch-break. It's wonderful to see all the activities."

As a result of the positive feedback regarding the introduction of a "Play Day," the remaining schools have decided to plan a similar event in the forth coming year.

Educators also reported that assistance from the school health nurses was appreciated, specifically with regards to fitness testing. Educators' comments included:

"The nurses were always available to help when we had questions or were not too sure about how to do the fitness tests." (Educators practised the measurement and evaluation of selected fitness tests on learners that were not involved in the intervention.)

"The nurses helped us with the flexibility box measures. We wanted to build one for our school."

Furthermore, health professionals (nurses, dieticians and physical therapists) play key roles in their communities based on their influence and credibility. Health professionals can lend support to school-based efforts by asking about and emphasising the importance of PA with patients, encouraging family-based activities, supporting local schools to adopt an "active school" approach and advocating for support to sustain evidence-based and promising PA models within schools (Naylor & McKay, 2009).

Nutrition

There appears to be changes in learners' nutrition behaviour, although only moderate at this point in time. There is an awareness of healthy eating that was observed by educators. An increased number of learners were drinking water throughout the day from their water bottles. Learners were encouraged to bring packed lunches from home. Educators also reported that learners are now

including fruit as part of their lunch box. Such measures have to some extent decreased the purchase of unhealthy food and beverages from vendors.

The researcher suggested to educators to encourage parental involvement and support regarding healthy nutritional choices. Newsletters, parent workshops and or meetings concerning learners' nutritional requirements and possible changes within their households may be beneficial in the process of promoting healthy lifestyles among learners and their families.

A study performed by Anand, Davis, Ahmed, Jacobs, Xie, Hill, Sowden, Atkinson, Blimkie, Brouwers, Morrison, de Koning, Gerstein, Yusuf, and SHARE-AP ACTION Investigators (2007) concluded that a household-based intervention is associated with some positive changes in dietary practices and activity patterns. Examples of dietary changes may include the decrease of fats, oils, sweets and fizzy-drinks consumption and the increase in water consumption. Since similar changes are been implemented in schools, it stands to reason that such changes need also to be implemented in the home so that patterns and habits of healthy food and beverage choices promoted at school will not be undone but in fact re-enforced at home, thus creating a healthy school and home environment.

Similarly, Hopper et al. (2005) examined the efficacy of a school-based exercise and nutrition programme with a parent component. The study concluded that the

family component of the programme provided a practical approach to improving learners PA and nutrition behaviours.

The vegetable gardens at all the schools were flourishing. Similar to reports to that of the pilot study, learners are regularly involved with the maintenance of gardens specifically during LO lessons. Schools utilise the vegetables when preparing meals for learners and also sell their produce to the community. Profit earned is used to upgrade and maintain current vegetable gardens and thus ensuring sustainability.

Community members (learners' parents) were also involved with assisting with maintaining the vegetable gardens. A soup programme has also been initiated by one of the schools and provides meals to the community on certain days. It should be considered that relationships formed with parents, health organisations, local businesses, other educational institutions and media offer promise for helping to sustain nutrition education efforts (Levine, Olander, Lefebvre, Cusick, Bieiadecki, & McGoldrick, 2002).

General

Firstly, as suggested in the pilot study, posters depicting stretching and various exercises were provided to schools. Posters were used during PE/LO lessons as well as displayed in various areas of the school. Furthermore, schools designed

their own healthy lifestyle posters and also displayed posters throughout their school.

“The grade six classes had started making posters but now other grades are getting involved as well and promoting healthy lifestyles.”

Initially, a sit-and-reach box was loaned to each district during assessments. However, each school had taken the initiative to build their own sit-and-reach box. Principals reported that even members of the community offered to assist with either supplying materials or building the boxes and in certain instances performed both tasks. The schools encouraged members of the community to become involved and aware of the NAP intervention.

Thirdly, information regarding the benefits of the NAP intervention had disseminated across one of the school districts. In turn, neighbouring schools had shown interest in the project. NAP trained educators had taken the initiative to inform other schools about the NAP intervention and have begun to teach other educators aspects of the intervention. Hence, the NAP training has empowered educators and provided them with knowledge and confidence to help other educators not only from their school but surrounding schools as well.

4.15.3 Recommendations

- All educators to attend training workshops. Training workshops to be on-going throughout the year (± 3 workshops per year).
- Fruit to be included as part of the feeding scheme. The DoE and DoH will address this suggestion.
- Implement the NAP intervention in additional schools.

4.16 Summary

Findings presented thus far have shown positive results regarding the implementation and possible sustainability of the NAP intervention. The following chapter will present conclusions and recommendation for this study.

CHAPTER FIVE

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

Following the analysis of the results, the following conclusions may be drawn:

- The present study documents that a school-based physical activity and nutrition (NAP) programme can be disseminated to schools in a range of geographic locations (urban, peri-urban and rural) and has the potential to be sustainable. Children spend most of their time in school than any other setting with the exception of their homes. Hence, if young children are going to engage in adequate physical activity (PA), it is essential that schools systematically and effectively provide and promote participation in PA (Pate, Davis, Robinson, Stone, McKenzi, & Young, 2006).
- The purpose of this study was to determine the effects of the NAP intervention on learners' health behaviour. Several positive health behaviour effects and subsequent health behaviour modifications have been achieved, and presented in the previous chapter. The study's objectives were also attained. Hence, a structured programme addressing nutrition and PA patterns appears to be efficacious in promoting positive health behaviour modification among learners.

- The study findings indicate that the NAP intervention was effective in increasing learner's PA participation and thus the primary hypothesis is accepted.
- Furthermore, the secondary hypothesis is also accepted as nutrition and PA school policies were developed and in turn, promoted healthy nutritional choices and increased PA participation among learners during school hours.
- This study applies the Social Cognitive Theory (SCT) including the model of triadic reciprocity, as well as the ecological model of influence approach. Within the SCT and the model of triadic reciprocity, this study takes into consideration learners PA behaviours, experiences, behavioural skills and context in which the learner is expected to be active. Furthermore this study is guided by the ecological model's five influences.
- The NAP intervention attempted to utilise all five levels of influences of the ecological model. Results presented in the previous chapter would show that selected levels were used more extensively than others, i.e. Individual (changing learners attitudes and behaviour towards PA and nutrition); Interpersonal (forming of sport/club groups); organisation (support from the University of KwaZulu-Natal and the Departments of Education and Health); Environmental or community (school staff, parents and informal vendors

working together to improve nutrition and PA); and Policy and society (school policies, collaboration with the Department of Health and Education). Incidentally, ecological approaches that recognise the interaction between individuals and the settings in which they spend their time are currently at the forefront of public health action. Schools have been identified as a key setting for health promotion (Kelly & Melnyk, 2008).

- Attempting to create behavioural changes (nutritional and PA) among children during the study was not a simple task. During the study, the NAP intervention developed continuously. For example, principals, educators, learners and school health nurses had to adapt to their new roles as promoters of healthy lifestyles, intervention components were improved, and social networks were created.
- The success of school-based interventions is highly dependent on recruitment at all levels: school districts, principals, educators, parents and children (Naylor, Macdonald, Warburton, Reed, & McKay, 2008). . The researcher agrees with Naylor et al. (2008). Thus a strong point of this study is that the NAP intervention also recruited, empowered and encouraged individuals from all levels i.e. provincial (Department of Education and Health), school district (school health nurses) principals,

educators, community (parents) and learners to participate in the NAP intervention.

- Educators were trained to provide organised PA within the school curriculum as well as within the classroom. Such activities did not hamper or change the primary outcomes of lessons but instead provided educators with incremental improvements and instructional teaching strategies including physical movement in various learning areas. Findings have shown an overall increase in PA participation per week across numerous learning areas. This suggests that classroom educators who are not physical education specialist can deliver effective PA lessons with specific training.
- It was observed that the lunch-breaks were a popular time to promote PA among learners. The provision of more supervision, equipment and organised activities can lead to more learners being physically active. School recess/lunch-break times are an important setting to promote MVPA, and contribute to daily PA in young children, especially in girls (Mota, Silva, Santos, Ribeiro, Oliveira, & Duarte, 2005).
- School-based-programmes that have included policy and environmental approaches have been more effective than curriculum-only approaches (Timperio et al., 2004). The diffusion of programmes often involves

intervening on policy level. It is useful to have research inform policy decisions and possible to base some policy recommendations on existing research. The NAP intervention was in collaboration with KwaZulu-Natal Departments of Education and Health. Such departments have the authority to propose and implement school policy. Thus, the possibility of intervention like the NAP programme to develop into school policy is increased.

- Although several enhanced PE programmes (McKenzie, Nader, Strikmiller, Yang, Stone, Perry, Taylor, Epping, Feldman, Puepker, & Kelder, 1996; Sallis, McKenzie, Kolody, Faucette, & Hovell, 1997; Sallis, Conway, Elder, Prochaska, Brown, Zive, Marshall, & Alcaraz, 2003; Pate, Ward, Saunders, Felton, Dishman, & Dowda, 2005; Stevens, Murray, Catellier, Hannan, Lytle, Elder, Yong, Simons-Morton, & Webber, 2005) have shown to be effective in increasing PA levels and promoting healthy nutrition behaviours (Wildey *et al.*, 2000; Saksvig *et al.*, 2005; Schwartz, 2007) in the past decade, much work remains to be conducted. (Wildey *et al.*, 2000; Saksvig *et al.*, 2005; Schwartz, 2007).
- Lastly, school and community programmes that promote regular participation in PA and optimal nutritional choices in children could be amongst the most effective strategies for reducing the public health burden of chronic diseases associated with sedentary lifestyles. Programmes that

provide children with the knowledge, attitudes, behavioural skills and confidence to participate in PA may establish a lifelong commitment to an active lifestyle.

5.2 RECOMMENDATIONS

Based on the results and the conclusions derived from this study, the following recommendations appear to be warranted:

- A stronger collaboration between schools and their respective provincial departments of Education, Health as well as Sport and Recreation (S&R) regarding the promotion of healthy lifestyles.
- Provincial departments of Health, Education and S&R can also provide support and assistance to the schools programmes for example with the provision of equipment, staff training and financial aid.
- The inclusion of a breakfast programme in conjunction with the schools feeding scheme.
- Primary schools to paint multicoloured markings on school playgrounds to assist with PA promotion among learners during lunch-breaks/recess.

- Incentives to be offered to schools that are implementing health interventions can be promoted by national and provincial governmental departments, non-governmental organisations, etc.
- Additional time on the school time-table for physical education.
- The design and development of school policies regarding health promoting polices to be promoted and endorsed by the national Department of Education.
- Community involvement in programmes is imperative, as this increases the probability of health intervention/programme self sustainability.
- Professional medical support from biokineticists, physiotherapists, dieticians, nurses, etc. is crucial in promoting the holistic development of the learner, educator and community. Such professionals can be invited to the school to educate and train members of the school and surrounding community on aspects focusing on healthy eating and PA, in relation to their profession.
- Further research involving the entire school population and over several years with support from PE and health education specialists.

- Furthermore, additional school-based research interventions for improving PA participation of girls needs to be investigated.
- Lastly, health promoting interventions need to be specific to the various school-settings (urban, peri-urban and rural) as the needs of the school and community vary.

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APPENDIX ONE

**NUTRITION AND PHYSICAL ACTIVITY PROJECT
(NAP)**

awards

(Learner Name and Surname)

**for most improved learner in (Name of School)
for the 2006 pilot programme**

**ROWENA NAIDOO
UKZN NAP PROJECT CO-ORDINATOR**



KZN DEPARTMENT OF EDUCATION

KZN DEPARTMENT OF HEALTH

APPENDIX TWO

INTERVIEW SCHEDULE WITH EDUCATORS

NAME: _____

SUBJECT/LEARNING AREA: _____

EDUCATORS EXPERIENCE

Was it an easy/difficult task to include the intervention strategies within your lessons?

Are you enjoying teaching the activities?

Do you have any recommendations/suggestions to improve the lesson formats?

INTERVENTION (Physical Activity)

How is the intervention working for you thus far?

Do you think that any aspects of the intervention need to be changed?

What challenges have you experienced thus far?

What recommendations do you suggest to improve the intervention?

Are the learners responding to the intervention? (change in behaviour)

Are they enjoying the activities?

What changes have you noticed in the learners as a result of the intervention?

INTERVENTION (Nutrition)

How are the health education lessons thus far?

Are the lessons aware of healthy food choices?

Can you see a difference in their behaviour, attitude etc.?

Are learners carrying water bottles?

What changes have been made in the tuck shop?

Are the learners buying the new products?

Do the learners ask about the "older" items sold in the tuck shop?

Do they want those "older" items to be re-introduced and sold in the tuck-shop?

How are the learners responding to the food and drink changes made in the tuck-shop?

LUNCH-TIME ACTIVITIES

What activities are occurring during the lunch breaks?

Are the learners participating in more activity now?

GENERAL COMMENTS

APPENDIX THREE

FOCUS GROUP DISCUSSION GUIDELINES

- A warm welcome to all of you, especially to those that have been travelling from Port Shepstone and Pietermaritzburg. Firstly, I would like to thank you all for participating in the NAP project. It has been a fun, educational and wonderful experience for me thus far. I have learnt so much from all the educators involved in the project. Your input and willingness to assist is much appreciated.
- The purpose of this meeting is to evaluate the NAP programme. I would like to know how you found the intervention programme, including benefits, challenges and recommendations.
- Let's start with reports from each school.

(Schools will present their reports)

(Once the reports have been completed, group discussion will be encouraged.)

- I will like to focus on the common benefits of the PA aspect of the intervention.
- Okay, now on common challenges.
- Finally, let's discuss recommendations to improve the intervention to ensure sustainability.
- Now, let's focus on the nutritional aspect of the intervention.

(Feedback on tuck-shops and informal vendors.)

(Benefits, challenges and recommendations will be discussed)

- Now, let's focus on school policies that have been developed.

(Discussion)

- The DoE and DoH officials will answer questions regarding policies, finance, and support concerning nutrition and PA aspects.

(Discussion)

- To conclude, I would like to thank all participants for your valuable input and that I will be available for assistance and support. Thank you

APPENDIX FOUR

Learner questionnaire:

Physical activity knowledge, attitudes and practices

First name:

Surname:

Age: _____ years old

Boy

Girl

Name of school:

Grade: Grade 4 Grade 5 Grade 6

Home address (street, number, town)

Today's date: _____

1. How many people are there living in your home, including you? _____

2. Who looks after you most of the time when you are at home? (Tick **only ONE** person)

- | | | |
|--------------------------------------|--------------------------------------|--|
| <input type="checkbox"/> Mother | <input type="checkbox"/> Father | <input type="checkbox"/> Sister or brother |
| <input type="checkbox"/> Grandmother | <input type="checkbox"/> Grandfather | <input type="checkbox"/> Aunt |
| <input type="checkbox"/> Uncle | <input type="checkbox"/> Cousin | <input type="checkbox"/> Someone else |

3. What kind of home do you live in? (Tick **only ONE**)

- | | |
|--|--|
| <input type="checkbox"/> Shack | <input type="checkbox"/> House (with walls made of brick and cement) |
| <input type="checkbox"/> Flat | <input type="checkbox"/> Traditional mud house |
| <input type="checkbox"/> Another kind of home: _____ | |

4. How many rooms do you have in your home, including kitchen, lounge, dining room, bedrooms (do not count the bathroom)? (Tick **only ONE**)

- | | | |
|----------------------------------|----------------------------------|--|
| <input type="checkbox"/> 1 room | <input type="checkbox"/> 2 rooms | <input type="checkbox"/> 3 rooms |
| <input type="checkbox"/> 4 rooms | <input type="checkbox"/> 5 rooms | <input type="checkbox"/> 6 rooms or more |

5. Where do you get your water from at home? (You can tick **more than one**)

- | | |
|---|---|
| <input type="checkbox"/> A tap inside your home | <input type="checkbox"/> A tap outside your home |
| <input type="checkbox"/> We fetch water from a pump | <input type="checkbox"/> We fetch water from a river or dam |
| <input type="checkbox"/> Somewhere else: _____ | |

6. What type of toilet do you have at home? (You can tick **more than one**)

- | | |
|--|---|
| <input type="checkbox"/> Flush toilet inside | <input type="checkbox"/> Flush toilet outside |
| <input type="checkbox"/> Outside toilet that doesn't flush, e.g. bucket or 'long-drop' | |
| <input type="checkbox"/> Another kind of toilet: _____ | |

7. Do you have electricity at home? Yes No

8. Which of these do you have at home? (Tick the ones that work)

- | | | |
|---|---|--|
| <input type="checkbox"/> Fridge | <input type="checkbox"/> Paraffin stove | <input type="checkbox"/> Microwave |
| <input type="checkbox"/> Electric stove with oven | <input type="checkbox"/> Gas stove | <input type="checkbox"/> Hot plate / 2 plate stove |
| <input type="checkbox"/> Open fire | <input type="checkbox"/> TV | <input type="checkbox"/> Radio |
| <input type="checkbox"/> Computer | <input type="checkbox"/> Cell phone | <input type="checkbox"/> Telkom phone |
| <input type="checkbox"/> Hi-fi / stereo system | <input type="checkbox"/> Car | <input type="checkbox"/> Bicycle |

9. Which of these do you have at home? (You can tick more than one)

- | | | |
|---------------------------------|--|--|
| <input type="checkbox"/> Cattle | <input type="checkbox"/> Goats | <input type="checkbox"/> Pigs |
| <input type="checkbox"/> Sheep | <input type="checkbox"/> Chickens or other birds | <input type="checkbox"/> Vegetable garden or fruit trees |

10. How would you describe yourself?

- | | | | |
|--------------------------------|--------------------------------|---------------------------------|--|
| <input type="checkbox"/> Black | <input type="checkbox"/> White | <input type="checkbox"/> Indian | <input type="checkbox"/> Mixed race (Coloured) |
|--------------------------------|--------------------------------|---------------------------------|--|

11. Which language is spoken at home most of the time? (Tick ONE)

- | | | | |
|----------------------------------|------------------------------------|----------------------------------|---|
| <input type="checkbox"/> Pedi | <input type="checkbox"/> Xistonga | <input type="checkbox"/> English | <input type="checkbox"/> Zulu |
| <input type="checkbox"/> Sotho | <input type="checkbox"/> Xhosa | <input type="checkbox"/> Swati | <input type="checkbox"/> Tshwana |
| <input type="checkbox"/> Ndebele | <input type="checkbox"/> Afrikaans | <input type="checkbox"/> Venda | <input type="checkbox"/> Another language |

12. Do you go to school in the same neighbourhood in which you live?

- | | |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

13. Which of these activities do you do as part of a sports club or school sports team?

(You can tick more than one)

- | | | | |
|-------------------------------------|---|--|----------------------------------|
| <input type="checkbox"/> Soccer | <input type="checkbox"/> Running | <input type="checkbox"/> Basketball | <input type="checkbox"/> Dancing |
| <input type="checkbox"/> Cricket | <input type="checkbox"/> Swimming | <input type="checkbox"/> Handball | <input type="checkbox"/> Netball |
| <input type="checkbox"/> Athletics | <input type="checkbox"/> Hockey | <input type="checkbox"/> Baseball / softball | <input type="checkbox"/> Rugby |
| <input type="checkbox"/> Gymnastics | <input type="checkbox"/> Another sport: _____ | | |

14. How many times during the past school week did you participate in these? (Tick **ONE**)

I don't participate in sports clubs or school sports teams

1 time

2 times

3 times

4 times

5 times

More than 5 times

15. For how long each time? (Tick **ONE**)

Less than 15 minutes

15 – 29 minutes

30 – 59 minutes

More than an hour

16. Which of these activities do you do in physical education (PE) class? This includes physical activity that you do in Life Orientation classes. (You can tick more than one)

Soccer

Running

Basketball

Dancing

Cricket

Swimming

Handball

Netball

Athletics

Hockey

Baseball / softball

Rugby

Gymnastics

Games

Another activity:

17. During PE classes, do you usually:
fast

(Tick **ONE**)

Sweat and breathe hard, like when running

quickly

OR

Breathe hard, like when walking

18. In the past week (7 days), what activities did you do after school? (Tick **ALL that you do**)

Playing games

Running

Dancing

Bicycling

Swimming

Sports like soccer or netball with friends

Doing chores at home, such as chopping wood, carrying water, cleaning, sweeping

Another activity: _____

19. How many times in the week do you do these activities? (Tick **ONE**)

1 time

2 times

3 times

4 times

5 times

More than 5 times

20. For how long do you participate in these activities? (Tick ONE)

- Less than 15 minutes 15 – 29 minutes
 30 – 59 minutes More than an hour

21. How do you usually get to school? (Tick ONE)

- Walk to school Bicycle to school
 Take a taxi to school Take a train to school
 Take a bus to school Go in a car

 Bicycle and take a taxi/bus/train Walk and take a taxi/bus/train
 Another way: _____

22. If you walk or bicycle, How long does it take you to get to school? (Tick ONE)

- Less than 10 minutes 10-30 minutes
 31-60 minutes More than 60 minutes

23. If you walk or bicycle, how fast do you normally go? (Tick ONE)

- I go slowly so there is no change in my breathing
 I go quickly which makes me breathe harder than normal
 I go very quickly, sweat a lot and breathe harder than normal

24. In the last school week, how did you spend your break time besides eating food? (Tick ONE)

- I sat down (talking, reading, doing schoolwork)
 I stood around or walked around
 I ran or played a little bit
 I ran and played hard most of the time

25. On a normal weekday, how long do you watch TV or sit and listen to the radio? (Tick ONE)

- Less than 30 minutes per day 30-59 minutes per day
 1-2 hours per day More than 2 hours per day
 I don't watch TV or sit and listen to the radio during the week

26. On a normal day on the weekend, how long do you watch TV or sit and listen to the radio?

(Tick ONE)

- | | |
|---|--|
| <input type="checkbox"/> Less than 30 minutes per day | <input type="checkbox"/> 30-59 minutes per day |
| <input type="checkbox"/> 1-2 hours per day | <input type="checkbox"/> More than 2 hours per day |
| <input type="checkbox"/> I don't watch TV or sit and listen to the radio on the weekend | |

27. On a normal weekday, How many minutes do you spend on the computer? (Tick ONE)

- | | |
|---|--|
| <input type="checkbox"/> Less than 30 minutes per day | <input type="checkbox"/> 30-59 minutes per day |
| <input type="checkbox"/> 1-2 hours per day | <input type="checkbox"/> More than 2 hours per day |
| <input type="checkbox"/> I don't spend any time on the computer | |

28. On a normal day on the weekend, how many minutes do you spend on the computer?

(Tick ONE)

- | | |
|---|--|
| <input type="checkbox"/> Less than 30 minutes per day | <input type="checkbox"/> 30-59 minutes per day |
| <input type="checkbox"/> 1-2 hours per day | <input type="checkbox"/> More than 2 hours per day |
| <input type="checkbox"/> I don't spend any time on the computer | |

Please answer the questions below; remember **there are no right or wrong answers**, just what you think! Place a tick in the box marked either true, false, or not sure.

29. You are doing physical activity when you are playing sport, running or going to the gym	True	False	Not sure
30. You are doing physical activity when you play games with your friends, e.g. skipping, other traditional games	True	False	Not sure
31. Walking is physical activity, e.g. walking to / walking home from school	True	False	Not sure
32. Doing chores at home, e.g. fetching water, chopping wood, is physical activity	True	False	Not sure
33. Dancing is physical activity	True	False	Not sure
34. It is important to do physical activity in order to keep my body healthy	True	False	Not sure
35. I should do at least 30 minutes of physical activity every day	True	False	Not sure
36. Boys are better at physical activity than girls	True	False	Not sure
37. Girls should not sweat and breathe hard when they do physically activity	True	False	Not sure

For the questions below, place a tick in the box marked **Yes OR No**.

38. For me, it is too dangerous to walk to school or play outside	Yes	No
39. For me, it is too far to walk to school	Yes	No
40. I do not have enough time to do sport or play games with my friends	Yes	No
41. I am not allowed to stay after school to play sports	Yes	No
42. I have fun when I am doing physical activity	Yes	No
43. I can do physical activity that makes me sweat and breath hard	Yes	No
44. I get tired very quickly when I do physical activity	Yes	No
45. <u>In the last year</u> , did you and your family go to events held at the school for physical activity, e.g. a fun run / walk?	Yes	No
46. <u>In the last year</u> , did any of your educators talk to you about physical activity or exercise or give you information to take home to your family?	Yes	No
47. <u>In the last year</u> , did you watch anything on TV or hear anything on the radio about physical activity or exercise?	Yes	No
48. <u>In the last year</u> , did you read anything in the newspaper or in a magazine about physical activity or exercise?	Yes	No

Nutrition

Please tick the ones you agree with.

49.1 Which do you think is healthier? (Tick ONE)

White bread

OR

Brown bread

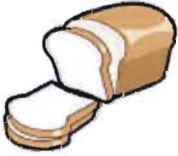


49.2 Which would you choose to eat? (Tick ONE)

White bread

OR

Brown bread



50.1. Which do you think is healthier? (Tick ONE)

Fried potato chips

OR

Boiled potato



50.2. Which would you choose to eat? (Tick ONE)

Fried potato chips

OR

Boiled potato



51.1. Which do you think are healthier? (Tick ONE)

Suckers

OR

Apples



51.1. Which would you choose to eat? (Tick ONE)

Suckers

OR

Apples

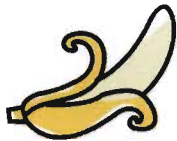


52.1 Which do you think is healthier? (Tick ONE)

A banana

OR

A chocolate



52.2 Which would you choose to eat? (Tick ONE)

A banana

OR

A chocolate



53.1 Which do you think is healthier? (Tick ONE)

A donut

OR

A sandwich



53.2 Which would you choose to eat? (Tick ONE)

A donut

OR

A sandwich



54.1 Which do you think is healthier? (Tick ONE)

Donut

OR

Spinach



54.2 Which would you choose to eat? (Tick ONE)

Donut

OR

Spinach



55.1 Which do you think is healthier? (Tick ONE)

Full cream milk

OR

2% milk



55.2 Which would you choose to drink? (Tick ONE)

Full cream milk

OR

2% milk



56. How often do you think you should eat fruit and vegetables? (Tick ONE)

- More than once every day At least once everyday
 At least once on most days Two or three times in the week

 About once a week Hardly ever



57. How often do you eat fruit and vegetables? (Tick ONE)

- More than once every day At least once everyday
 At least once on most days Two or three times in the week
 About once a week Hardly ever

58. How often do you eat breakfast at home?

- Every morning Most mornings Hardly ever
 Never

59. Which would you choose for breakfast? (Tick ONE)

- Fried egg OR Maize porridge



60. Which one would you choose? (Tick ONE)

- Porridge with margarine OR Porridge without margarine



61. Which one would you choose? (Tick ONE)

Fizzy drink, e.g. Coke

OR

Fruit juice

OR

Water



62. What would you choose for a snack? (You can tick more than one)

Fruit

Sweets

Chips

Biscuits



63. Do you think that you eat too little? (Tick ONE)

Yes

No

64. Do you think that you eat too much? (Tick ONE)

Yes

No

65. What is the best way to lose weight? (You can tick more than one)

By eating less

By eating more healthily

By exercising more

66. Does your school have a tuckshop? (Tick ONE)

Yes

No

67. If you answered yes, do you buy items from the tuckshop? (Tick ONE)

Yes

No

68. If you answered yes, what do you buy from the tuck shop?

- | | |
|---|--|
| <input type="checkbox"/> Fruit | <input type="checkbox"/> Milk |
| <input type="checkbox"/> Chips e.g. simba, nik-naks | <input type="checkbox"/> Fizzy drinks e.g. coke, fanta |
| <input type="checkbox"/> Chocolate | <input type="checkbox"/> Fried food |
| <input type="checkbox"/> Pies/ hot dogs/ hamburgers | <input type="checkbox"/> Salads |
| <input type="checkbox"/> Fresh vegetables | <input type="checkbox"/> Sandwiches |
| <input type="checkbox"/> Fruit juices | <input type="checkbox"/> Sweets |
| <input type="checkbox"/> Other, please specify: | |

69. What additional items would you want your school's tuck shop to sell?

Thank you for completing the questionnaire!

APPENDIX FIVE

Name:					Subject number:
<input type="checkbox"/> Black <input type="checkbox"/> White <input type="checkbox"/> Coloured <input type="checkbox"/> Indian <input type="checkbox"/> Other					
Gender:			Grade: <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6	Age:	
Height:			Weight:		
			cm	kg	
Sit and reach – <i>best of 2:</i>			1.	cm	2. cm
Sit-ups (in 30 secs):				Shuttle run:	seconds
Standing long jump – <i>best of 2:</i>			1.	cm	2. cm

APPENDIX SIX

INFORMED CONSENT

Knowledge, perceptions, practices regarding physical activity and fitness in primary school children, before and after a physical activity programme within the curriculum

Information and consent for learners

RE: Permission to test the physical fitness levels, and the knowledge, perceptions and practices of school children in grade 6 toward physical activity and health.

Dear parent / guardian

The University of KwaZulu Natal, in partnership with the Department of Health and Department of Education, is undertaking the monitoring and evaluation of a research programme which is soon to be implemented in your school setting. The programme is designed to increase participation in physical activity in primary school children

We will be using trained field workers, as well as educators, to assist us with conducting the various tests. Learners will be asked to complete a simple questionnaire reflecting their knowledge, perceptions and practices concerning physical activity during school, after school, and in their spare time. Questionnaires will be filled out during class time, and pupils' privacy while completing the questionnaires will be respected. Educators and trained volunteers will help to conduct the fitness tests with the children. The fitness tests include standing long jump, ten times 5-metre shuttle run, sit-ups in 30 seconds and sit and reach flexibility test. In addition, we will be assessing weight and height, to determine children's growth according to that expected for their age and gender. Fitness tests will be carried out during a physical education or life-skills lesson and may all be conducted in ordinary PE clothes. Your child will not be expected to do anything that would not be required during a normal PE class. He/she will be able to warm up and will be well supervised. All the information obtained will be processed confidentially without revealing the identity of the child.

Tests and questionnaires will be repeated again after 5-6 months. Some schools will not receive the intervention programme straight away due to resources, but will receive the programme after a period of 5-6 months.

All children must have written permission from parents or caregivers before they can participate in the study. If interested, please sign the form consenting for your child to participate in our study. Your child will be given feedback concerning their fitness levels and a small token of appreciation for their participation.

Thanking you

Rowena Naidoo

University of KwaZulu Natal

Tel work: 031-2603676

Mobile: 083 777 2813

Professor Y. Coopoo

University of Witwatersrand

Tel work: 011 717-3229

Fax: 011 717-3379

Parental consent to participate:

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

I (name of parent or legal guardian)
give informed consent on behalf of my child (name of the
child) to participate in the above-mentioned study. I have read and fully understand the information
about the study.

Be informed that your child is free to withdraw at any time from the study, without prejudice, if he
or she should wish to do so.

Signature of Parent or guardian:

DATE:

.....

.....

Witness:

DATE:

.....

.....

Assent to participate (child):

I (name of child) agree that I
understand what is being asked of me, to participate in this research study. I understand that I will
be asked to complete some questionnaires and to undergo fitness testing (including running,
jumping, sit-ups and stretching). I understand that I can stop participating at any stage simply by
saying that I would no longer like to be in the research study. This is entirely your choice, and
whatever you decide is fine, and the school, your parents, educators, and the research team will
respect your decision.

Signature of child:

DATE:

.....

.....

APPENDIX SEVEN

Information and consent for educators

Exploring enabling factors and potential barriers to implementation of a classroom-based programme for increasing levels of physical activity for health in primary school children (grade 6).

Dear educators,

The University of KwaZulu Natal, in partnership with the Department of Health and Education, is undertaking the monitoring and evaluation of a programme soon to be implemented in your school setting. This programme is designed to increase participation in physical activity in primary school children.

We will be using trained field workers to assist us with conducting the various tests. Learners will be asked to complete a simple questionnaire reflecting their knowledge, perceptions and practices concerning physical activity during school, after school, and in their spare time. Questionnaires will be filled out during class time, and pupils' privacy while completing the questionnaires will be respected. Educators and trained volunteers will help to conduct the fitness tests with the children. The fitness tests include standing long jump, ten times 5-metre shuttle run, sit-ups in 30 seconds, and sit and reach flexibility test. In addition, we will be assessing weight and height, to determine children's growth according to that expected for their age and gender. Fitness tests will be carried out during a physical education or life-skills lesson and may all be conducted in ordinary PT clothes. All the information obtained will be processed confidentially without revealing the identity of the child.

In addition, we would like to explore the knowledge and practices of educators concerning physical activity for health, along with other lifestyle factors, which are associated with increased or decreased risk for chronic diseases such as heart disease, cancers and diabetes mellitus. In order to achieve this goal, we are inviting educators in the selected schools to complete a lifestyle survey regarding physical activity, nutrition, smoking, alcohol intake, and stress. Many of these questions form the basis of the national health survey. All results of questionnaires will be kept strictly confidential, and will be utilised by the research team only, as a means to understand potential enabling factors and barriers to the successful implementation of a school-based curriculum for increasing physical activity in primary school learners.

In addition, all educators involved in the implementation of the programme, either now or at some future date, will be invited to participate in focus group discussions. These discussions will be led by a trained researcher, and there will be other trained researchers noting the outcomes of the discussion for later analysis. Focus groups will be conducted in a private, non-threatening setting, where educators may feel free to voice their opinions and concerns in a group of their peers.

Tests and questionnaires, as well as focus groups, will be repeated again after 5-6 months. Some schools will not receive the classroom based programme straight away due to resources, but will receive the programme after a period of 5-6 months.

Thanking you

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Educators' consent to participate:

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

I (name of educator) give informed consent to participate in the above-mentioned study. I have read and fully understand the information about the study. I understand that I can stop participating at any stage simply by saying that I would no longer like to be involved in the research study. This is entirely your choice, and whatever you decide is fine, and the school and the research team will respect your decision.

Signature of educator:

DATE:

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Witness:

DATE:

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APPENDIX EIGHT

E.g. LEARNING AREA: _____		DATE: _____																					
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