ASSESSMENT OF HEALTH-RELATED FITNESS STATUS OF 6-9 YEAR OLD PRIMARY SCHOOL PUPILS IN MUKONO AND WAKISO DISTRICTS, CENTRAL UGANDA

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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This work is dedicated to my children Michael Martin Kalemba, Marion May Nanditta and Mildred Jemimah Nanteza and my beloved father Hannington Kagimu.

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LIST OF ABBREVIATIONS AND ACRONYMS

AAHPERD.....American Alliance for Health, Physical Education, Recreation and Dance

ACSM.....American College of Sports Medicine

ANOVA.....Analysis of Variance

BMI.....Body Mass Index

CDC.....Centre for Disease Control

DHHSCDCP.....Department of Human and Health Services Centre for Disease Control and Prevention

MOES.....Ministry of Education and Sports

NASPE..... National Association of Sport and Physical Education

NCPAD.....National Center for Physical Activity and Disability

NILBP.....National Institute of Low Back Pain

PCYF.....President's Council Youth Fitness

PE.....Physical Education

UPE.....Universal Primary Education

USDA.....United States Department of Agriculture

USDHHS.....United States Department of Human and Health Services

WHO.....World Health Organisation

YMCLS.....Youth Media campaign Longitudinal Study

ABSTRACT

Despite a world-wide increase in health-related diseases and conditions among children, little information is known about the children's health-related fitness status in Uganda. Assessment of the fitness status of pupils aged between 6 and 9 years in Mukono and Wakiso districts in central Uganda was conducted using physical fitness testing. The study also determined their level of engagement in physical activities. A cross-sectional survey research design was used to assess four health-related fitness components. These were cardiovascular endurance using a 9-minute run test, body composition using BMI method, low back flexibility using the sit and reach test and abdominal muscular strength/ endurance using the sit up test. The target population comprised of 25,500 school children drawn from public and private schools. Four thousand pupils formed the sample for the study. The actual sample consisted of 1929 pupils with 922 day scholars and 1,007 in boarding schools. Data was analysed using frequencies, percentages, means and standard deviation and one way analysis of variance at 0.05 level of significance. The AAHPERD (1980) percentiles and the WHO (2007) CDC-BMI for sex- age-growth charts percentiles to determine the fitness status of the pupils. The results showed that out of the 922 day scholars 250 (27.1%) had weak cardiovascular endurance, 27 (2.9%) were underweight, while 58 (6.3%) were overweight, 29 (3.1%) were obese; 707 (76.7%) had poor flexibility and 798 (86.5%) had weak abdominal muscles. On the other hand, out of the 1007 pupils in boarding schools 307 (30.5%) had weak cardiovascular endurance, 50 (5%) were underweight, while 79 (7.8%) were overweight, 50 (5%) were obese, 824 (81.8%) had poor flexibility and 814 (80.9%) had weak abdominal muscles. The results revealed significant differences in cardiovascular endurance, body composition and abdominal muscular strength/endurance between day and boarding pupils ($p>0.05$) with day scholars having higher mean distance run scores, lower mean BMI scores and lower mean sit up scores. There were no significant differences in the mean sit and reach scores between day and boarding pupils. However, majority of pupils achieved the recommended standard for the cardiovascular endurance and normal body composition. There were also significant gender differences in all the health-related fitness components. The boys had higher mean distance run scores, lower mean BMI scores, lower mean sit and reach scores and higher mean sit up scores. This implies that more boys had better cardiovascular endurance, normal weight and better muscular strength/endurance than girls. On the other hand, more girls were flexible than boys. The study revealed that the pupils demonstrated poor health-related fitness status especially in abdominal muscular endurance and low back flexibility. The study also revealed that most pupils met the recommended 60 minutes of daily physical activity although the activities they engaged in were not appropriate enough to develop most of the health-related fitness components. It is recommended that more physical activities that develop the health-related fitness should be integrated in the school curriculum and children need to engage in more active behaviours.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Physical fitness is the ability to perform occupational, recreation and daily activities without excessive fatigue (Heyward, 1998). It is subdivided into two categories namely; motor and health related fitness. The motor or skill or performance related fitness components comprise of agility, balance, coordination, power, reaction time and speed that are necessary for sport performers who aim at improving specific sport related skills (Insel and Roth, 1998). Health-related fitness components on the other hand, comprise of body composition (percent body fat), cardiovascular endurance, low back/hamstring flexibility, abdominal muscular strength and endurance (American Alliance for Health, Physical Education, Recreation, and Dance, [AAHPERD], 1998; Insel and Roth, 1998 and Toriola, 2002). Rosser (2005) states that health-related fitness is good for health thus it is a requirement of every individual irrespective of gender and age.

To understand health-related fitness, it is important to define its components and the circumstances under which these relate to the way the body functions in health and disease (Dishman, Washburn and Heath, 2004). Cherubini (2008) defines cardiovascular endurance as the ability of circulatory and respiratory systems to continue, persist, adjust and recover after strenuous tasks that involve large muscle groups for a long period. A high level of cardiovascular fitness in childhood is associated with reduced risk of developing cardiovascular diseases such as arteriosclerosis and hypertension (American College of Sports Medicine [ACSM], 2000).

Flexibility is defined as the ability of a joint or a group of joints to move through a full range of motion (ACSM, 2005). Health-related fitness requires a child to possess reasonable flexibility of the low back and hamstring muscles as this enables him or her perform daily activities efficiently and prevents low back pain (McCallister, 2004). National Institute of Low Back Pain [NILBP] (2008) links increased incidences of low back pain in children to lack of flexibility in the low back and hamstring muscles.

According to Heyward (1998), muscular strength allows a muscle or muscle group to develop maximal contractile force against resistance in a single contraction while muscular endurance enables a muscle or group of muscles to contract repeatedly for a prolonged period of time. Strength and endurance of the abdominal muscles, which is recommended for a fit child, enhance performance of daily physical activity; prevent low back pain and poor posture (Rosser, 2005).

Body composition is defined as the relative proportion of body fat to lean body tissues or fat free weight (ACSM, 2005). Health-related fitness requires that a child has a high proportion of lean mass and low body fat (Rosser, 2005). Childhood overweight and obesity are linked to having excess of body fat (Bessesen and Kushner, 2002). This condition has significant impact on the physical and physiological health. For example, it has been linked to hypertension, digestive diseases, type II diabetes and depression (Myers, 2004). Therefore, a child is considered to have health-related fitness if he or she has high levels of cardiovascular function, low amounts of fat, sufficient abdominal

muscular strength/endurance and flexibility in the low back and hamstring muscles (AAHPERD, 1980).

The key determinants of the health-related fitness components include proper diet, adequate rest, mental and social outlets (Rosser, 2005). However, according to Corbin and Pangrazi, (2004), one is considered unfit unless he or she engages in satisfactory levels of physical activities. Bouchard and Shephard (1994) define physical activity as the bodily movement of skeletal muscles that substantially increases energy expenditure over resting level. To ensure health-related fitness, the energy one obtains from the food eaten should be balanced with the energy one expends (Heyward, 1998). Appropriate energy expenditure is achieved through engagement in adequate levels of physical activity that is determined by the type, frequency, duration and intensity of the activity (Beashel, Sibson and Taylor, 2001). Frequency is the number of times an activity is performed, while duration refers to the time taken to perform a particular activity. Intensity refers to how hard one works during a performance (Beashel et al., 2001). Health-related fitness will be developed, improved or maintained if one engages in regular long duration low intensity physical activities (Rosser, 2005).

Historically, most people maintained fitness through engaging in activities such as walking long distances in search of water and firewood (Toriola, 2002). Toriola (2002) further adds that the onset of modernization and urbanisation have led to gradual shift from physical to mental activities as means of survival. Thus formal education has become a prerequisite for survival and success in the modern world. Driven by this need,

many parents in Uganda now take their children to school at an early age. While at school, pupils mostly remain seated in classrooms engaged in mental activity (Nsibambi, Waiswa, Mukiibi and Soita, 2005). Emphasis in most schools is focused on passing examinable subjects rather than provision of an all round education. Gradually, non-examinable subjects that enhance physical fitness like Physical Education (PE) have been marginalized in many schools in Uganda (Nsibambi et al., 2005). Similarly, in the United States many stakeholders in education focus on traditional academic activities at the expense of PE (President's Council on Youth Fitness [PCYF], 2007). PCYF (2007) further notes that the period devoted to PE in schools in the United States has decreased despite the advice from public health experts on what constitutes good school programmes.

In Uganda pupils extend their academic workload to homes in form of homework and this further limit the time that could be used for involvement in physical activities. Besides, passive physical activities such as engaging in indoor games and watching television have set in (Natukunda, 2007). Furthermore, many pupils especially in urban setting lack space where they can engage in physical exercise (Natukunda, 2007 and Guthold, Cowan, Auterieth, Kann, and Riky, 2009). Natukunda (2007) also points out that many urban parents in Uganda are keen on keeping their children clean, thus they restrict their outdoor activities.

Moreover, many urban school children in Uganda are either driven to school or use public transport which has also restricted their physical activity. Other parents take their

children to boarding schools believing that they will concentrate on academic work and minimize disturbances like commuting to and from school (Natukunda, 2007). Unfortunately, when children's engagement in physical activities is restricted their health- related fitness status is negatively affected (PYCF, 2007).

Although academic excellence is a worthy goal, what is also critical is the appreciation of the benefits derived from engaging in physical activities and their impact on pupils' health status. A physically active child is involved in active leisure time pursuits which reduce natural degeneration that often comes with middle age and beyond (National Center on Physical Activity and Disability [NCPAD], 2008). Conversely, leading a sedentary life often results in many health-related fitness problems (Bakibinga, 2007). Such a lifestyle is associated with many hypokinetic diseases and conditions like obesity, overweight, musculo-skeletal disorders (including low back pain, osteoporosis and osteoarthritis), cardiovascular diseases, type II diabetes and certain cancers (Toriola, 2002; Crespo, 2004 and Lee, Welchester and Balling, 2006). The World Health Organisation [WHO] (2005) warns that sedentary life is one of the leading causes of death and disability. Guthold, et al., (2009) also report that 1.9 million deaths including children occur every year because of diseases and conditions which could be prevented if people engaged in sufficient physical activity.

Hypokinetic diseases and conditions, sometimes referred to as non-communicable diseases, are increasing at an alarming rate in both developing and developed countries especially among sedentary children and adults (WHO, 2005 and Bakibinga, 2007).

Nabadda (2002) confirms that in Uganda, non-communicable diseases and conditions such as hypertension, diabetes and certain cancers are offsetting traditional infectious diseases and these conditions are affecting children as well. Unfortunately, hypokinetic or non-communicable diseases and conditions are bound to increase the medical burden of any given society if there is no intervention strategies put in place (Guthold et al., 2009).

Many studies have been conducted in developed and developing countries to evaluate the health-related fitness status of children in an effort to devise intervention strategies. However, in Uganda, there is comparatively little information on the health-related fitness status of school children.

1.2 Statement of the problem

In Uganda a sedentary lifestyle is affecting more people, both young and old, especially because of urbanisation and modernization (Nabadda, 2002). Pupils concentrate more on academic subjects and engage less in physical activities because society values good academic grades (Nsibambi, et al. 2005). Furthermore, many pupils engage in passive activities during free time due to lack of space to play from or restriction of outdoor activities by parents (Natukunda, 2007). Such a lifestyle is likely to lead to health-related fitness problems (Bender et al., 2005; Lee et al., 2006; Rukiya, 2004 and Bakibinga, 2007).

Namutebi (2007) notes that little is known about the health status of children in Uganda. Therefore, assessing the health related fitness status among school children is relevant

because of the existing gaps in information. Determining the health status of children can be done by testing their health-related physical fitness which according to AAHPERD (1998) is a good indicator of one's health. Health-related fitness testing also provides data that can help in designing preventive measures and avert future threats to children's health (Bender, 2005 and National Academic Press [NAP], 2007). Data obtained from the testing can be used in the maintenance and improvement of children's health, thus ensuring a healthy generation in future.

This study examined health-related fitness status of primary school pupils in Wakiso and Mukono districts in Central Uganda. It focused on school going children whose number dramatically increased since the introduction of Universal Primary Education (UPE) in 1997 (Ministry of Education and Sports [MOES], 2006). Therefore, most children within the age bracket of six to nine years are in school. As mentioned earlier, formal education has affected children's lifestyle, particularly those in urban areas. This is because this type of education reduces time for active engagement in physical activity as pupils remain seated in classrooms engaged in mental work and also spend some time at home doing homework.

1.3 Purpose of the study

The purpose of the study was to assess the current health-related fitness status of pupils in primary schools of Wakiso and Mukono districts in central Uganda. It was crucial to gather such baseline information about the fitness status of pupils as it can be used to observe the trend over time and take necessary intervention measures.

1.4 Objectives of the study

The objectives of the study were to:

i) determine the health-related fitness status of pupils in primary schools in Mukono and Wakiso districts using the AAHPERD (1980) percentiles for cardiovascular endurance, low back flexibility and abdominal muscular strength/endurance and the WHO (2007) age-sex specific BMI percentiles for body composition.

ii) compare health-related fitness status of pupils in day and boarding primary schools.

iii) compare health-related fitness status of girls and boys in primary schools.

iv) examine the level of involvement in physical activity of pupils in Wakiso and Mukono districts.

1.5 Research hypotheses

It was hypothesized that there would be no significant difference in health-related fitness levels of day and boarding primary school boys and girls aged between 6 and 9 years in Mukono and Wakiso districts.

The sub-hypotheses included:

$H0_1$ There would be no significant difference in cardiovascular endurance between day and boarding primary school pupils.

$H0_2$ There would be no significant difference in body composition between day and boarding primary school pupils.

$H0_3$ There would be no significant difference in low back flexibility between day and boarding primary school pupils.

$H0_4$ There would be no significant difference in abdominal muscular strength/endurance between day and boarding primary school pupils.

$H0_5$ There would be no significant difference in the health-related fitness status between boys and girls.

1.6 Research questions

The following research questions were also used to guide the study:

1. What is the status of health-related fitness of the pupils in Mukono and Wakiso districts?
2. How do pupils in day schools get to and from school?
3. What physical activities do pupils engage in before, during and after school?
4. What common physical activities do pupils engage in during weekends?

1.7 Significance of the study

The study provides information on health-related fitness status of pupils in Mukono and Wakiso districts. This can be utilised by the Ministry of Health in devising measures that promote, maintain and/or improve the current fitness status of pupils. Curriculum planners in the Ministry of Education and Sports can use data obtained from the study to formulate policies that enhance involvement in physical activities so as to maintain and improve the health-related fitness status of school children. The study also provides information on the importance of community engagement in physical activities which can

lead to a healthy nation. The study also forms basis for further research on fitness levels of other categories of people like the adolescents, youth and adults as well as children from other regions. Such information helps in creating awareness about health related fitness status of people and provides baseline data that can be used to trace trends and design appropriate actions to be taken where necessary.

1.8 Delimitations of the study

The study was delimited to day and boarding primary schools in Wakiso and Mukono, the most urbanised districts in central Uganda after Kampala district. Apparently, in these districts, many children have adopted a modern lifestyle that is associated with urbanisation.

The study focused on pupils aged between 6 and 9 years because most children start primary school education at the age of six (MOES, 2006). Secondly, according to Malina, Bourchard and Oded Bar-Or (2004), there is a steady growth of children in this age bracket which is characterised by physical development and improvement in motor abilities. Thus, Malina et al. (2004) recommends that they engage in regular and adequate physical activity to ensure proper development of their muscles and bones. The pupils who are over nine years did not form part of the sample because puberty that normally begins at 10 years tends to affect the fitness status especially flexibility, body composition and muscular strength (Rubahamya, 2003; Fox, 2004 and Malina et al., 2004).

The study was also delimited to pupils with no record of chronic diseases and conditions and those who were not on medication at the time the study was conducted as recommended by the ACSM (2000). Only four health-related fitness variables namely, cardiovascular endurance, body composition, flexibility of the low back and the hamstring and abdominal muscular strength/endurance were assessed as these are indicators of a healthy individual (AAHPERD, 1980).

The physical activities considered for the study included those done during school term when pupils were at school and not during holidays. The school term time lasts for nine months of a calendar year hence pupils spend most of their time in school and activities they engage in during school time basically form their habitual physical activities. The study included only activities done between 6am and 7pm when children were likely to be more physically active.

1.9 Limitations of the study

This study was limited by various factors such as heredity, diet and rest patterns that influence health-related fitness status of an individual. In addition, there are many schools that lacked standard well leveled track fields and were therefore not sampled as this would affect the reliability of cardiovascular endurance test scores.

The test scores of the pupils were compared with the AAPHERD (1980) percentile norms of the developed world. Presently, there are no established standardised percentile norms

set by African countries that have been agreed upon and can be reliably used for comparative purposes.

1.10 Assumptions of the study

According to Bouchard and Shephard (1994), health-related fitness is influenced by such factors as lifestyle, physical and social environment among others. The lifestyle factors that Bouchard and Shephard (1994) identify include smoking, diet, alcohol consumption and sleeping patterns. It was assumed in the study that pupils neither smoked nor consumed alcohol. Bouchard and Shephard (1994) also identified temperature, humidity, air quality, altitude and climatic changes as variables in the physical environment. Variables in the social environment include social, cultural, political, and economic conditions (Bouchard and Shephard, 1994). The researcher assumed that all these variables did not significantly cause variations in the pupils' health-related fitness since they lived in a relatively similar physical and social environment.

1.11 Conceptual framework

The conceptual framework for this study was derived from Bouchard and Shephard (1994). The model shows how heredity, health, physical and social environment affect health-related fitness. However this study considered only physical activity as a factor that influences health-related fitness status. According to Bouchard and Shephard (1994), physical activity is defined as any bodily movement produced by skeletal muscles that substantially increase energy expenditure over the resting level. Malina (1999) considers physical activity as a bio-cultural behavior where energy is spent in active behaviours

that occur in different forms and cultural contexts. These may include leisure-time, occupational and daily living activities. Leisure-time physical activities are those an individual engages in during free time and are based on personal tastes. Such activities may be formal and informal. Formal exercises are leisure-time physical activities that are planned, structured and repetitive (Malina, 1999). They are categorised as vigorous activities performed to improve and maintain at least one component of physical fitness (Lawlor, Taylor, Bedford and Ebrahim, 2007).

Occupational physical activity is associated with job performance. However, this study involved pupils who are not engaged in occupational physical activity but in school activities that consume much of their daytime. Daily living tasks may include domestic duties can either be routine chores or house maintenance tasks like gardening, walking and cycling and are categorized as moderate intensity activities according to Lawlor et al. (2007). Moderate intensity activities tend to affect body composition and in some cases cardiovascular fitness (Lawlor et al., 2007). All leisure, school time activities and daily living tasks form habitual physical activities of the pupils. Habitual physical activity is a collective term and is defined as the level and pattern of energy expended in course of life that includes work and leisure (Twisk, 2001).

The study conceptualized that regular involvement in physical activities leads to health-related fitness. Components of health-related fitness in this model were categorised as morphological, muscular, motor, cardiovascular and metabolic. According to Dishman, Washburn and Heath (2004) morphological fitness components relate to body mass for

height, body composition, subcutaneous fat distribution, bone density and flexibility. In the study, only body composition component and flexibility were assessed.

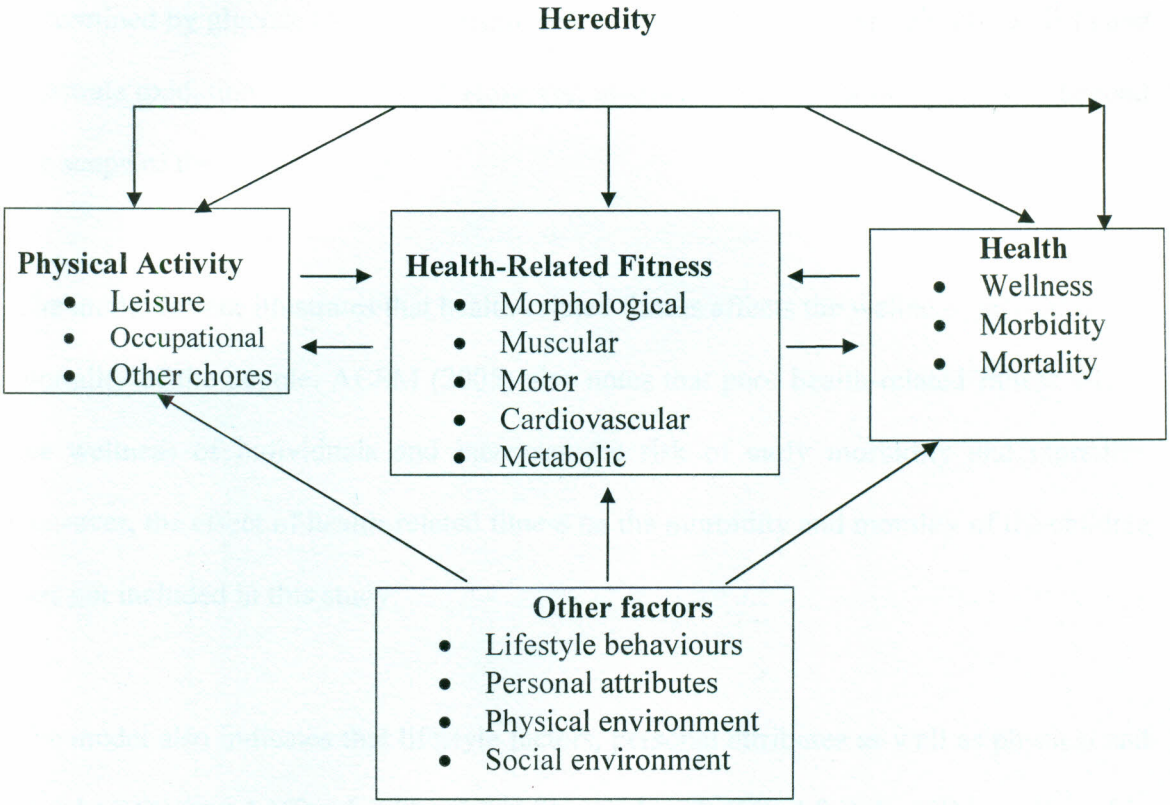


Figure 1: A model describing the factors that affect Health-Related Fitness (Adopted from Bouchard and Shephard, 1994).

Muscular fitness component relates to power, strength and endurance of the muscles (Dishman et al., 2004). However, the study assessed strength and endurance of the abdominal muscles only. Motor components include agility, balance, coordination and speed of movement (Dishman et al., 2004). The study however did not include assessment of these components. Cardiovascular endurance fitness can be determined by sub maximal exercise capacity, maximal aerobic power, heart functions, lung functions

and blood pressure (Dishman et al., 2004). In this study, sub maximal exercise capacity was assessed using a 9-minute distance run/walk to determine the cardiovascular endurance fitness of the pupils. According to Dishman et al. (2004) metabolic fitness is determined by glucose tolerance, insulin sensitivity, lipid and lipoprotein metabolism and substrate oxidation characteristics. However, assessment of metabolic fitness was beyond the scope of the current study.

The model further illustrates that health-related fitness affects the wellness, morbidity and mortality of the people. ACSM (2005) also notes that poor health-related fitness affects the wellness of individuals and increases the risk of early morbidity and mortality. However, the effect of health-related fitness on the morbidity and morality of the children was not included in this study.

The model also indicates that lifestyle factors, personal attributes as well as physical and social environment affect health-related fitness. A sedentary lifestyle will be reflected in engagement in passive physical activities in which in turn affects health-related fitness status and the person's general health.

The current study thus assessed the health-related fitness components and established the pupils' level of involvement in physical activity as this affects their fitness.

1.12 Operational definition of terms

Cardiovascular Endurance: is the ability to work for relatively long periods of time without getting tired. It is measured by the longest distance in yards covered a pupil can cover in nine minutes (AAHPERD, 1980).

Body Composition: is expressed in terms of the amount of fat in the body. It is measured by computing the Body Mass Index (BMI).

Low back Flexibility: refers to the ability to move the low back and hamstring muscles freely through the entire range of motion. It is measured by the sit- and- reach test (AAHPERD, 1980).

Abdominal Muscular Strength/Endurance: is the ability of the muscles of the abdomen to perform and sustain a contraction repeatedly over a period of time and is measured by the correct number of sit-ups a pupil performs in one minute (AAHPERD, 1980).

Pupils: primary school children who are chronologically aged between 6 and 9 years in Wakiso and Mukono districts.

Free time: time outside classroom learning between 6am and 7pm, seven days a week.

Matron: a person in-charge of boarding school pupils in the houses.

House: a place where pupils in boarding schools reside.

Director of Studies: a teacher in charge of the school curriculum.

Physical Activity: formal and informal activities done by the pupils at school, home or house including PE, exercise, sport, dance, play and house chores.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Literature was reviewed under the following sub-topics: The concept of health-related fitness; Physical activity and health-related fitness; Benefits of engaging in physical activity; Trends in health-related fitness among children; Effects of health-related fitness problems in children; The role of schools in promoting physical activity; Physical fitness testing; Assessment of physical activity; Related studies and Summary.

2.2 The concept of health-related fitness

Several researchers define health-related fitness differently. According to Marrow, Jackson, Disch and Mood (2000), it is the attainment and maintenance of physical capacities that are related to good and improved health and are necessary in performance of daily activities and confronting physical challenges. The National Center on Physical Activity and Disability [NCPAD] (2008) defines health-related fitness as the ability to perform daily activities that lower the risk of premature development of diseases and conditions related to movement. Cherubini (2008) points out that health-related fitness optimizes quality of life by reducing risk of heart disease, diabetes, osteoporosis, cancer and other chronic diseases through enhancement of physical fitness so that daily tasks are completed with less effort and fatigue. Health-related fitness helps in the development of cardiovascular endurance and muscular fitness (flexibility, muscular strength and endurance) while optimizing body composition (percentage of lean body mass against body fat). It is important therefore that children attain this type of fitness to ensure proper

growth and development and prevent many diseases or conditions that often begin during childhood and surface clinically during adulthood (WHO, 2005). In addition, children who are fit in this respect are able to perform their daily activities with ease (Corbin and Pangrazi, 2004).

Health-related fitness comprises of five components namely; cardiovascular endurance, body composition, low back flexibility, abdominal muscular endurance and upper body muscular strength (Toriola, 2002 and Cherubini, 2008). AAPHERD (1998) however, recommends that children require fitness of the cardiovascular endurance, body composition, low back flexibility and abdominal muscular strength/endurance only. Rosser (2005) affirms that for an individual to be considered fit, all these components need to be in balance regardless of whether one is an athlete or not. Therefore, it is important that every society establishes the health-related fitness status of its people in order to address the factors that enhance health and set up risk prevention strategies (NCPAD, 2008). Since there was no data available on the health-related fitness status of school children in Wakiso and Mukono districts the current study aimed at filling this gap in information.

2.3 Physical activity and health-related fitness

Health-related physical fitness can not be achieved without engagement in adequate levels of physical activity (Fehay and Insel and Roth, 2003). According to Ruiz et al (2006), moderate to vigorous levels of physical activity improve fitness by stimulating functional adaptations of all body tissues and organs making them less vulnerable to

lifestyle related degenerative and chronic diseases. Therefore, when the children are exposed to optimal physical activity harmonious growth and development of their motor abilities is ensured which in turn affects their health positively (Malina et al., 2004). The criteria set for children to attain optimal level of fitness require 60 minutes of moderately intensity physical activity on most days of the week (Lee at al., 2006).

However, schooling and passive activities during free time can reduce engagement in adequate physical activity leading to sedentary living. Such a lifestyle poses a significant public health hazard in developing and developed countries (Malina, 1999). Unfortunately, inactive children usually carry such habits into adulthood (Fahey et al., 2003). According to Goon (2006), many hypokinetic diseases or conditions are life long problems that begin during the pediatric years and surface clinically during adulthood. Therefore it is important that physical inactivity is reduced early enough during childhood by devising necessary intervention measures. The current study aimed at determining the pupils' level of engagement in physical activity which may have an influence on their health-related fitness and their health now and in the future.

Various studies have been conducted to establish the relationship between physical activity levels and health related fitness status among different categories of people. Andersen, et al, (1998) studied gender attitude on physical activity and TV watching with body weight and fat levels among children. The study established that girls, regardless of the race, had significantly more body fat levels than boys and participated less in

vigorous activities than boys. This affects their health-related fitness status especially with respect to body composition and cardiovascular endurance.

Monyeki et al., (2005) studied the relationship between physical activity and physical fitness using the AAPHERD (1980) tests of Ellisras rural primary school children aged 7 to 14 years in South Africa. The study revealed a significant relationship between body composition and physical fitness. In addition, the study reported significant gender and age differences that were observed with respect to body composition with girls having more body fat than boys. However, there is hardly any study conducted to establish the levels of engagement in physical activity among pupils in Mukono and Wakiso districts and yet this affects their health-related fitness status. This study therefore aimed at providing this data.

2.4 Benefits of physical activities

Potential benefits of physical activity can be seen in individual's improved performance, appearance and health (Rosser, 2005). In other words, physical activity can improve both physical and mental performance (NCPAD, 2008). Thus, when a pupil combines classroom activity with physical exercise it helps him or her relax and improve on the mental concentration. In this regard, Bakibinga (2007) reports that teachers in countries like Demark incorporate thirty seconds of simple stretching during classroom learning to reinvigorate a pupil and make him or her more alert and able to deal with stressful situations. Similarly, Stewart et al. (2004) recommends 15-20 minutes of brisk walking or

calisthenics not only to improve cardiovascular endurance but also improve mental productivity and lessen anxiety.

Engaging in physical activity also helps in controlling and maintaining an individual's body weight and this improves body appearance. Obesity and overweight conditions are to a great extent related to inadequate engagement in physical activity (Foss and Keteyian, 1998; WHO, 1998 and Marchione, 2005). Obese and overweight people tend to suffer psychological maladjustments that lead to poor relationship with peers and this often result in low self-esteem (Bessesen and Kushner, 2002). Secondly, obesity and overweight also lead to awkward physical movement. On the other hand, involvement in physical activity prevents such psychological maladjustments and enables one to maintain a good posture leading to improved appearance (Bessesen and Kushner, 2002). In addition, adequate engagement in appropriate physical activity helps in strengthening weak and tight muscles of the abdomen, low back and hamstring muscles that often lead to postural problems and low back pain (Rosser, 2005).

With respect to health, physical activity also contributes to fitness by reducing the risk of chronic diseases and conditions. Heart diseases, high blood pressure, weight problems, type II diabetes, mental disorders and certain types of cancer are some of the diseases and conditions that can be prevented or controlled through participating in appropriate physical activities (Bender et al., 2005, Erdmann and McMillan, 2005 and Padilla, Wallace and Park, 2005).

2.5 Trends in health-related fitness among children

Modern lifestyle is characterised by sedentary living that contributes to low levels of fitness among children world wide. Hui, Sum and Morrow (2005) confirm that there is deterioration in health-related fitness among primary school children in Hong Kong which is related to sedentary lifestyle, associated with rapid modernization. According to Tomkimson and Olds (2007), there is a correlation in declining aerobic fitness and decline in active physical activity among Australian children. Asian children too have experienced decline in cardiovascular endurance since 1992 (Macfarlene and Tomkimson (2007). In addition to the declining levels in cardiovascular endurance, there is an increasing number of children with inappropriate body weight or high levels of body fat which is associated with physical inactivity among other factors (Myers, 2004 and Bakibinga, 2007). In Kenya, Mallo (2004) associated obesity among the preadolescents attending private primary schools in Nairobi with lack of physical activity at home and passive indoor games during free time. The NILBP (2008) has attributed the declining levels of adequate low back flexibility and weak abdominal muscles to the increasing incidences of low back pain among children.

Data on health-related fitness status of children is available in many countries and this can be used to study the trends of over period of time. However, in Uganda such data is lacking and this necessitated a baseline study to provide information that can be used to establish the trend in future.

2.6 Effects of poor health-related fitness among children

Health-related physical fitness is an important marker of health and many complications resulting from low levels of such fitness among children have been documented. For instance, low cardiovascular fitness in childhood is associated with cardiovascular risk factor like hypertension (WHO, 1998; Freedman, et al, 1999; Fahey et al, 2003 and Hui et al, 2005). The NILBP (2008) notes that lack of flexibility in low back and hamstring muscles has increased led to incidences of low back pain among children. Similarly, weakness in abdominal muscles leads to low back pain even among children (McCallister, 2004). Lack of appropriate body weight (poor body composition) manifested in having high body fat levels had led to a significant increase in childhood overweight and obesity (Corbin, 2001). Since the study aimed at establishing the health-related fitness of children in Uganda, the data thus obtained can be used to devise strategies, if necessary, to avert such possible future health-related fitness problems.

One of the intervention strategies for reducing the risk factors for many hypokinetic diseases involves maintenance of appropriate levels of health-related fitness achieved through promotion of moderate to vigorous physical activity among children (Corbin, 2001). To attain this, Bungum and Vincent (1997) recommend inclusion of subjects that enhance physical activity in the school curricula.

2.7 The role of schools in promoting physical activity

Lee, et al (2006) points out that structures like families, community organizations, media and schools play a crucial role in enhancing physical activities among school children.

Lee, et al (2006) further notes that none of these units can solve this problem single handedly without school intervention programmes. Guthold, et al (2009) also notes that a well designed and implemented school programme can enhance physical activities among children. Such a programme requires establishment of school facilities and provision of trained and focused administrators and teachers who can implement quality PE programmes (National Association of Sport and Physical Education [NASPE], 2004).

High quality PE programmes not only help a pupil develop the psychomotor domain but also lead to acquisition of knowledge and skills needed for life time maintenance of a physically active lifestyle (PCYF, 2007). Similarly, NASPE (2004) confirms that quality PE helps all learners develop health-related fitness and physical competence that leads to adoption of a healthy and a physically active lifestyle. NCPAD (2008) recommends that children and youth aged 6-19 years should accumulate at least 60 minutes of daily physical activity, part of which can be achieved through daily PE lessons.

Walking to school is another way of ensuring that pupils are physically active. Guthold, et al (2009) note that children who walk or cycle to school participated more in physical activities than those driven to school. However, letting pupils walk or cycle to school requires an enabling and safe environment.

All measures to improve or maintain health-related fitness status of the children need to be designed when the current status has been established. In Uganda there is little

information about the health-related fitness status of children yet this can be determined through physical fitness testing.

2.8 Physical fitness testing

Various physical fitness tests have been designed to measure performance or health-related fitness skills. The AAHPERD health-related fitness test battery, used for this study, was introduced in 1980. The battery was intended to replace batteries that placed a lot of emphasis on performance-related fitness (Lance, Dalleck and Kravtiz 2007).

The AAHPERD (1980) advocates for an active lifestyle that aims at achieving and maintaining high levels of cardiovascular endurance, low amounts of fat, sufficient muscular strength/endurance and flexibility in the lower back and hamstring muscles. When the AAPHERD (1980) tests are administered the results can be used to determine an individual's fitness status which can later be compared with peers within a cohort to establish his or her strengths and weaknesses. Tailor made programmes can then be developed.

The study used the AAHPERD (1980) tests because they can be used for mass testing and their administration required little or no equipment. The AAHPERD (1980) test manual lists four measures necessary in assessing health-related fitness. They include:

i) Cardiovascular endurance using one mile or nine minute run for children below 12 years.

ii) Body composition (leanness/fatness) or percent body fat using the skin folds although this study used the Body Mass Index.

iii) Abdominal musculoskeletal function to measure muscular strength/endurance using modified, timed sit-ups test and

iv) Trunk and low-back flexibility using sit and reach test.

For each of the fitness variable, the AAHPERD (1980) test battery recommends a remedial programme for all persons who score below the 25th percentile. Individuals scoring between the 25th but below the 50th percentile are considered weak. Attaining the 50th percentile or above is regarded as having the desired level of fitness.

2.8.1. Cardiovascular endurance

According to Riuz, et al (2006), cardiovascular endurance, cardio-respiratory endurance, aerobic capacity aerobic power, aerobic fitness, maximal aerobic power, aerobic work capacity, physical work capacity or maximal oxygen uptake (VO_{2max}) refer to the same concept and can be used interchangeably. This study however used cardiovascular endurance. Cherubini (2008) defines cardiovascular endurance as the ability of circulatory and respiratory systems to continue, persist, adjust and recover after strenuous tasks that involve large muscle groups for a long period. This is a complex fitness component that requires fitness of several body parts including the heart, lungs, blood tissue and blood vessels to deliver an adequate supply of oxygen and food nutrients and remove waste products like carbon dioxide in every body cell (Gunstream, 2000). According to Honeybourne, Mill and Moors (2002) cardiovascular fitness also leads to a reduction in the number of heart beats per unit time (heart rate) and an increase in the

amount of blood pumped out in a given heartbeat (stroke volume). Consequently, the heart and the blood vessels become more efficient by spending less energy in delivering materials. Physical activities such as brisk walking, running, swimming and gardening can help in developing, improving and maintaining this fitness component (Rosser, 2005). A high level of cardiovascular fitness in childhood is associated with reduced risk of developing cardiovascular diseases such as arteriosclerosis and hypertension (Malina, 1999).

2.8.1.1 Factors affecting cardiovascular endurance

The factors that affect cardiovascular endurance include heredity, gender, age and the type of physical activities. Honeybourne et al (2002) note the significant role heredity plays in the determination of this fitness component. According to McArdle, Katch and Katch (2000), heredity accounts for between 25-40 percent of the cardiovascular endurance. However, the influence of heredity on this fitness component is beyond the scope of this study.

Gender is another major determinant of this fitness component. According to McArdle, et al (2000) women have up to 20 percent less cardiovascular endurance (VO_{2max}) than men. This is attributed to the differences in body size, body composition, and blood volume where men have bigger muscles and hence need more supply of materials to produce energy and maintain life than their female counterparts (Gunstream, 2000). Gender differences also exist among the children and adolescents. According to Armstrong and Welsman (2000), there is a gradual and progressive increase in VO_{2max}

(cardiovascular endurance) in relation to chronological age in boys between 8 to 16 years which is more consistent compared to that of girls. Secondly, Armstrong and Welsman (2000) note that prepubertal boys have a significant higher VO_{2max} than prepubertal girls and attribute it to higher levels of habitual physical activity among boys as compared to the girls. Armstrong and Welsman (2000) also attribute significantly higher VO_{2max} of boys as compared to girls to variation in body composition as boys possess a greater percentage of lean body mass than girls even in the prepubertal years. Goon (2006) also conducted a study to assess the physical fitness status of Nigerian children aged 9-12 years. The study revealed that boys had significantly higher VO_{2max} than girls at all ages.

With respect to age, cardiovascular fitness levels are lower in children than in adults. This is because a child has smaller blood volume, lower haemoglobin concentrations and immature hearts than adults (Foss, and Keteyian, 1998). However, the fitness levels of children continue to improve as they grow (Malina et al., 2004). McArdle, et al (2000) report that cardiovascular endurance continue improving and reaches its peak at 20 years and begins declining by 1 percent annually until the age of 65 years when there is a dramatic decline of 30 percent. However, engagement in regular exercise one can offset this decline (McArdle et al., 2000).

The mode, intensity and duration of training also influence cardiovascular endurance fitness. Rowland (1996) shows that endurance training involving sub maximal intensity for a relatively long duration most days a week elicit great improvement in individuals irrespective of their age.

2.8.1.2 Measurement of cardiovascular endurance

The highest maximal oxygen uptake (VO_{2max}) is the best indicator and most accurate laboratory measure of cardiovascular endurance fitness (Rosser, 2005). ACSM (2005) defines VO_{2max} as the highest rate at which oxygen can be taken in, transported and used during maximal dynamic exercises. It involves an athlete working to exhaustion on a treadmill and all the air he or she expires is collected in Douglas bag. The volume of the expired air and its oxygen content are measured. The oxygen content in the expired air is then compared with the oxygen in the atmospheric air. However, this laboratory procedure uses expensive equipment, requires technical expertise and is time consuming (Honeybourne, et al, 2002).

Several field protocols that estimate this type of fitness have been developed. The AAHPERD (1980) recommends one mile or nine minute run for children below 12 years. Arabas, Anderson, Arabas, Arabas and Mayhew (1996) describe the 9-minute run as the best predictor in estimating $VO_{2\ max}$ with a significant correlation of 0.83. In addition, the test takes a shorter time to administer, making it more applicable in mass testing. The test also utilizes affordable tools like a stopwatch, a well-leveled surface, strings, pegs and a tape measure. The results obtained are interpreted through comparative studies in the cohort based on percentile norms set.

The percentile norms for the 9-minute run are presented in table 2.1 below. It is important to note that most people can achieve the desired fitness level of the 50^{th} or above

percentile when motivated and conditioned by engaging in physical activities such as brisk walking, jogging and aerobics (Lawlor et al., 2007).

Table 2.1 Percentile norms. Ages 6-9 years for the 9-minute run (yards) for boys and girls (AAHPERD, 1980)

Age	Sex	25th Percentile	50th Percentile
6	Boys	1090	1280
	Girls	1017	1208
7	Boys	1243	1440
	Girls	1150	1344
8	Boys	1380	1595
	Girls	1225	1358
9	Boys	1440	1660
	Girls	1243	1425

2.8.2 Low back flexibility

According to ACSM (2005), flexibility is defined as the ability of a joint or a group of joints to move through a full range of motion. Flexibility is considered to be specific since some joints have either a low or high range of motion (Insel and Roth, 1998). Health- related fitness requires that an individual possesses reasonable flexibility of low back and hamstring muscles. Such flexibility enables a person to perform daily activities efficiently, prevent musculo-skeletal injuries and low back pain. Flexibility also helps prevent stiffening and shortening of joints that may result from injury, disease, inactivity and age (Rosser, 2005). Stiffening of joints often leads to unnatural body postures such lumbar lordosis and forward pelvic tilt which can be corrected through engaging in stretching exercises that improve flexibility (Foss and Keteyian, 1998 and McCallister, 2004).

2.8.2.1 Factors affecting flexibility

Age, gender and physical activity are some of the factors that affect flexibility. Doyle (1998) reveals that flexibility improves gradually from 6 to 12 years, then levels off or even declines as one gets older. This implies that physical activities which promote flexibility among growing children are crucial. With respect to gender, Heyward (1998) notes that due to the anatomical differences in the joints, females are more flexible than males. These gender differences are present even during prepubertal and adolescent years. Goon (2006) reveals that girls aged 9 to 12 years had higher sit and reach mean values than boys. High sit and reach values are indicators of good flexibility. Heyward (1998) and ACSM (2005) acknowledge that the type and extent of activities that boys and girls tend to engage in affect their flexibility. According to ACSM (2005), engaging in stretching exercises contributes more to the development and determination of flexibility than gender and age.

2.8.2.2 Measurement of flexibility

A goniometer and a flexometer are some of the common laboratory test instruments that measure flexibility (Heyward, 1998). However, these instruments are expensive and require technical skills (Topendsports, 2008). Rosser (2005) identifies several field tests that have been devised namely, the floor-touch test, forward flexion (toe-touching) test, twist-and-touch test, trunk extension, backward abdominal stretch test and sit-and-reach test. Such tests are affordable, easy to administer and can be applied to both females and males (Rosser, 2005). The AAHPERD (1980) test battery employs a sit-and-reach test to evaluate static flexibility of the lower back and hamstring muscles, because low back

pain is associated with lack of flexibility of these muscles. According to Topendsports (2008), sit-and- reach test is the most commonly used test for flexibility and it provides data that can be used for comparative purposes among different populations. Clarke and Clarke (1987) found a correlation coefficient of 0.86 to 0.87 between this field test and laboratory measures making it a reliable and acceptable measure of flexibility.

Table 2.2 Percentile norms. Ages 6-9 years for sit and reach (cm) for boys and girls (AAHPERD, 1980)

Age	Sex	25^{th} Percentile	50^{th} Percentile
6	Boys	22	26
	Girls	23	27
7	Boys	22	25
	Girls	24	27
8	Boys	22	25
	Girls	23	28
9	Boys	22	25
	Girls	23	28

The table above shows the percentile norms for low back flexibility. An individual is considered to have an acceptable level of flexibility when he or she scores the 50^{th} or above percentile. However, AAHPERD (1980) notes that many boys and girls score below this percentile (23cm). This is because during the pre-adolescent and adolescent growth spurt their legs are proportionately longer than the trunk. This could therefore give misleading information for comparative purposes (AAHPERD, 1980).

2.8.3 Abdominal muscular strength and endurance

Muscular strength is the ability of a muscle or muscle group to develop maximal contractile force against resistance in a single contraction (Heyward, 1998). On the other

hand, muscular endurance is the ability of a muscle or group of muscles to contract repeatedly for a prolonged period of time (Insel and Roth, 1998). Strength and endurance of the abdominal muscles, recommended for a fit person, enhance performance of both daily and most leisure activities, decrease chances of injury and prevent low back pain and poor posture (Doyle, 1998; Insel and Roth, 1998; Fox, 2004 and Topendsports, 2008). Rosser (2005) adds that strong abdominal muscles support abdominal wall, help in correcting the pelvic tilt and support and prevent protrusion of abdominal content. In addition, these muscles provide an equilibrium between pelvis and thorax; and produce resistant force that reduces stress on lumbar-sacral joint and lower thoracic spine (Rosser, 2005). Therefore, abdominal muscular strength and endurance is vital for back support and core stability.

2.8.3.1 Factors affecting muscular strength/endurance

There are several factors that affect this fitness component namely, gender, body composition and age. With respect to gender, Rosser (2005) observes that males are generally stronger than females because of the differences in body composition. The more muscle mass an individual has the stronger his or her abdominal muscles will be. Whilst males have more muscle mass, females possess more body fat and such differences become more pronounced with growth due to hormonal production that leads to secondary male and female characteristics (Fink, Neave and Manning, 2003). However, the gender differences in abdominal strength/endurance exist even during the prepubertal and years. Goon (2006) reports that the Nigerian boys aged 9-12 years had

higher sit up mean values than girls at all ages. High sit up scores are indicators of strong abdominal muscles.

Age is another factor that influences muscular strength/endurance. According to Pate and Shephard (1989), there is a linear and progressive increase in muscular strength in prepubertal boys and girls at all ages which is attributed to the increase in muscle mass as children grow older.

2.8.3.2 Measurement of muscular strength and endurance

Comparatively, muscular strength requires an individual to perform one repetition of a movement, while muscular endurance that requires one to perform a number of repetitions of a movement (Beashel, Sibson and Taylor, 2001). The laboratory measures used in measuring abdominal muscular strength and endurance include dynamometers, cable tensiometers and free weights which are expensive and require technical skill according to Topendsports (2008). Field tests that are inexpensive and easy to administer have been devised. These include callisthenic-type exercises like the pull-up, dip strength and sit-up (Rosser, 2005). The AAHPERD (1980) test battery recommends a sit-up test for measuring abdominal muscular strength and endurance. Clarke and Clarke (1987) found a correlation coefficient of 0.86 to 0.87 between this field test and laboratory measure which makes the test reliable in testing low back flexibility. Moreover, a sit-up test is affordable since it requires only a flat clean cushioned surface, a stop watch, recording sheet and a pen.

The AAHPERD (1980) test recommends that subjects who score below the 50th percentile should improve their abdominal muscular strength and endurance along with low back, hip and hamstring flexibility. Table 2.3 indicates the percentile norms for sit ups for children aged between 6 to 9 years.

Table 2.3 Percentile norms. Ages 6-9 years for sit ups for boys and girls (AAHPERD, 1980)

Age	Sex	25th Percentile	50th Percentile
6	Boys	15	20
	Girls	14	22
7	Boys	19	26
	Girls	20	25
8	Boys	25	30
	Girls	22	29
9	Boys	25	32
	Girls	23	29

2.8.4 Body composition

Body composition is defined as the relative proportion of body fat to lean body tissues or fat free weight. Lean body tissues include water, bone, muscle, skin, blood and other non fat tissues while body fat comprise of the adipose tissue (ACSM, 2005). According to Doyle (1998), a healthy person has a high proportion of lean body tissues (fat free weight) and a low body fat. Such appropriate body composition is important in preventing obesity which results from having excess body fat. According to William, (2002) children who accumulate body fat levels greater than 25 percent for boys and 30 percent for girls are also likely to develop chronic conditions such as high blood pressure. On the contrary, low body fat adversely affects fitness and health of a person (Monyeki et al., 2005). Thus, to achieve health-related fitness status an individual should have a desirable amount of body fat.

2.8.4.1 Factors affecting body composition

Several factors have been identified that determine body composition namely, gender, diet and physical activity. According to Fink, et al (2003), females have more body fat than males because of the testosterone hormone produced from puberty and throughout adulthood in males and this hormone leads to more increases in muscle mass than body fat. However, even in the prepubertal stage girls possess more body fat than boys (Goon, 2006 and Shaw et al, 2007).

With regard to diet, a high fat and high cholesterol diet negatively affects body composition by increasing body fat which may lead to chronic diseases like hypertension and arteriosclerosis (Deckelbaum and Williams, 2005). Lack of adequate physical activity has also been associated with problems in body composition (Payne and Hahn, 2002; Myers 2004 and Prentice, 2006). Davis (2005) conducted a study to examine health-related fitness levels of 516 fifth grade elementary schoolchildren in the North Carolina (USA). Body composition was determined by Body Mass Index (BMI). When data was analysed using Center for Disease Control (CDC) standard measure, it was discovered that half of the children either were overweight or at risk of being overweight. Davis (2005) attributes the findings to many factors including passive behaviours and recommends that children should engage in adequate physical activities as one of the intervention measures. In Kenya, Mallo (2004) also associated obesity among the preadolescents attending private primary schools in Nairobi with lack of physical activity at home and passive indoor games during free time.

2.8.4.2 Measurement of body composition

Several techniques have been used to determine body composition and all of them involve measuring body fat. The most commonly used techniques include under water weighing, bioelectrical impedance and skin fold thickness (Rosser, 2005). Under water or hydrostatic weighing is the most accurate measure of body fat percentage and is described as the "gold standard" (Fahey et al., 2003). It requires multiple trials, complete immersion of the body and measurement of residual volume and the technique relies on Archimedes' Principle of displacement. Its drawbacks include time consuming, expensive and it is contraindicated to children (Goss et al., 2003). Besides, it is difficult to administer since many people are uncomfortable when immersed in water (Payne and Hann, 2002 and The Sports Fitness Advisor, 2007).

Field methods such as Bioelectric Impedance Analysis (BIA), skin fold thickness and Body Mass Index (BMI) have been used in estimating body composition. These methods provide a reasonable estimate of body composition although they are not very accurate (Rowland, 1996). Assessing body fat using BIA has the advantages of taking a short time, being easy to administer and requiring no specialized training (Goss et al., 2003). However, data derived from BIA is affected by hydration status, ambient temperature, food intake and recent exercise and it is not possible to control these variables in either field based or school environment testing (Goss et al., 2003 and Wanjiku, 2008).

The skin-fold technique can also be used in measuring body composition and it measures the thickness of the subcutaneous fat layer (Rosser, 2005). The technique is reliable and

accurate and if handled by a professional tester, its results could be 98 percent accurate (Topendsports, 2008). Skin-fold calipers are also portable and can be used on a large population in a short time (The Sports Fitness Advisor, 2007). The International Society for Advancement of Kinanthropometry (ISAK, 2001) however, criticizes the technique because it causes embarrassment among respondents as it requires them to undress in front of a tester. Secondly, the technique causes discomfort among children as it involves pinching of calipers (ISAK, 2001). This study therefore did not use skin fold measures although it is the one recommended by the AAHPERD (1980) battery.

The Body Mass Index (BMI) is a descriptive and reliable method of determining body composition by assessing body fat. However, according to WHO (1998), the BMI is restricted to identifying individuals with excessive body weight but does not distinguish between muscle weight and weight associated with fat making it therefore an inaccurate measure of body fat. In spite of this limitation, the BMI method is easy to administer, widely used and can used to screen weight categories among children that it can lead to health problems (Monyeki et al., 2005; The Sports Fitness Advisor, 2007 and Shaw et al., 2007). This study therefore employed this method for assessing body fat.

Calculation of the BMI requires that the score obtained from the body weight in kilograms is divided by the square of height in meters (kg/m^2). This score is then plotted on the BMI-for-age growth charts for either girls or boys to obtain a percentile ranking. Growth charts help in categorising the weight status of children as underweight, healthy

or normal weight, overweight or obese. The following are the BMI-for-age weight status categories and the corresponding percentiles ranges according to WHO CDC (2007).

Table 2.4: BMI-for-age weight status (WHO, 2007)

Weight status category	Percentile range
Underweight	Less than the 5th percentile
Healthy (normal) weight	5th percentile to less than the 85th percentile
Overweight	85th to less than 95th percentile
Obese	Equal to or greater than the 95th percentile

WHO (2007) classifies a child as underweight when his or her body weight is below the 5th percentile. A healthy or normal child should have a body weight ranging between the 5th and less than the 85th percentile. An overweight child has a body weight that exceeds the 85th but less than the 95th percentile. A child with the BMI equal or above the 95th percentile is considered obese. Underweight is caused by a child having less than the desirable body fat and this negatively affects his or her health. Similarly, overweight and obesity are a result of having undesirable body composition with higher than normal amount of body fat. Such a condition reduces life expectancy by increasing the risk of coronary artery disease, hypertension, depression, type II diabetes and certain cancers (Hann, 2000 and Toriola, 2002).

Various studies that have been conducted in Africa reveal that there is prevalence of childhood overweight and obesity. Deckelbaum and Williams (2001) report a marked increase of overweight among children aged 6 to 11 years in Morocco, Egypt and in North Africa. Wanjiku (2008) also reveals that childhood obesity and overweight prevail among the school children aged 10 to 15 years in Nairobi Province, Kenya.

On the contrary, several studies have confirmed that underweight cases among school children in Africa exist. Monyeki et al (2004) confirm that there are underweight school children in Ellisras in South Africa. Goon (2006) also revealed cases of underweight among the school children in Makurdi, Nigeria. However, information about the prevalence of these conditions among the school children in Uganda is very limited. Hence there was a gap in information about the weight status of the school children aged 6 to 9 years in Mukono and Wakiso districts which the current study has filled.

2.9 Assessment of physical activity

It is well documented that good dietary habits, adequate rest patterns and engagement in appropriate physical activity lead to health-related physical fitness (Payne and Hann, 2002; Monyeki et al., 2004 and Rosser, 2005). This study however was delimited to assessment of physical activity of pupils as a factor that may influence health-related fitness. Several methods have been devised to help in determining the pattern of an individual's physical activity namely, pedometers, accelerometers and self-administered questionnaire. Pedometers are digital devices that detect steps of an individual by responding to vertical accelerations. Pedometers are commonly used devices for measuring physical activity of different age groups including elementary school children because they are cheap, unobtrusive, accurate and valid (Vincent and Pangrazi, 2002; Schneider, Crouter, Lukajic, and Bassett, 2003 and Le Masurier and Tudor-Locke, 2003 and Le Masurier 2004). However, these devices are limited in their usefulness since they measure only ambulatory movements and are inaccurate in detecting some physical activity like bicycling, climbing and swimming that are common to children (Vincent and

Pangrazi, 2002). In addition, pedometers do not assess the intensity of an activity (Corbin and Pangrazi, 2004).

Accelerometers, on the other hand, detect movement in one or more directions, up and down, side to side, and /or forward and backward (Corbin and Pangrazi, 2004). This renders them more accurate in measuring physical activity than the pedometers (Corbin and Pangrazi, 2004). However, the study neither used pedometers or accelerometers in determining the physical activity levels of the pupils because they were not readily available in Uganda.

Questionnaires were used for this study to determine physical activity of the pupils. Pupils in day schools provided information about how they got to and from school and the activities they commonly engaged in during the day outside classroom time. Welk, Corbin and Dale (2000) note the inaccurate recalling of all the activities subjects especially children may have done as a limitation of obtaining data using this method. Despite this limitation, several researchers have used the self-administered questionnaire to establish the level of physical activity in children. For instance, in 2002 in United States, the Youth Media Campaign Longitudinal Study (YMCLS) of the Center for Disease Control (CDC) used questionnaires and interviews that were administered to parents and children to gather data on participation in organized and free time physical activity of children aged 9-13 years. Secondly, the research obtained data that relates to common activities that pupils did which formed their habitual physical activity and were not difficult for them to remember. Moreover, some information on physical activities of

pupils was obtained from the sets of questionnaire administered to the directors of studies and the matrons.

There is limited data available on the level of engagement in physical activity among pupils in Wakiso and Mukono districts, the current study therefore aimed at filling this gap in information.

2.10 Related studies

Many studies have been carried out to assess on physical fitness of children in developed and developing world. In Africa, Goon (2006) evaluated physical fitness and body composition of 2015 school children aged 9 to 12 years in Makurdi, Nigeria. Goon (2006) used several techniques in determining body composition including BMI. The findings of the study reveal that girls had significantly higher body mass, sum of skin fold and percent body fat than boys. In relation to muscular strength and cardiovascular endurance, the boys had significantly higher push ups and maximal oxygen uptake than girls respectively. Goon (2006) also reports that the Nigerian children demonstrated poor physical fitness performance when compared with their peers in other developed countries.

Several studies have been conducted to investigate on physical activity and health-related fitness of school children. Sallis, McKenzie and Alcarazje (1993) conducted a cross sectional survey and correlational analysis to examine the relationship between habitual physical activity and components of health-related fitness using 528 boys and 254 girls in

schools in sub urban southern California City. Physical activity was monitored by accelerometers, parent report and child self-reports of physical activity index that included weekday activities, weekend activities and summer involvement in activity classes and youth sports. The index of habitual physical activity was examined in relation to health-related fitness components using 1mile run, skin fold tests, pull-ups and sit and reach tests. The study reveals that children who engaged more in physical activity had better health-related fitness test scores compared to those who were inactive. Sallis, et al (1993) conclude that engagement in a sufficient variety of activities enhance multiple components of health-related fitness.

Ekeland, et al (1999) conducted a review to investigate whether the amount of physical activity and level of physical fitness had changed over time among the Norwegian children and youth. The study involved 5 repeated cross-sectional studies of healthy children from a period of 1950 to 1997 using fitness tests and self-reported physical activity. The study reveals that there was decline in the level of physical fitness and physical activity and recommended a need for intervention in order to reverse the trend.

In Africa, Onywera, et al (2010) assessed physical activity levels of 179 Kenyan children aged 9 to 12 years. The study used pedometers and questionnaires administered to parents. Parents provided data about perception of their children's physical activity patterns. It was found that over 50 percent of the urban children spend over two hours on watching TV, DVDs and videos everyday an indicator that children's physical activity patterns are in transition towards sedentary living which eventually will impact

negatively on their health-related fitness. Onywera, et al (2010) recommend that urban children should minimise physical inactivity as it is likely to cause serious health problems.

Many studies conducted in developed and developing countries have attributed schooling and engagement in passive behaviours to the declining levels of physical fitness in school children. Guthold, et al (2009) carried out a comparative study on physical inactivity and sedentary behaviour of 96,072 school children in 24 countries including Uganda. The study used a set of questionnaires designed to gather data about the physical activities children engage in including walking or biking to and from school and time spent doing sitting activities. It was found that in more than half of the countries over a third of students spent three or more hours a day on sedentary activities excluding the hours spent sitting at school or doing homework. This is an indicator of high prevalence of physical inactivity among schoolchildren. Guthold, et al (2009) recommend that efforts should be made to increase levels of physical activity among school children to enable them meet the public health recommendations.

Other studies have been done to establish the prevalence of health-related fitness problems among children. Most of these studies have concentrated on problems related to body composition. Brunet, Chaput and Tremblay (2007) carried out a cross sectional study to evaluate fitness and body composition of 1140 children aged 7 to 10 years in Canada. The study used BMI and waist circumference (WC) measures and their relation to performance in physical fitness tests. It was revealed that a negative correlation existed

between BMI and WC and performance in all physical fitness tests. This suggests that inappropriate body composition, reflected in high body fat, negatively affects the physical fitness status.

Monyeki, et al (2005) also determined the relationship between body composition characteristics and physical fitness in undernourished rural primary school children in Ellisras, South Africa. A cross sectional study using 462 and 393 girls aged 7-14 years was conducted. Monyeki et al (2005) report that children with high BMI values performed poorly in cardiovascular endurance test. Secondly, body composition in undernourished children was significantly related to physical fitness.

In Kenya, Mallo (2004) carried out a study to establish the prevalence of obesity using BMI on 120 schoolchildren aged 10 to 13 years in Nairobi. The study reports prevalence of obesity among school children and attributes it to physical inactivity among other factors.

All the studies presented provide evidence that there is prevalence of physical inactivity in both developed and developing countries which has a negative influence on health-related physical fitness. However, there is little information on the health related fitness status of pupils in Uganda and their physical activity patterns. The current study therefore aimed at filling this gap in information by establishing the fitness status and providing data on the level of engagement in physical activity among the pupils.

2.11 Summary

The literature reviewed in this study shows that the health-related physical fitness status of children affects their physical and mental health as well as their level of performance in daily activities. There is evidence that there are children even in Africa with poor health related fitness. The literature also reveals that there is a positive correlation between physical activity levels and health-related fitness and points out that the physical activity patterns in some developed and developing countries have shifted towards passive activities. The literature further indicates that modern lifestyle that includes formal schooling and engagement in passive activities during free time has negatively impacted on children's health-related fitness and this has posed a global concern. The call for all countries to provide interventions on 'untrack' sedentary behaviours in children has also been well documented. However, there is limited information on the health related status of pupils in Uganda and their patterns of physical activity hence the current study was conducted to fill this gap in information.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Introduction

This chapter focused on description of the procedures used in carrying out the study. It covered the Research design, Variables, Location of the study, Target population, Sampling technique and sample size, Research instruments, Pre testing, Validity, Reliability, Data collection procedures and Logistical and ethical considerations.

3.2 Research design

A cross-sectional survey research design was used for the study. The objective of the study was to assess the current status of a large population of pupils sampled from different strata in terms of gender and type of school. The research was conducted in a relatively short period of time and did not involve manipulation of variables. All these factors made this research design the most appropriate. The study used both the quantitative and qualitative approaches. The quantitative approach was applied to establish the fitness status of the pupils and make comparison with the percentile norms and this involved using numerical figures. The qualitative approach was used to describe the pupils' level of engagement in physical activities (Oso and Onen, 2005).

3.3 Variables

Independent variables in the study included age, gender and type of school. Dependent variables included cardiovascular endurance, body composition, low back flexibility and

abdominal muscular strength/endurance all of which form health-related fitness components.

3.4 Location of the study

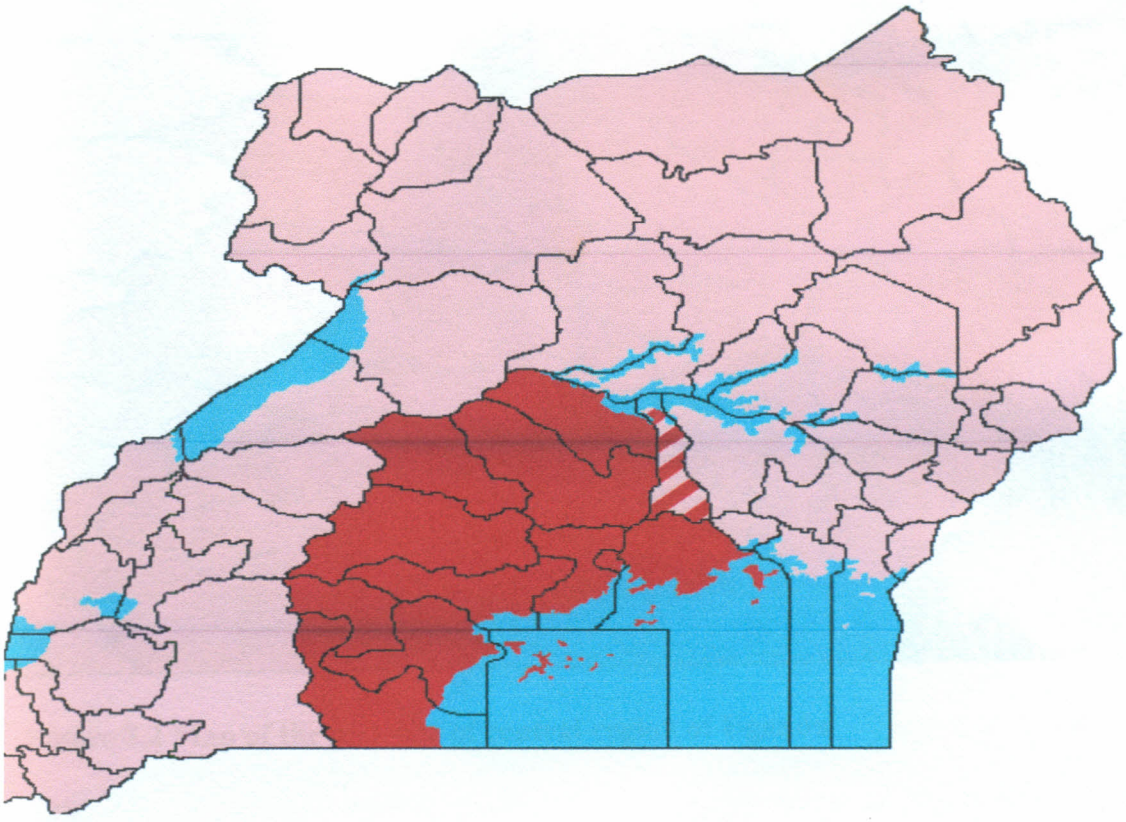


Figure 3.1 Map of Uganda showing the central region in dark red.

Uganda is a land locked country found in East Africa. It is made up of four regions namely the central (which forms the kingdom of Buganda), the eastern, the northern and the western. The study area comprised of the central region which is the most urbanised area in Uganda and within which Kampala the capital city is located (Wikipedia, 2010). The boundaries of the central region in which Wakiso and Mukono districts are located include Lake Victoria on the south, River Nile on the east, Lake Kyoga on the North and

River Kafu on the northwest. The Baganda people predominantly inhabit the area with a good number of migrants. The major language spoken is Luganda although the official language is English (Wikipedia, 2010).

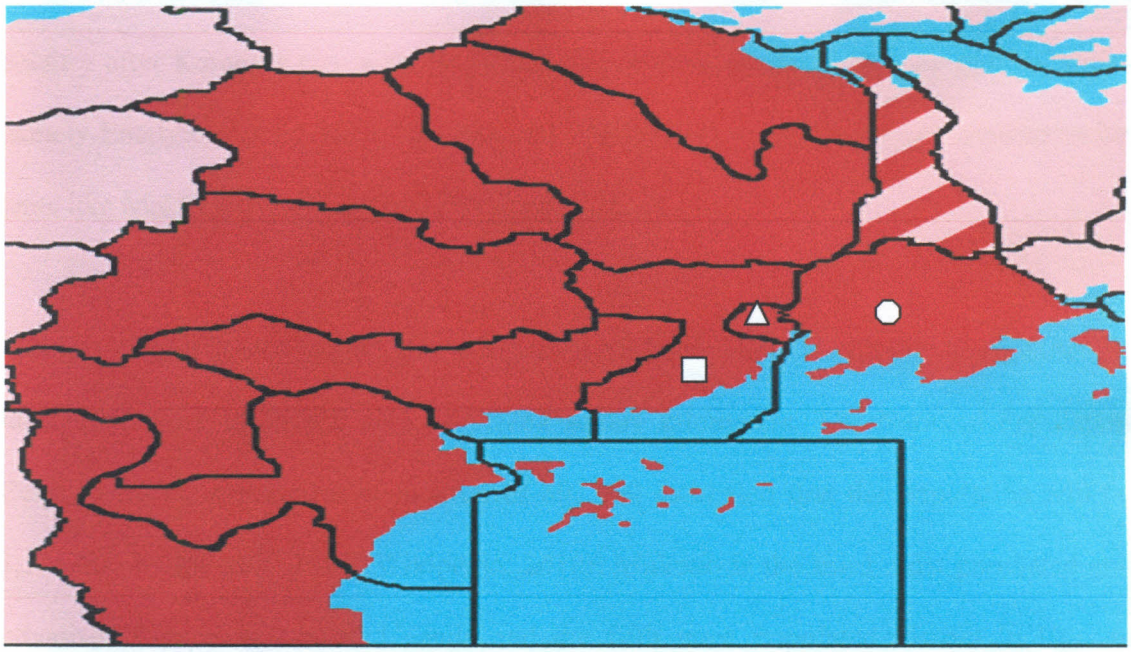


Figure 3.2 Map of the districts of central region of Uganda

Key

Wakiso

Kampala

Mukono

Wakiso district is named after Wakiso town where the headquarters of the district is located. The total land area of Wakiso district is 2,704 square kilometers with a population of 907, 988. Children below 18 years make up 53 percent of the total

population according to the National Population Census of 2002. The population within the district is fast growing and it was estimated that the population will be 1,310,100 by the 2010 (Wikipedia, 2010). It is the second most populated and urbanised district in the country after Kampala city with 16 administrative units of which five are municipalities namely Entebbe, Kakiri, Kira, Nansana and Wakiso. There are also major administrative units like Makindye and Nabweru (Wikipedia, 2010).

Mukono district is also named after a big town Mukono where the district headquarters is located. It has a total land area of 11,764 square kilometers. The National Population Census of 2002 reported a population of 807,900 estimated that the population will be 1,114,300 by the year 2010 (Wikipedia, 2010). Mukono is the third most populated and urbanised district in central Uganda and the fifth most populated district in Uganda comprising of four municipalities namely, Lugazi, Mukono, Njeru and Nkokojeru (Wikipedia, 2010). Nkokonjeru municipality is not as urbanised as the other three municipalities and therefore was not included in the study.

3.5 Target population

The target population comprised of pupils in 78 urban day primary schools and 20 boarding schools found in Wakiso and Mukono districts making a total of 102 schools (MOES, 2006). It is estimated that each school had about 250 pupils ranging between 6 and 9 years. Thus the target population was 25,500 pupils.

3.6 Sampling technique and sample size

Purposive sampling was done to select only schools that had standard, demarcated, leveled and green 400m track fields. Purposive sampling was also done to select schools in the major urban areas of the two districts. The urban municipalities of Mukono are Mukono, Njeru and Lugazi. The most urban municipalities of Wakiso include Entebbe, Kira and Nansana. Wakiso district has also major administrative centres that are shared with Kampala district namely Makindye and Nabweru. Therefore, a total of six municipalities and two administrative centres were selected for the study. Quota sampling was then applied to select one private and one public day school in each of these municipalities and the two administrative centres making a total 16 selected urban day schools. For boarding schools, stratified random sampling technique was applied to select one girls' and one boys' school in each district making a total of four boarding schools. A total of 20 day and boarding schools were thus selected for the study.

Thereafter, stratified random sampling was used for each of the 20 selected schools to sample participants according to age and gender. In each school 100 boys and 100 girls were selected. On the basis of age, 25 boys and 25 girls were selected for each age category of 6, 7, 8, and 9 years from each school. Therefore, four thousand (4,000) pupils formed the sample as shown in table 3.1.

Table 3.1 Sample size

	Boys				Girls				No. of schools	Total
Years	6	7	8	9	6	7	8	9		
Day	25	25	25	25	25	25	25	25	16	3200
Boarding	25	25	25	25	25	25	25	25	4	800
Matrons										10
Directors of studies										20
Total										**4030**

All the matrons in charge of pupils in primary one to primary three in boarding schools where pupils of the 6 to 9 year old age bracket are were purposively selected. In addition, all directors of studies in all the selected schools were purposively selected for the study.

3.7 Research instruments

3.7.1 The fitness performance assessment chart and Data entry form

The researcher used a modified Eureka Sport Participant Information form to construct a Fitness performance assessment chart and data entry form (Appendices I and III). The chart was used to record information on demographic data and the physical activities pupils engaged in during their free time (Appendix I). Data on the demographic and health information of the pupils was gathered from the school records and recorded in section A of Appendix I. The data entry form was used to record the fitness test scores of the pupils for each variable (Appendix III). AAHPERD (1980) and WHO (2007) CDC-BMI percentiles for age-sex were used to determine the health-related fitness status of the pupils.

3.7.2 Questionnaires schedules

Two sets of structured questionnaires were designed for the study. One set of questionnaires sought data from matrons on how pupils in boarding schools spent their time before and after school as well as during weekends (Appendix IV). Another set of questionnaires basically sought information from the directors of studies on what pupils did during school time (Appendix V).

3.7.3 Weight

Body weight was determined using the CAMRY large floor digital bathroom scales (Long bang machinery co., China) to the nearest 0.5kilograms. Each pupil stood on the scale barefoot wearing only sports attire. The researchers made sure the pupil being tested made minimal or no movements with the hands kept by the side and the head erect. The weight was taken and recorded on the data entry form.

3.7.4 Height

Height was measured to the nearest 0.5 centimeter then converted to meters by dividing the values by 100 using an Oxford measuring tape. Every pupil stood barefoot against a stick on which the measuring tape was taped with his or her feet parallel to each other. The researcher made sure that the head was erect and the heels, buttocks and shoulders were touching the stick which was placed against a wall. The steel edge of the measuring tape was taped on the stick. The researcher held the chin of the pupil up to ensure that the position of the chin appeared perpendicular to the measuring tape. The top most part of

the pupil was determined using a ruler that touched the head and the measuring tape. The reading was taken and recorded on the data entry form.

3.7.5 BMI

Body Mass Index (BMI) is a value that is obtained from weight in kilograms divided by the square of height in meters (kg/m^2). After calculating the BMI, the score was plotted on the WHO CDC-BMI-for-age growth charts of 2007 for either girls or boys to obtain a percentile ranking. The standards for weight status categories presented in table 2.4 were used to determine the weight status of each pupil.

3.8 Pre testing

The fitness performance assessment chart and the two sets of questionnaires were pre tested using one day and one boarding primary school that were situated within the study area but were not part of the sampled schools. This helped the research assistants in practicing the measurement of various variables and getting acquainted with the whole testing process. Pre testing also helped in the modification and determination of the validity and reliability of the research instruments.

3.9.1 Validity

To determine the validity of the instruments the researcher used experts in the then Department of Exercise, Recreation and Sports Science, Kenyatta University. The content validity index (CVI) of 0.8 was obtained which is acceptable according to Oso

and Onen (2005). Their comments and suggestions were also incorporated in the final instruments.

3.9.2 Reliability

Topendsports (2008) lists several factors that need to be observed to ensure reliability of the test instruments. These include equipment error, variability in environmental conditions and or surfaces, use of skilled testers and testing sequence. To ensure that errors caused by these factors are avoided the researcher did the following. First, six students and four members of staff in the Sports Science department, Kyambogo University were recruited as research assistants. These were subjected to rigorous training to equip them with the necessary research skills. With respect to equipment error, the same equipment for anthropometric measurements were used in all schools; that is CAMRY digital bathroom scales and the Oxford measuring tapes for measuring weight and height respectively. In addition, test-retest reliability was conducted where measurements of 15 pupils were taken twice and the results recorded. When the results were computed a reliability coefficient of 0.96 was obtained which fall within the acceptable range according to Oso and Onen (2005).

All testing sessions were carried out in the morning beginning at 7.00 and 7.30 am for boarding and day schools respectively to ensure that there was no variability in environmental conditions. Secondly, at such a time the weather condition was favourable and not hot to tire the pupils easily. For proper testing of the cardiovascular endurance fitness, only standard demarcated and leveled 400m track fields with well maintained

green grass surfaces were used. The tests followed the same sequence throughout the schools where the study was conducted. The researcher also made sure that activities were organized in such a way that they do not tire the pupils. Proper instructions and demonstrations were given before any test was conducted.

3.10 Data collection techniques

An arranged visit was done in the sampled schools to help in the preparation as well as setting dates and time for the testing process. The visits aimed at sensitizing and inducting the school administrators about the importance of the research and the testing procedure. On the visiting day, the researcher also obtained school records and used the information therein to determine where the pupils lived and their medical condition. The data so obtained was filled in section A of fitness performance assessment chart (Appendix I). Pupils with chronic illnesses were excluded from the study. The researchers then applied stratified sampling to select pupils according to age and gender from the lists of pupils obtained from each of the selected school. Two lists for each age category according to gender were generated. From these lists the researcher then assigned numbers from 001 to 100 starting from the list of boys aged 6 years up to the list of girls aged 9 years. That is, 25 aged 6, 25 aged 7, 25 aged 8 and 25 aged 9 years for both boys and girls in each school making a total of 200 in each of the selected mixed school. For single sex boarding schools there were four lists generated according to age category and assignment of numbers was done starting from 001 to 100. That is, the first 50 aged 6, second 50 aged 7, third 50 aged 8 and forth 50 aged 9 years.

On the scheduled day of testing, sampled pupils who were not well and those on medication were not involved in the study. The testing process followed this format: all respondents were requested to wear sports attire and empty their bowels before they received an identification number. Instructions and proper demonstration were given to the pupils before taking the anthropometric measures and conducting a test for each fitness component. The detailed procedure for testing each fitness component is shown in appendix II. On that same day the researcher administered the questionnaire for the matrons and directors of studies.

Below is the sequence of the test administration.

3.10.1 Body composition

The anthropometric measures for height and weight of each pupil was taken and recorded in the data entry form (see Appendix III). Then the researchers obtained and recorded responses from each pupil about the physical activities done before, during and after school (section B of Appendix I).

A general warm up session was then conducted.

3.10.2 Cardiovascular endurance

Every member of the research team was assigned a number of pupils and was to record the distance covered by each pupil. Pupils were made to stand on the starting point of the demarcated 400m track field. Upon blowing the whistle each pupil ran on the field for nine minutes. As pupils ran they were encouraged by words like "keep on" so that they neither sit nor give up during the testing process although walking was allowed. At the

ninth minute the whistle was blown and the pupils had to remain at their respective place until the distance was recorded. The test results were recorded in meters in the data entry form (Appendix III). Later the results were converted to yards -1 yard is equivalent to 0.836 metres.

3.10.3 Low back flexibility

A sit-and-reach test was used to test this fitness component. The pupil was given the three trials and the greatest stretch that lasted for 2 seconds with the pupil leaning forward was recorded in the data entry form (Appendix III).

3.10.4 Abdominal muscular strength/endurance

Each pupil was required to perform sit-ups for one minute. Every researcher had one pupil at a time to test and when the whistle was blown to start the testing, only correctly performed sit-ups were recorded at the end of one minute (Appendix II).

3.11 Data analysis and presentation

Descriptive statistical techniques namely, frequencies, percentages, mean and standard deviation were used to summarise the data obtained from the tests and determine the health-related fitness status of the pupils. Analysis of Variance (ANOVA) at $p \leq 0.05$ level of significance was used to test the hypotheses and establish whether there were any differences between pupils in day and boarding schools as well as differences between girls and boys with respect to each of the health-related fitness component. The statistical

analysis was done using the Statistical Package for Social Sciences (SPSS) version 15 and the results were then presented in table form.

Data obtained from the matrons and directors of studies was summarised using descriptive statistical techniques namely the frequencies and percentages. The data relating to proportion of time and type of physical activities pupils engaged in during school time was provided by the directors of studies. The matrons gave information about what the pupils in boarding schools do outside school time. Data obtained from the pupils in day schools on how they get to and from school as well as the physical activities they engaged in at school during free time and at home were also summarised using frequencies and percentages. This data was also presented in pie-charts and bar graphs.

3.12 Logistical and ethical considerations

A letter to introduce the researcher to relevant authorities in the Ministry of Education and sampled schools was obtained from the University, thus upholding ethical requirements of the study needed before conducting the study (Appendix VI). A consent letter was designed which was signed by the head teachers who allowed the study to be conducted in their respective schools (Appendix V111). The researcher sensitized and inducted the school administrators about the importance of research and test procedure. Information about the duration and type of activities required of the pupils was also given.

The study did not include pupils with chronic illness and those who were ill or on medication at the time of testing. The pupils who participated in the study were informed

of what they were expected to do before the testing was done. All the pupils who did not want to participate were exempted from the study. The researcher gave an identification number to each pupil and refrained from revealing the names of participating schools to ensure uttermost confidentiality.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

The purpose of the study was to assess the health-related fitness status of primary school pupils aged 6 to 9 years in Mukono and Wakiso districts. The assessment was done on cardiovascular endurance, body composition, low back flexibility, abdominal muscular strength/endurance using the 9-minute run/walk, the BMI, the sit and reach and the sit-up tests respectively. The study also established the common physical activities pupils did that may affect their fitness status. To obtain the desired goals, four research objectives were formulated namely:

i) To determine the health- related fitness status of pupils aged between 6 and 9 years using the AAHPERD (1980) percentile norms for cardiovascular endurance, low back flexibility and abdominal muscular strength/endurance and the WHO (2007) CDC age-sex specific BMI percentiles for body composition.

ii) To establish if there were any significant differences in the health-related fitness status between day and boarding primary school pupils.

iii) To establish if there were any significant differences in the health-related fitness status between boys and girls.

iv) To determine the level of pupils' involvement in various physical activities.

To attain these objectives hypotheses and research questions were formulated. To establish if there were significant differences among the pupils in day and boarding schools as well as the boys and girls, the hypotheses were tested using one way-ANOVA.

All hypotheses were either accepted or rejected at $p \leq 0.05$ alpha level. In addition, the research questions were analysed using descriptive statistics namely, frequencies, percentages, means and standard deviations.

4.2 Presentation of the findings of the study

The study findings are presented, discussed and analysed in order of the set objectives.

4.2.1 Demographic information of pupils in the study

The sample for the study was 4000 pupils but the actual number of pupils that participated in the study was 1929. This was attributed to the following factors. First, in three day schools many pupils did not turn up on the scheduled day for conducting the research because they defaulted on tuition. Secondly, in Wakiso district there was an outbreak of malaria and flu that led to many pupils failing to attend school or not feeling well enough to participate in the study. Some pupils in day schools arrived late after 7.30 am which was the scheduled time to begin the testing and were not allowed to participate in the study. Lastly, due to administrative procedures, three day schools did not allow the research to be conducted although prior visits and bookings had been made.

4.2.2 Demographic characteristics of pupils by district

The study involved 924 (47.9%) pupils from Mukono district and 1005 (52.1%) pupils from Wakiso district (Table 4.1). There were more day schools selected from Wakiso because it has more urban municipalities than Mukono district.

4.2.3 Demographic characteristics of pupils by age

Table 4.1 indicates that a total of 1929 pupils ranging from 6 to 9 years participated in the study that was conducted from June 2008 to February 2009. The age of the participants was established using the school records and were as follows: 359 (18.6%) pupils aged 6 years, 492 (25.5%) aged 7 years; 556 (28.8%) were 8 years and 522 (27.1%) were 9 years old.

Table 4.1 Demographic characteristics of the pupils

	MUKONO				WAKISO				
AGE (yrs)	DAY		BOARDING		DAY		BOARDING		Total
	Male	Female	Male	Female	Male	Female	Male	Female	
6	32	33	22	67	51	59	25	70	359
7	58	56	63	69	59	61	63	63	492
8	70	83	65	72	56	56	78	76	556
9	52	72	60	50	63	61	84	80	522
Total	212	244	210	258	229	237	250	289	1929
	456		468		466		539		
	924 (47.9%)				1005 (52.1%)				

4.2.4 Demographic characteristics of pupils by gender

The study involved 901 (46.7%) boys and 1028 (53.3%) girls as shown in the table 4.1. There were more girls than boys because the sampled girls' boarding schools allowed more pupils to participate in the study than the boys' schools.

4.2.5 Demographic characteristics of pupils by type of school

The study involved 1007 (52.2%) pupils in boarding schools and 922 (47.8%) in day schools. The number of pupils that participated in day schools was affected by the reasons earlier mentioned in subsection 4.2.1.

4.3 The health-related fitness status of pupils

The following section presents findings on health-related fitness status of the pupils. The differences among pupils with respect to gender and type of school are also discussed.

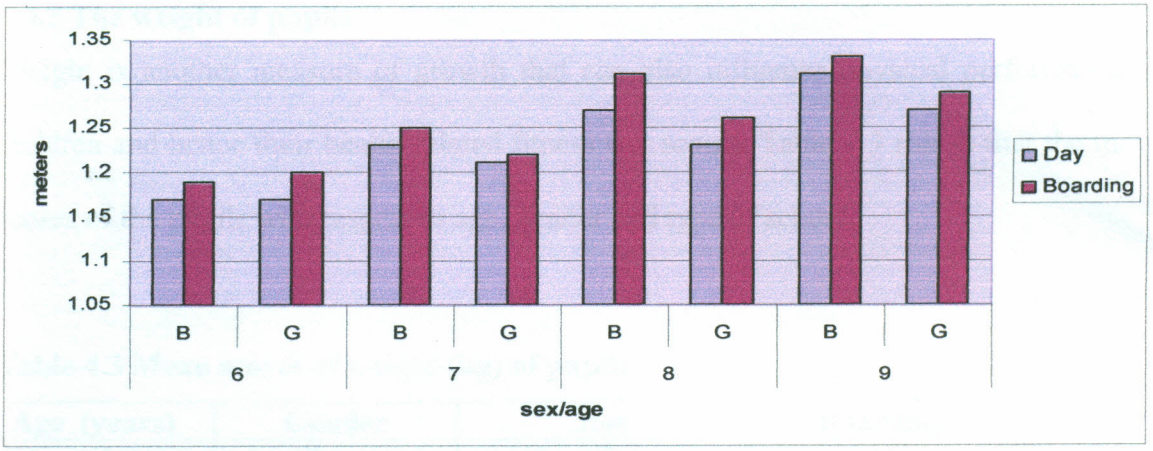
4.3.1 The height of pupils

According to Malina et al (2004), performance in physical activities of children within this age bracket depends partly on their growth which is reflected in their height. Therefore, the height of the pupils contributed to their health-related fitness test scores.

Table 4.2 Mean scores of height (meters) of pupils

Age (years)	Gender	Day	Boarding
6	Boys	1.17	1.18
	Girls	1.17	1.20
7	Boys	1.23	1.25
	Girls	1.21	1.22
8	Boys	1.26	1.31
	Girls	1.22	1.26
9	Boys	1.31	1.33
	Girls	1.26	1.28

Table 4.2 shows the mean height of boys and girls of age categories 6, 7, 8 and 9 years in day and boarding schools. It is observed that the increase in chronological age is accompanied by a corresponding increase in height which is in accordance to what Malina et al (2004) note. The data in the table is presented in figure 4.1.



B - Boys G – Girls

Figure 4.1: Mean scores of height of pupils

Figure 4.1 reveals that there is a gradual and linear increase in height in both boys and girls from the age of six to nine years. In addition, all boys were taller than their female counterparts within the same age category except for the six-year age category. The figure also indicates that for all the age categories, the pupils in boarding schools were taller than their counterparts in day schools.

The boys had a higher mean height of 1.27m and with a standard deviation of 0.08 compared to the girls (1.24±0.08). Similarly, pupils in boarding schools had a higher mean with a standard deviation of (1.27 ± 0.08) than those in day schools (1.23± 0.08). This may be because pupils in boarding schools are provided with regular meals which promote growth. Unfortunately, lunch is not guaranteed in some day schools especially in the public schools commonly known as Universal Primary Education (UPE) schools. The government exempted parents from paying for meals and this has resulted in many pupils remaining hungry during school time, moreover some come to school without breakfast (Kyeyune, 2009).

4.3.2 The weight of pupils

Weight is another measure of growth that can also influence physical performance in children and hence their health-related fitness test scores. Table 4.3 shows that the mean scores of the pupils with respect to age, gender and type of school.

Table 4.3 Mean scores of weight (kg) of pupils

Age (years)	Gender	Day	Boarding
6	Boys	23	25
	Girls	22	25
7	Boys	24.9	26.5
	Girls	24.2	25.5
8	Boys	26.2	28
	Girls	25.8	29
9	Boys	28	34
	Girls	28	30

The table demonstrates that the increase in age is accompanied by an increase in weight in both boys and girls. Malina et al (2004) attribute this to the increase in lean mass, fat tissues and other body organs. Data in this table is presented in figure 4.2 below.

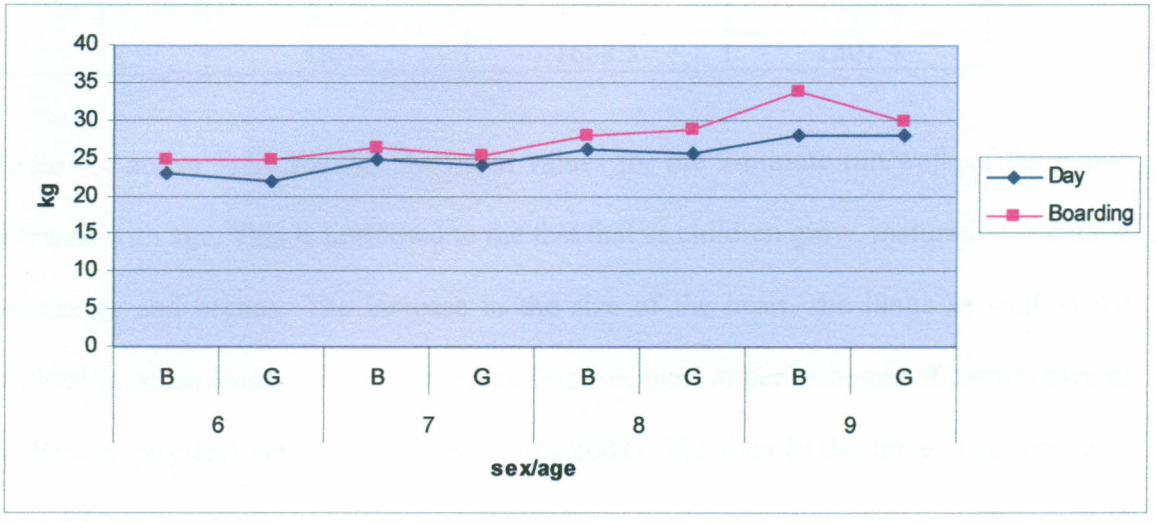


Figure 4. 2 Mean scores of weight of pupils

Pupils in boarding schools weighed heavier than their counterparts in day schools in all age categories (Figure 4.2). Availability of regular meals for boarders, as explained earlier, may partly account for such differences. For pupils in day schools, boys weighed heavier than girls in all age categories except for 9 year old category.

4.3.3 The cardiovascular endurance status of pupils

The cardiovascular endurance of the pupils was measured using the 9-minute run/walk. The mean distance scores covered by the pupils in the 9 minutes are presented according to age, gender and type of school in table 4.4 below.

Table 4.4 Mean values for the 9-minute run/walk (yards) for pupils

Age (years)	Gender	Day	Boarding
6	Boys	1408.2	1308.6
	Girls	1289.0	1234.7
7	Boys	1468.9	1389.7
	Girls	1434.8	1416.3
8	Boys	1714.6	1680.3
	Girls	1478.0	1425.6
9	Boys	1784.9	1777.3
	Girls	1688.3	1507.4

Table 4.4 above indicates that the mean values for the 9-minute run/walk of the pupils increase with age. This is attributed to the fact that as children grow, maturation occurs in all tissues and organs. The increase in the size of the heart, the lungs as well as the skeletal muscles leads to a corresponding improvement in performance of cardiovascular endurance physical activities (Malina et al., 2004). The data in the table is presented in figure 4.3.

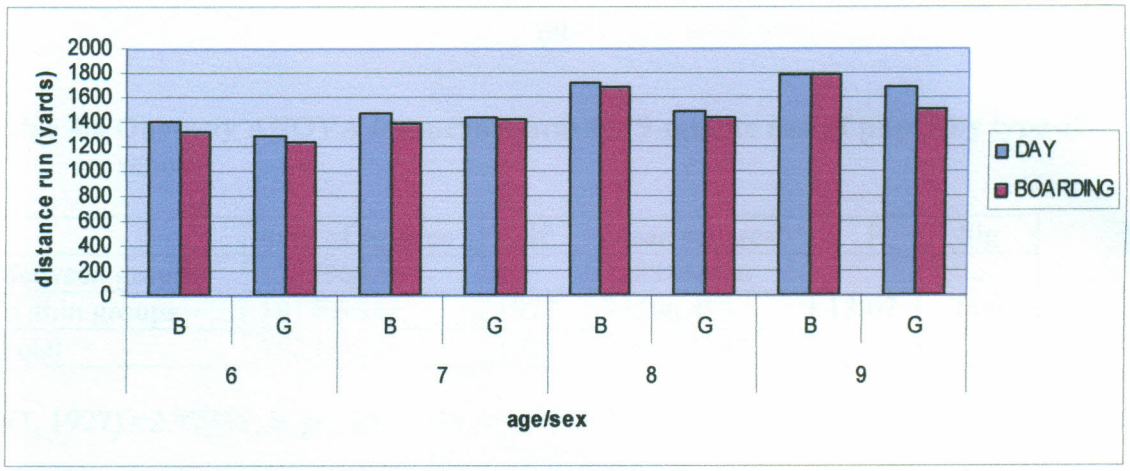


Figure 4.3 Mean scores for the 9-minute distance run/walk of pupils

Table 4.4 and figure 4.3 indicate a linear and progressive increase in the mean values for each age category in both boys and girls. In addition, it is shown that boys in day schools had higher mean values for the 9-minute run/walk than their counterparts in boarding schools. Similarly, girls in day schools had higher mean values than those in boarding schools. With respect to gender, all boys for each age category had greater mean values than the girls. Higher mean values indicate better cardiovascular endurance fitness.

Table 4.5 Means and standard deviations scores of 9-minute run of pupils by type of school

Type of school	Number	Mean	sd
Day	922	1538.02	309.09
Boarding	1007	1486.27	305.22

Table 4.5 illustrates that day scholars recorded higher mean scores and standard deviation (1538.02±309.09) for the 9-minute run/walk than boarders (1486.27±305.22). To determine if the differences in mean scores were significant, one way ANOVA was computed and results are presented in table 4.6.

Table 4.6 One-way ANOVA for mean scores for 9-minute run of pupils by type of school

	Sum of squares	df	Mean squares	F	Sig
Between groups	1288868.96	1	1288868.96	13.67	.000
Within groups	181709342	1927	94296.493		
Total	182998211	1928	94916.0845		

F (1, 1927) =2.77351, at p<. 05

As shown in Table 4.6, the results were F (1, 1927) =13.67, at p<0.05 indicating that differences in mean scores amongst day and boarding pupils were significant. Therefore, the null hypothesis was rejected at 0.05 level of significance which means that there was a significant difference in the cardiovascular endurance between day and boarding pupils. This could be attributed to the majority of pupils in day schools walking to and from school. Such exercises like brisk walking and running develop, improve and maintain their cardio-vascular endurance (Cherubini, 2008). On the contrary, their counterparts in boarding schools may not be having enough of such exercise.

Table 4.7 Means and standard deviations scores of 9-minute run of pupils by gender

Gender	N	Mean	sd
Boys	901	1591.21	356.76
Girls	1028	1440.64	236.72

Table 4.7 indicates that there were gender differences in the scores where boys recorded a higher mean and standard deviation for the 9-minute run scores (1591.29±356.76) than the girls (1440.64±236.72). This finding concurs with what Armstrong and Welsman (2000) and Goon (2006) reported. These authors attribute the gender differences to the physical activity levels where boys tend to engage in more vigorous play activities than girls. Such activities help in the development of their cardiovascular endurance. Rowland,

Goff, Martel and Ferrone (2000) also point out that cardiac functional capacity and body composition also account for the differences in cardiovascular endurance (VO_2max) between prepubertal boys and girls. The cardiac functional capacity relates to the relatively larger heart size in boys that ensures higher stroke volume which positively affects performance in cardiovascular endurance activities (Turley and Wilmore, 1997). With respect to body composition, since the boys have relatively more lean mass they produce more energy to sustain endurance activities than the girls who have comparatively more body fat than lean mass (Turley and Wilmore, 1997 and Malina et al., 2004).

To determine if the differences in the mean scores were significant, one way ANOVA was computed and the results are presented in table 4.8 below.

Table 4.8 one-way ANOVA for mean scores for 9-minute run/walk of pupils by gender

	Sum of squares	df	Mean squares	F	Sig
Between groups	10897709.7	1	10897709.7	122.02	.000
Within groups	172100501	1927	89310.0845		
Total	182998211	1928			

F (1, 1927) =2.77351, at p<. 05

As shown in Table 4.8, the results were F (1, 1927) = 122.02, at p<.05 indicating that differences in mean scores amongst the boys and girls were significant. Thus the null hypothesis was rejected at 0.05 level of significance implying that there was a significant difference in cardiovascular endurance between boys and girls. This finding is in agreement with the finding of Goon (2006) who reported a significant difference in cardiovascular endurance (VO_{2max}) between 9 to 12 year old male and female school children in Makurdi, Nigeria. Armstrong and Welsman (2000) also found significant

differences in cardiovascular endurance between pre pubertal boys and girls and attributed them to boys having more body lean mass than girls and thus performing better in endurance activities. Armstrong and Welsman (2000) further related the significantly higher VO_{2max} of boys to engagement in more vigorous habitual physical activity than girls. This study also found that boys were generally more involved in vigorous physical aerobic activities than girls as discussed in sub section 4.5.5. Trost, et al (2002) and Crespo (2004) confirm that engagement in moderate-vigorous physical activity improves the cardiovascular fitness.

To determine cardiovascular endurance status of pupils, the individual scores were categorised according to the percentile norms set by AAHPERD (1980). The findings obtained are presented and discussed below.

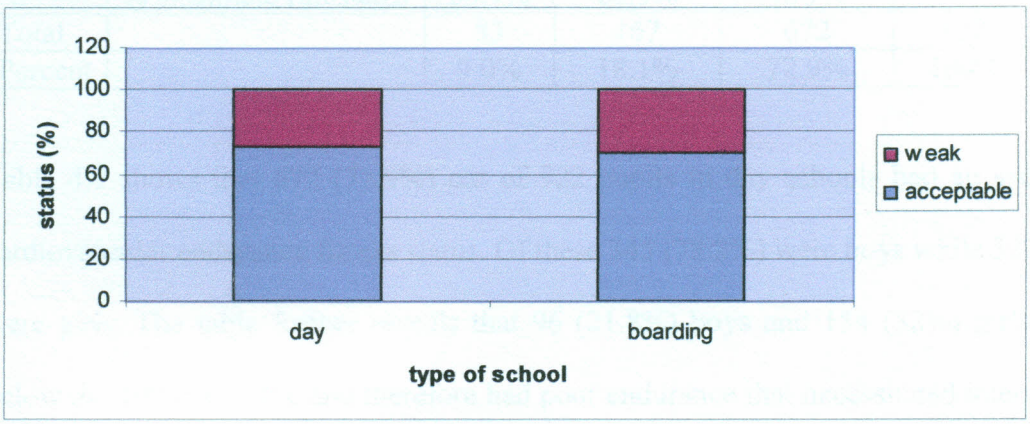


Figure 4.4 Cardiovascular endurance status of pupils

Figure 4.4 indicates that majority of the pupils in both day (72.9%) and boarding schools (69.5%) had an acceptable level of cardiovascular endurance. This implies that most pupils engage in adequate physical activities that develop their cardiovascular endurance. On the contrary, there were pupils in both types of schools who were categorised as having weak cardiovascular endurance fitness. Pupils in this category were more in

boarding than day schools. This may be because most pupils in day schools have an opportunity of walking to and from school which promotes the development of their fitness status as compared to the boarders who do not have such opportunity.

Table 4.9 Gender and cardio-vascular endurance status (9-minute run/walk) of pupils in day schools

	Percentile norms for 9-minute run	<25 Critical	>25-<50 Weak	≥50 Acceptable	Total
Male	Number	30	66	345	441
	% sex	6.8%	15%	78.2%	100%
		21.8%			
	%9-minute run status	36.1%	39.5%	51.3%	
Female	Number	53	101	327	481
	% sex	11%	21%	68%	100%
		32%			
	% 9- minute run status	63.9%	60.5%	48.7%	
Total		83	167	672	922
Percent		9.0%	18.1%	72.9%	100%

Table 4.9 shows that 672 (72.9%) out of 922 pupils in day schools had an acceptable cardiovascular endurance fitness status. Of these 345 (78.2%) were boys while 327 (68%) were girls. The table further reveals that 96 (21.8%) boys and 154 (32%) girls scored below the 50th percentile and therefore had poor endurance that necessitated intervention. It is also indicated that there was a higher percentage of boys (51.3%) with acceptable cardiovascular endurance fitness than girls (48.7%). The fact that boys generally engage in more vigorous activities than girls as described in section 4.5.5 may contribute to them having better cardiovascular endurance fitness. This finding is similar to what Armstrong and Welsman (2000), Trost et al (2002) and Crespo (2004) reported. These authors confirm that boys perform better in cardiovascular activities and attribute this to boys engaging in more vigorous activities than girls.

Table 4.10 Gender and cardio-vascular endurance status of pupils in boarding schools

	Percentile norms For 9-minute run	<25 % Critical	>25 - <50 Weak	≥50 Acceptable	Total
Male	Number	47	93	320	460
	% sex	10.2%	20.2%		100%
		30.4%		69.6%	
	% 9-minute run status	42.3%	47.4%	45.7%	
Female	Number	64	103	380	547
	% sex	11.7%	18.8%		
		30.5%		69.5%	100%
	% 9- minute run status	57.7%	52.6%	54.3%	
Total		111	196	700	1007
Percent		11%	19.5%	69.5%	

Table 4.10 above shows that 700 (69.5%) out of 1007 pupils in boarding schools have an acceptable cardiovascular endurance fitness status and the percentage of boys (69.6%) with such a status is almost similar to that of girls (69.5%). Tables 4.9 and 4.10 also reveal that day scholars have a higher percentage of boys (78.2%) with acceptable cardiovascular endurance fitness than their counterparts in boarding schools (69.6%). In addition, from these tables it is observed that there is a higher percentage of girls (69.5%) in day schools with better cardiovascular endurance compared to their counterparts in boarding schools (68%). This can be attributed to the fact that majority (747, 81%) of day scholars walk to and from school everyday (section 4.5.1). Cherubini (2008) notes that walking helps in the development and maintenance of this fitness component.

4.3.4 The low back flexibility status of pupils

Low back flexibility was measured using the sit and reach test as recommended by the AAHPERD (1980). The results are presented in table 4.11.

Table 4.11 Mean values of sit and reach test (cm) of pupils

Age (years)	Gender	Day	Boarding
6	Boys	18.9	16.9
	Girls	21.5	19.3
7	Boys	19.3	18.2
	Girls	22.2	21.4
8	Boys	21.4	20.6
	Girls	23.4	21.6
9	Boys	22.6	21.3
	Girls	24.5	23.4

Table 4.11 shows that the mean values of the sit and reach test increased with age. This concurs with Doyle (1998) who reports that there is a gradual improvement in flexibility in children aged between 6 to 12 years. Doyle (1998) attributes this to a steady improvement in joint mobility during these years.

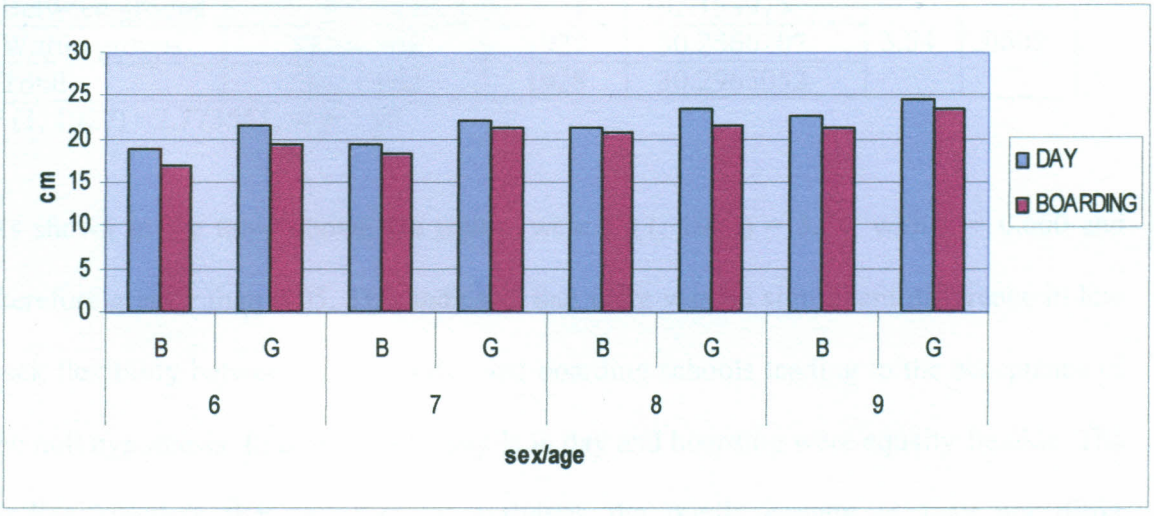


Figure 4.5: Sit and reach mean scores of pupils

From the figure 4.5 it is observed that day scholars had greater sit and reach mean scores than the boarders. Secondly, for all age categories girls had higher mean scores than boys.

Table 4.12 Means and standard deviations of sit and reach scores of pupils by type of school

Type of school	N	Mean	sd
Day	922	21.5781	5.66
Boarding	1007	21.1063	5.34

Table 4.12 indicates that pupils in day schools recorded slightly higher mean and standard deviation sit and reach scores (21.58±5.66) than that of boarders (21.11± 5.34) respectively. To determine if the differences in mean scores were statistically significant, one-way ANOVA was computed and the results presented in Tables 4.13 below.

Table 4.13 one-way ANOVA for mean sit and reach scores of pupils by type of school

	Sum of squares	df	Mean squares	F	Sig
Between groups	107.153975	1	107.153975	3.54	.0600
Within groups	58304.508	1927	30.2566207		
Total	58411.662	1928	30.2965052		

F (1, 1927) =2.773551, at p<. 05

As shown in the table above, the results were F (1, 1927) = 3.54, with p = 0.600 and therefore greater than 0.05. This indicates that there was no significant difference in low back flexibility between pupils in day and boarding schools leading to the acceptance of the null hypothesis. In other words, pupils in day and boarding were equally flexible. The finding suggests that the type of activities the pupils engage in may not differ significantly so as to cause differences in their low back flexibility.

Table 4.14 Means and standard deviations of sit and reach scores of pupils by gender

Gender	N	Mean	sd
Boys	901	20.1376	5.84
Girls	1028	22.3784	4.96

Table 4.14 indicates that girls recorded a higher mean but lower standard deviation for sit and reach test scores (22.38±4.96) than boys who recorded the mean and standard deviation scores of 20.14±5.84. To determine if the differences in mean scores were significant, one-way ANOVA was computed and the results are presented in Tables 4.15 below.

Table 4.15 one-way ANOVA for mean sit and reach scores of pupils by gender

	Sum of squares	df	Mean squares	F	Sig
Between groups	2410.9269	1	2410.9269	82.96	.000
Within groups	56000.7351	1927	29.0610976		
Total	13831.7053	1928	7.17412101		

F (2, 1925) =2.773551, at p<. 05

Table 4.15 shows that the results were F (1, 1927) = 82.96, at p<.05 indicating that the differences in the mean sit and reach scores between the boys and girls were significant. Thus, the null hypothesis was rejected at 0.05 level of significance implying that there was a significant difference in low back flexibility between boys and girls. The higher mean scores in the sit and reach test indicate that the girls were had more flexible low back and hamstring muscles than boys. Similar findings are reported by Heyward (1998) and Barry, Crawford, Hill, Roberts and Spence (2004). These authors state that the anatomical differences in the joints allow girls to have greater flexibility of the low back and hamstring muscles than the boys.

To determine low back flexibility status of the pupils, the individual scores were categorised according to the percentile norms set by AAHPERD (1980) for sit and reach. The findings obtained are presented and discussed below.

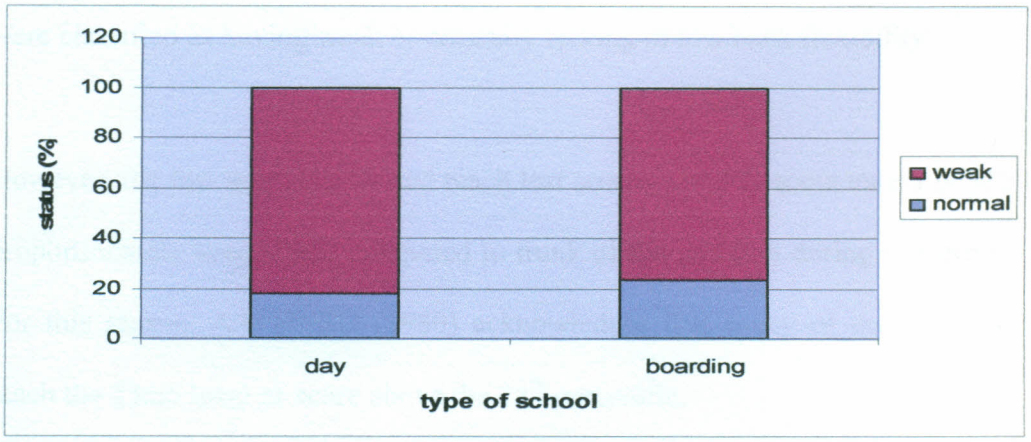


Figure 4.6 Low back flexibility status of pupils

Figure 4.6 reveals that majority of the pupils had poor low back flexibility with more pupils in day (81.8%) than in boarding (76.7%) schools.

Table 4.16 Gender and low back flexibility (sit & reach) status of pupils in day schools

	Percentile norms for Sit and Reach	<25 Critical	>25-<50 Weak	≥50 Normal	Total
Male	Number	264	77	100	441
	%sex	59.9%	17.4%	22.7%	100%
		77.3%			
	% flexibility status	*56.9%*	*31.9%*	*46.5%*	*47.8%*
Female	Number	200	166	115	481
	% sex	41.6%	34.5%	23.9%	
		76.1%			100%
	% flexibility status	*43.1%*	*68.3%*	*53.5%*	*52.2%*
Total		464	243	215	922
Percent		50.3%	26.4%	23.3%	100%

The results of the study in table 4.16 show that only 215 (23.3%) had a normal level of low back and hamstring flexibility, of which 100 (22.7%) were boys and 115 (23.9%)

were girls. The table further indicates that more girls (53.5%) had a normal flexibility status than boys (46.5%). It is also revealed that 341 (77.3%) boys and 366 (76.1%) girls were classified as having weak or critically lacking in low back flexibility.

However, the low scores of sit and reach test scores could to some extent be attributed to proportionately longer legs compared to trunk of the children during this growth period. For this reason, AAHPERD (1980) acknowledges that many of the children may not reach the 23cm level or score above the 25th percentile.

Table 4.17 Gender and low back flexibility status of the pupils in the boarding schools

	Percentile	<25 Critical	>25-<50 Weak	≥50 Normal	Total
Male	Number	305	112	43	460
	% sex	57.1%	24.3%		
		81.4%		23.5%	100%
	% flexibility status	42.9%	38.6%	65%	
Female	Number	229	178	140	547
	% sex	42.9%	32.5%		
		75.4%		76.5%	100%
	% flexibility status	42.9%	61.4%	35%	
Total		534	290	183	1007
Percent		53%	28.8%	18.2%	100%

Table 4.17 above indicates that only 183 (18.2%) of boarders had a normal level of flexibility, 43 (23.5%) of whom were boys and 140 (76.5%) were girls. The remaining (824, 81.8%) had weak or were critically lacking in low back flexibility. In this category there were boys (417) more than the girls (407).

4.3.5 The abdominal muscular strength/endurance status of pupils

Abdominal muscular strength/endurance was determined using the number of correctly performed sit ups in one minute. The test results are presented in the table 4.18.

Table 4.18 Mean values of the sit ups (per minute) of pupils

Age (years)	Gender	Day	Boarding
6	Boys	15.0	20.8
	Girls	12.5	17.2
7	Boys	15.3	20.8
	Girls	14.1	18.2
8	Boys	18.2	24.5
	Girls	15.6	22.2
9	Boys	18.7	24.5
	Girls	18.3	20.2

Table 4.18 shows the mean values of the sit ups the pupils performed in one minute presented according to age, gender and type of school. The table reveals that as age increases there is a gradual increase in the number of sit ups performed. This concurs with Malina et al (2004) who note that there is a positive relationship between age and muscular strength in children. Malina et al (2004) further adds that age and body size are primary factors that influence muscular strength. The fact that the mean height and the mean weight (body size) of the boys were higher than those of the girls could account for the greater mean sit ups values of the boys than the girls. The data in the table is presented in figure 4.7.

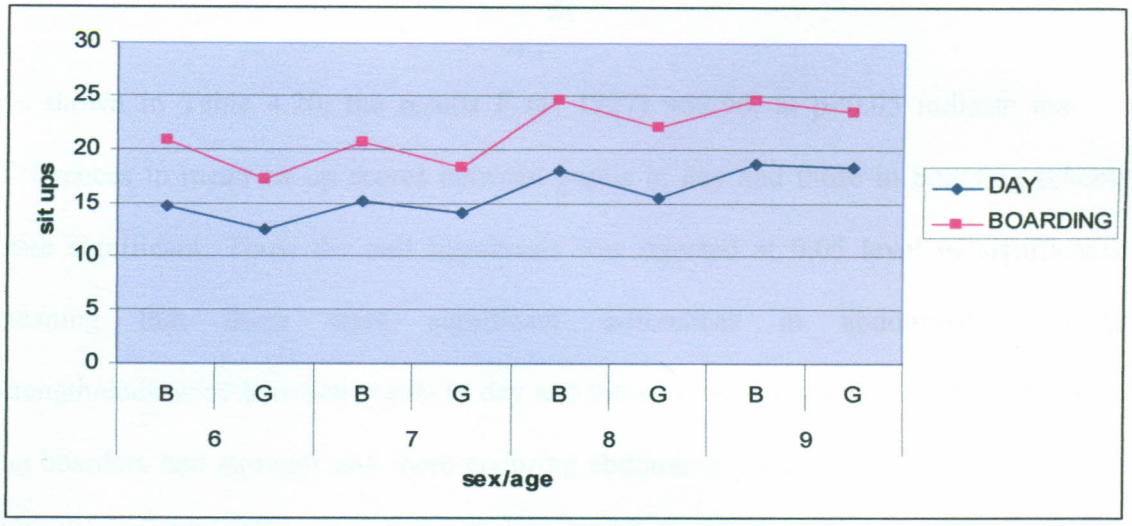


Figure 4.7: Mean scores of sit ups of pupils

Figure 4.7 illustrates that boarders performed more sit-ups in one minute than day scholars. In addition, boys performed more sit-ups than girls.

Table 4.19 Means and standard deviation scores of sit ups of pupils by type of school

Type of school	N	Mean	sd
Day	922	16.0987	8.2
Boarding	1007	21.1797	6.83

The table above indicates that the mean and standard deviation scores for sit ups of boarders (21.18±6.83) were higher than the day scholars who recorded a mean and standard deviation of (16.10±8.2). To determine if the differences in mean scores were significant, one-way ANOVA was computed and the results are presented in Table 4.20.

Table 4.20 one-way ANOVA for mean sit up scores of pupils by type of school

	Sum of squares	df	Mean squares	F	Sig
Between groups	3255.16242	1	3255.16242	52.96	.000
Within groups	118437.397	1927	61.4620641		
Total	121692.56	1928	63.1185477		

F (1, 1927) =2.773551, at p<. 05

As shown in Table 4.20, the results F (1, 1927) =52.96, at p<0.05 indicate that the differences in mean sit up scores between pupils in day and those in boarding schools were significant. Thus, the null hypothesis was rejected at 0.05 level of significance meaning that there were significant differences in abdominal muscular strength/endurance between pupils in day and those in boarding schools. In other words, the boarders had stronger and more enduring abdominal muscles than the day scholars. According to Fry, Irwin, Saunders, Richey (2005) the differences in muscular strength among prepubescent children are attributed more to body weight. That is, the heavier one's body weight is the stronger and more enduring his or her muscles will be. The fact that the boarders on average weighed heavier than the day scholars as described earlier may account for the observed differences.

Table 4.21 Mean and standard deviations of sit up scores of pupils by gender

Gender	N	Mean	sd
Boys	901	20.1387	8.26
Girls	1028	17.5350	7.45

Table 4.21 indicates that the mean and standard deviation of the sit up scores of boys (20.14±8.26) was higher than that of girls who recorded the mean and standard deviation of (17.54±7.45). To determine whether the differences in mean scores were significant, one-way ANOVA was computed and the results are presented in below.

Table 4.22 one-way ANOVA for mean sit up scores of pupils by gender

	Sum of squares	df	Mean squares	F	Sig
Between groups	1246.0747	1	12426.0747	219.14	.000
Within groups	1094266.485	1927	56.7028984		
Total	121692.56	1928	63.1185477		

F (1, 1927) =2.77351, at p<. 05

As shown in Table 4.22, the results F (1, 1927) =219.14 at p<.05 indicate that differences in mean sit up scores between boys and girls were significant. Thus, the null hypothesis was rejected at 0.05 level of significance suggesting that there were significant differences in abdominal muscular strength/endurance between boys and girls. Armstrong and Welsman (2000) note that prepubertal boys have more lean body mass than their female counterparts. The more lean mass one has the stronger one is likely to be since it is the muscles that produce the strength (Fahey et al, 2003). This could explain why the boys performed more sit ups than girls. Fry et al (2005) also attribute the differences in muscular strength among the prepubescent children to body mass and not to gender differences. Therefore, since boys generally weighed heavier than girls it could explain the observed differences in muscular strength/endurance.

To determine the abdominal muscular strength/endurance fitness status of pupils, individual scores were categorised according to the percentile norms set by AAHPERD (1980) for sit ups performed in one minute. The findings are presented in figure 4.8.

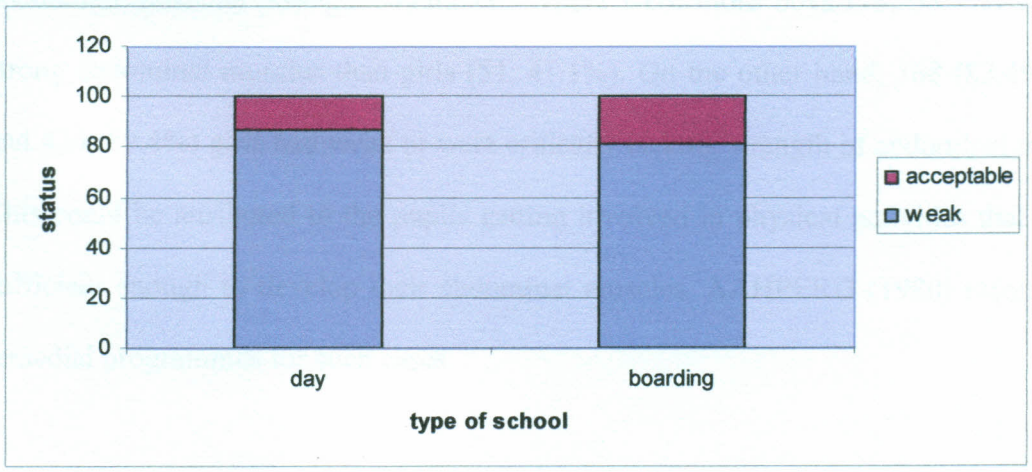


Figure 4.8: Abdominal muscular strength/endurance status of pupils

Figure 4.8 reveals that the majority of the pupils had weak abdominal muscles. There were more pupils in day schools (86.9%) with weak muscles than their counterparts in boarding schools (80.9%).

Table 4.23 Gender and abdominal muscular strength/endurance (sit ups) status of pupils in day schools

	percentile	<25 Critical	>25-<50 Weak	≥50 Strong	Total
Male	Number	296	72	73	441
	% sex	67.1%	16.3%	16.6%	100%
	%muscular strength/ endurance status	83.4%		58.9%	47.8%
Female	Number	324	106	51	481
	% sex	67.4%	22.0%		
		89.4%		10.6%	100%
	%muscular strength/ endurance status	52.3%	59.6%	41.1%	52.2%
Total		620	178	124	922
percent		67.2%	19.3%	13.5%	

According to the results indicated in table 4.23, only 124 (13.5%) pupils had strong abdominal muscular strength/endurance. There were more boys (73, 58.9%) who had strong abdominal muscles than girls (51, 41.1%). On the other hand, 368 (83.4%) boys and 430 (89.4%) girls had weak or were critically lacking strength of abdominal muscles. This could be attributed to the pupils getting involved in physical activities that are not sufficient enough to develop their abdominal muscles. AAHPERD (1980) recommends remedial programmes for such cases.

Table 4.24 Gender and muscular endurance status of pupils in boarding schools

	Sit-ups percentile	<25 Critical	>25-<50 Weak	≥50 Strong	Total
Male	Number	229	112	119	460
	% sex	49.8%	24.3%		
		74.1%		25.9%	100%
	%M/endurance status	47.2%	34.1%	61.7%	45.7%
Female	Number	256	217	74	547
	% sex	46.8%	39.7%		
		86.5%		13.5%	100%
	%M/endurance status	52.8%	65.9%	38.3%	54.3%
Total	Number	485	329	193	1007
Percent		48.2%	32.7%	19.1%	

Table 4.24 shows that 193 (38.3%) pupils had strong abdominal muscles. Of these 119 (25.9%) were boys and 74 (13.5%) girls. There were 341 (74.1%) boys and 473 (86.5%) girls who did not meet the recommended 50th percentile implying that they had weak abdominal muscles and therefore require remedial programmes. The table also indicates that more girls (256, 52.8 %) had weak abdominal muscles than boys (229, 47.2%).

4.3.6 The body composition status of pupils

There are various methods used to assess body composition but this study used the BMI method to assess the relative body fat of the pupils. Table 4.25 shows the mean BMI scores of the pupils with respect to age, gender and type of school.

Table 4.25 Mean BMI scores of pupils

Age (years)	Gender	Day	Boarding
6	Boys	15.1	15.8
	Girls	14.9	18.9
7	Boys	16.0	15.8
	Girls	16.0	19.3
8	Boys	15.9	16.5
	Girls	16.8	19.7
9	Boys	16.4	17.1
	Girls	18.4	20.3

The increase in age is accompanied by an increase in the mean BMI scores. Since the pupils increase in height and weight as they grow there is a corresponding increase in the BMI values. Secondly, Malina et al (2004) reveals that growth in children is accompanied by an increase in fat tissues which results in the increase in BMI. The data in the table is presented in figure 4.9.

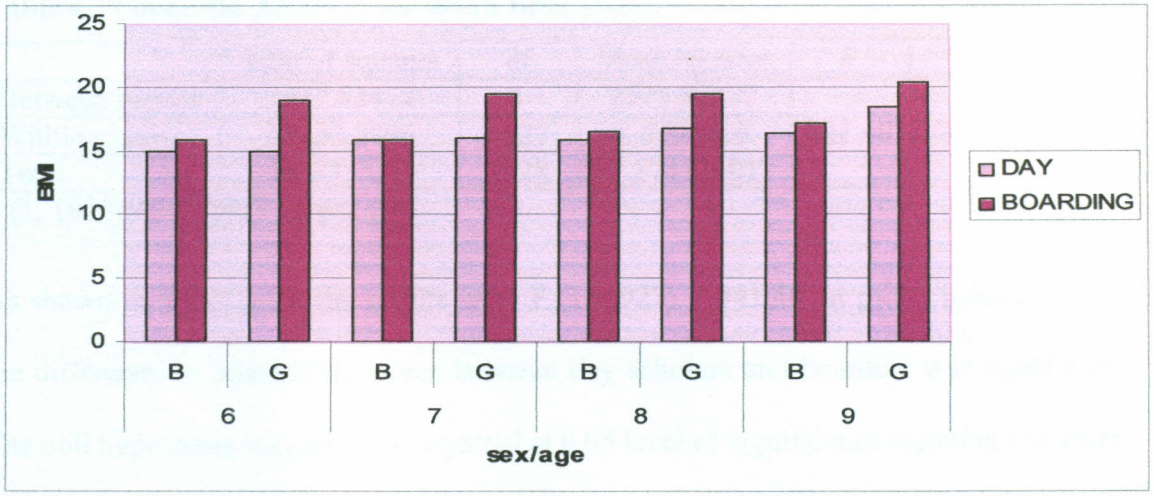


Figure 4.9: BMI mean scores of pupils

Figure 4.9 above shows that boarders, regardless of their gender had higher mean values of BMI for all categories than day scholars. In addition, the figure indicates that, the BMI mean values for girls were higher than those of boys for all the ages.

Table 4. 26 Means and standard deviations of BMI scores of pupils by type of school

Type of school	N	Mean	sd
Day	922	15.79	2.0
Boarding	1007	18.11	2.74

Figure 4.9 and table 4.26 indicate that boarders recorded higher mean and standard deviations scores for BMI (18.11±2.74) than day scholars who recorded mean and

standard deviation scores of 15.79±2.0. This implies that boarders had more body fat, reflected in higher mean BMI values than their counterparts in day schools. To determine if the differences in mean scores were statistically significant, one-way ANOVA was computed and results presented in Table 4.27.

Table 4.27 one-way ANOVA for mean BMI scores of pupils by type of school

	Sum of squares	df	Mean squares	F	Sig
Between groups	2577.82472	1	2577.82472	441.40	.000
Within groups	11253.8806	1927	5.8401409		
Total	13831.7053	1928	7.17412101		

F (1, 1927) =2.773551, at p<. 05

As shown in Table 4.27, the results were F (1, 1927) = 441.40, at p<.05 indicating that the difference in mean BMI scores between day scholars and boarders was significant. The null hypothesis was therefore rejected at 0.05 level of significance meaning that there was a significant difference in body composition (body fat) between pupils in day and boarding schools. The fact that boarders get regular meals and may be walking less compared to day scholars could account for these differences. It could also be because day scholars are more physically active since majority of them walk to and from school and this could have lead to them having less body fat. Optimising body composition requires that one has less body fat than lean mass. To achieve this, Rosser (2005) advocates for brisk walking since it is an aerobic activity that uses fat as a major source of energy supply. The higher BMI scores of boarders could be also be attributed to their height and weight since on average they were taller and weighed heavier than the day scholars.

Table 4.28 Means and standard deviations of BMI scores of pupils by gender

Gender	N	Mean	sd
Boys	901	16.21	2.05
Girls	1028	17.90	2.92

Girls recorded higher mean and standard deviation scores (17.90±2.92) than boys who recorded the mean and standard deviation scores of 16.21±2.05 (Figure 4.9 and table 4.28). These results imply that girls had higher BMI values than boys. Similarly, Goon (2006) reports that Nigerian school girls had significantly higher BMI than the boys. To determine if the differences in the mean scores were statistically significant, one-way ANOVA was computed and the results are presented in table 4.29.

Table 4.29 one-way ANOVA for mean BMI scores of pupils by gender

	Sum of squares	df	Mean squares	F	Sig
Between groups	1068.43748	1	1068.43748	161.31	.000
Within groups	12763.2678	1927	6.62338756		
Total	13831.7053	1928	7.17412101		

F (1, 1927) =2.77351, at p<. 05

As shown in Table 4.29 the results F (1, 1927) =161.31, at p<.05 indicate that the difference in mean BMI scores between boys and girls was significant. The null hypothesis was rejected at 0.05 level of significance implying that there was a significant difference in the body composition (body fat) between boys and girls. The higher BMI scores for girls imply that they have more body fat than the boys. Rosser (2005) notes that the difference in BMI between females and males and attributes it to the fact that females tend to have more body fat than males. Similarly, Shaw et al (2007) account for gender differences in body composition among prepubertal children to girls having more body fat than boys which translates into higher BMI scores.

To determine weight status of pupils, the individual scores were categorised according to the percentile norms set by the WHO (2007) CDC-BMI for sex-age growth charts percentiles. The findings obtained are presented in figure 4.10.

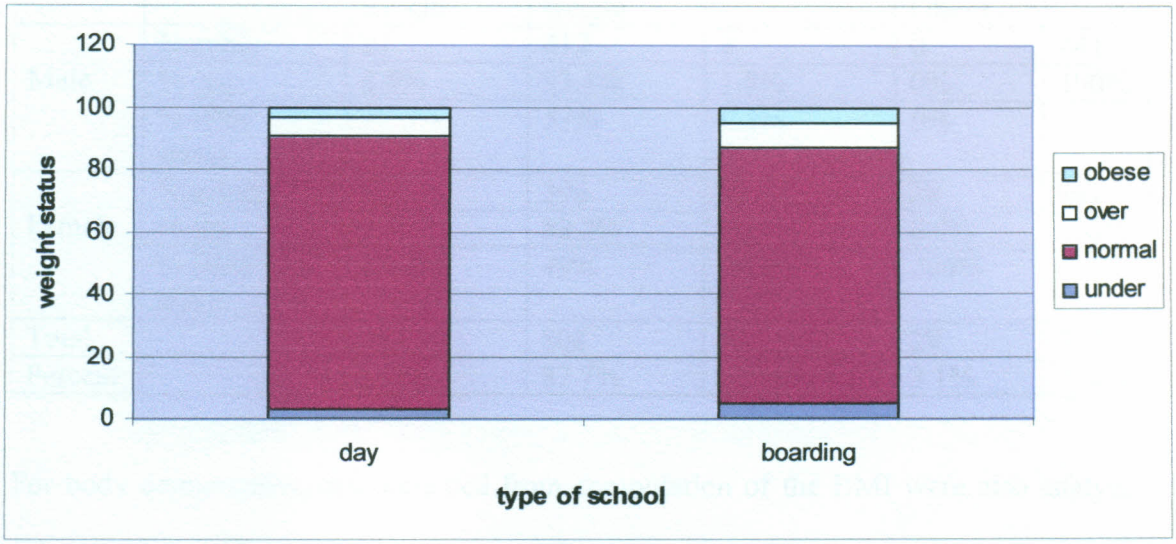


Figure 4.10 Weight status of pupils

Figure 4.10 above demonstrates that majority of the pupils in both day (87.7%) and boarding (82.2%) schools had a normal weight status. However, there were cases of underweight pupils in both day (2.9%) and boarding (5%) schools. In addition, there were cases of overweight pupils in day (6.3%) and boarding (7.8%) schools. There were also cases of obese pupils in day (3.1%) and boarding (5%) schools.

Table 4.30 Gender and body composition (BMI) status of pupils in day schools

Sex	Percentile	BMI Frequency $P<5^{th}$ Under weight	BMI Frequency $P>5^{th} < 85^{th}$ Normal weight	BMI Frequency $P\ 85^{th} < 95^{th}$ Overweight	BMI Frequency $P \geq 95^{th}$ Obese	Total
Male	Number	21	412	8	0	441
	% sex	4.8%	93.4%	1.8%	0%	100%
	% BMI status	*77.8%*	*51%*	*9.2%*	*0%*	
Female	Number	6	396	50	29	481
	% sex	1.3%	82.3%	10.4%	6.0%	100%
	% BMI status	*22.2%*	*49%*	*90.8%*	*100%*	
Total		27	808	58	29	922
Percent		2.9%	87.7%	6.3%	3.1%	100%

For body composition, data obtained from computation of the BMI were also analysed using WHO (2007) CDC-BMI age-sex specific percentiles. The results shown in table 4.30 above indicate that majority of the pupils (808, 87.7%) had a normal BMI status reflecting a healthy or normal weight. Out of the 808 pupils, 412 (51%) were boys and 396 (49%) were girls implying that there were more boys than girls with normal BMI. Shaw, et al (2007) also observed that since prepubertal girls have more fat than boys therefore have higher BMI scores. The pupils who had low BMI scores and therefore considered underweight were 27 (2.9%). The table also indicates that 87 (9.4%) pupils had high BMI scores of these were 58 were classified as overweight and 29 as obese. There were more overweight girls (50, 10.4%) than boys (8, 1.8%). It was also found that all pupils who were classified as obese among the day scholars were girls.

4.31 Gender and body composition (BMI) status of the pupils in boarding schools

	Percentile	BMI $P<5^{th}$ *Under* weight	BMI $P>5th < 85^{th}$ *Normal* weight	BMI $P\ 85^{th} < 95^{th}$ *Over* weight	BMI $P \geq 95^{th}$ *Obese*	Total
Male	Number	24	417	10	9	460
	% sex	5.2%	90.7%	2.1%	2%	100%
	% BMI status	*48%*	*50.4%*	*12.7%*	*18%*	
Female	Number	26	411	69	41	547
	% sex	4.8%	75.1%	12.6%	7.5%	
	% BMI status	*52%*	*49.6%*	*87.3%*	*82%*	
Total		50	828	79	50	1007
Percent		5%	82.2%	7.8%	5%	

Table 4.29 above indicates that majority of pupils in the boarding schools (828, 82.2%) had a normal BMI status. Out of 828 pupils, 417 (50.4%) were boys and 411 (49.6%) were girls implying that there were more boys with normal body weight (BMI) than girls. The table also shows that pupils with low BMI scores and considered to be underweight were 50 (5%) whereas 129 (12.8%) pupils that had high BMI scores were categorized as either overweight or obese. There were 10 (2.1%) overweight boys and 69 (12.6%) overweight girls. With respect to obesity, 9 (2.7%) boys and 41 (7.5%) girls were obese. These results concur with the findings of Shaw, et al (2007) that revealed that girls have more body fat than boys during prepubertal stage which translates into higher BMI scores. This therefore makes them more likely to become overweight or obese than boys.

From tables 4.30 and 4.31 it can be deduced that there is a higher percentage of pupils with normal BMI status in day schools (87.7%) than in boarding schools (82.2%). Secondly, overweight and obese cases were more in boarding schools (129, 12.8%) than

day schools (87, 9.4%). The fact that boarders are more likely to have regular meals than day scholars could account for this finding. On the contrary, there were underweight pupils in both day and boarding schools.

4.4 Pupils' involvement in physical activities

The forth objective was to determine the pupils' level of engagement in physical activities. Malina, et al (2004) list free play, house chores, exercise, school physical education and organised sport as physical activities that can help improve the fitness status of children. This study also used such activities to determine the level of engagement in physical activities. Data in this section was gathered from the pupils (Appendix I), the matrons (Appendix IV) and the directors of studies (Appendix V). The study was delimited to activities that pupils engaged in from 6.00am to 7.00pm everyday of the week. The data presented and discussed in this section indicate the activities pupils do before, during and after school time for five days a week and the activities they do during weekends.

4.4.1 Activities done before school for day scholars

The study determined how pupils used to get to and from school for the 13 day schools that participated in the study.

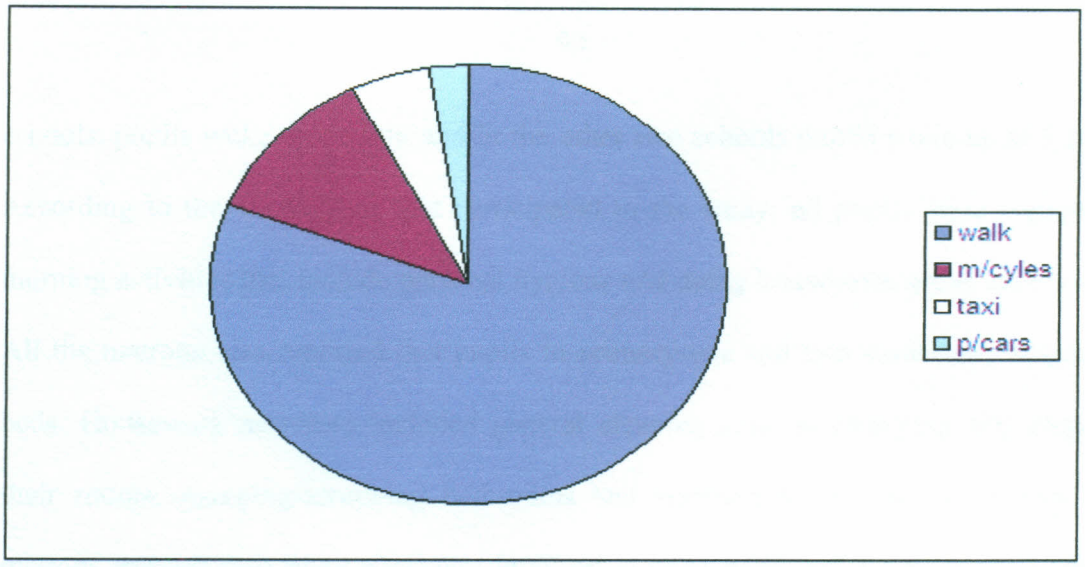


Figure 4.11 Common mode of transport used by pupils to get to and from school

The pupils in day schools were asked the mode of transport they use to get to and from school. The results in figure 4.11 reveal that out of 922 day scholars, majority of pupils (747, 81%) walked to and from school, 107 (12%) used motorcycles (commonly known as "boda-boda"), 48 (5%) used public minibuses (taxi) and 22 (2%) were driven to school by their parents or guardians. This type of active transport involving pupils walking to and from school offers them an opportunity of exercising and developing their cardiovascular fitness (Cherubini, 2008). Guthold et al (2009) also report that children who walk to school participate in more physical activities than those who are driven. This could explain why majority (72.9%) of day scholars met the standard set by AAHPERD (1980) for cardiovascular fitness.

4.4.2 Activities done before school for boarders

The data provided in this section was obtained from the matrons who were in charge of the pupils in boarding schools. The study reveals that in two out of the four boarding

schools, pupils woke up at 5am and in the other two schools pupils woke up at 5.30am. According to the 10 matrons that participated in the study, all pupils were engaged in morning activities that include personal hygiene and doing housework under supervision. All the matrons also reported that pupils in primary one and two made their respective beds. Housework activities included general cleaning such as sweeping and mopping their rooms, mopping/scrubbing bathrooms and washing toilets and/or latrines. The matrons ensured that every pupil was involved in housework and a duty roster is drawn which is followed. In two schools, it was reported that pupils in primary one and two were not involved in scrubbing the bathrooms and washing the toilets and/or latrines. However, all pupils in primary three in all the schools that participated in the study were involved in all housework activities. These activities can be categorised as moderate activities according to USDHHS (1996). Such activities can also be used to accumulate the recommended 60 minutes of daily physical activities which in turn may affect their health- related fitness (USDHHS, 1996 and Lawlor et al, 2007).

4.4.3 Activities done by pupils at school

The data presented in this section was obtained from the directors of studies. In all day schools and two of the boarding schools, classes begin at 8.00am. In one boarding school, classes begin at 7.00 am and in one other school classes begin at 7.15 am. The break time lasts between 20 to 50 minutes in all schools. In 11(61%) schools (nine day and two boarding schools) the break session last for 30 minutes. In two day schools the directors of studies reported a break of 20 minutes and in two boarding schools a break time of 50 minutes was reported. In all schools that participated in the study, the directors of studies

noted that pupils were served with porridge during break time. However, in the public schools porridge is served only to a pupil that paid a fee of shs 5000 (equivalent to two and a half US dollars) for a term of three months. In all boarding schools however, porridge was served to all pupils. Thus some of the time during the break session is used for eating. In addition, during break time pupils engaged in play activities of their choice when time allowed. The directors of studies reported that during break time many boys played football and activities that involved running, while some girls engaged in activities like dodge ball. It was also reported that many girls sit in the shade with friends. This finding may imply that girls were less physically active than boys. This concurs with the findings of Crespo (2004) who reported that irrespective of age and race, girls participate in less vigorous activities than boys. Similarly, Trost, et al (2002) reported that for every grade males accumulated more activity than females especially in regard to vigorous activity. Thus, pupils especially the girls need to be encouraged to actively use the break sessions for engaging in physical activities which in turn may improve their health-related fitness. Ridgers, Stratton and Fairclough (2005) observe that break (recess) time can be used to help the pupils accumulate the recommended 60 minutes of daily moderate physical activity.

In addition, the study findings indicate that classes end at different times in different schools. All directors of studies in day schools indicated that classes ended at 1.00pm for pupils in primary one and two. For primary three, in seven out of the 13 schools (54%) it was reported that classes end at 4.30pm and in other six schools (46%) classes end at 5.00pm. In one of the boarding schools, classes for primary one to primary three ended

classes at 3.30 pm, one other boarding school classes ended at 4.00pm and in two other boarding schools classes ended at 4.30 pm. In schools where classes end after 1.00pm, the directors of studies noted that there is a lunch break of one hour during which pupils are served with lunch and later they are free to engage in activities of their choice. This free time can also be used to perform physical activities that allow pupils to accumulate the recommended 60 minutes of daily of physical activity (Ridgers et al., 2005). The table 4.31 below summarises the duration and schedule of activities that pupils engage in which include classroom time, free time activities during break and lunch time as well as the number of hours pupils spend at school.

Table 4.32 Schedule of activities during school time

School	No. of schools	Primary	lessons begin am	lessons end pm	Break Time (mins)	Lunch Time (hr)	Hrs at school
Day	13	1 & 2	8	1	20-30	-	5
	5 out of 13	3	8	4.30	20	1	8
	2 out of 13	3	8	4.30	30	1	8
	6 out of 13	3	8	5	30	1	9
Boarding	1	1-3	7.15	3.30	30	1	8 ¼
	1	1-3	7	4	50	1	9
	1	1-3	8	4.30	30	1	8 ½
	1	1-3	8	4.30	50	1	8 ½

From the findings in table 4.32 above, it is indicated that all pupils in primary three spend at least eight hours at school with an average of one and a half hours not in classroom. During this period the pupils are either involved in eating or in free time activity of their choice. On the other hand the pupils in primary one and two spend five hours at school with either 20 or 30 minutes outside classroom.

4.4.4 The teaching of Physical Education in schools

The directors of schools provided the information presented in this section. It is known that the periods scheduled for Physical Education (PE) give pupils an opportunity to engage in physical activities and break away from mental activities within the classroom (NASPE, 2004). For the 17 day and boarding schools that participated in the study, two directors of studies, both in day schools, reported that PE was not taught in their schools because of the big number of pupils in class. They further mentioned that although PE was scheduled on the timetable, this time was devoted to teaching other subjects like English and Mathematics. This is contrary to NASPE (2004) recommendation that advocates for the teaching of PE in schools in order to help pupils accumulate the 60-minutes of daily physical activity. NASPE (2004) further notes that including PE in the school curriculum does not negatively impact on the academic performance but improves children's mental concentration in addition to helping them develop their psychomotor domain.

4.4.4.1 Duration of Physical Education lessons

The data obtained from the directors of studies in the 15 schools that taught PE reveals that the duration of the lessons varied in different schools and classes. Majority of schools (13, 87%) scheduled 30 minutes of PE for primary one and for primary two classes. Only in two (13%) schools were the lessons scheduled for 40 minutes in primary one and two. For primary three classes, eight (53%) out of the 15 schools scheduled PE for 30 minutes and the other seven schools (47%) scheduled PE for 40 minutes (figure 4.12).

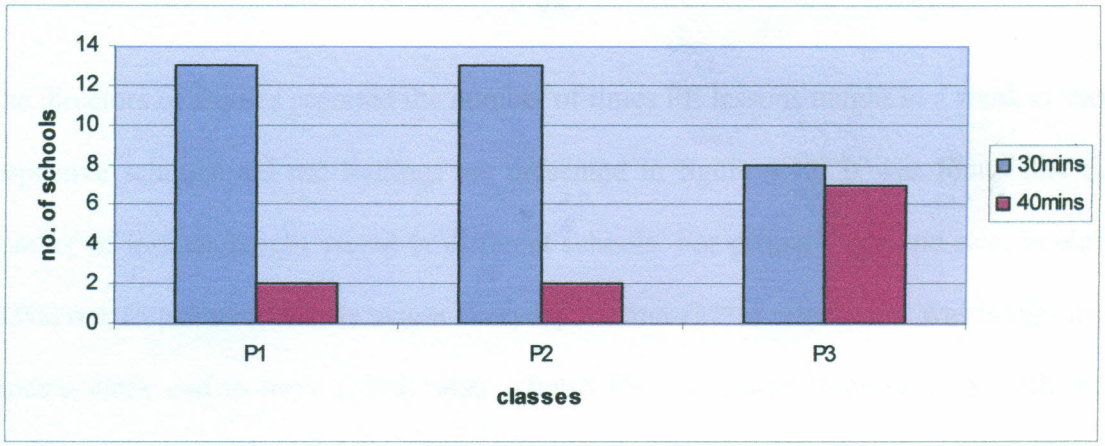


Figure 4.12 Time allocated for teaching PE in different schools and classes

Figure 4.12 shows that the time allocated for PE in the schools concurred with the recommended time of at least 30 minutes (NASPE, 2004). However, adequate allocation of teaching time should also be accompanied by teaching the content that develops health-related fitness skills. This requires adequately prepared and competent teachers, adequate facilities and reasonable class sizes (NASPE, 2004). Yet these are some of the challenges facing many of the primary schools in Uganda (Nsibambi et al., 2005).

4.4.4.2 Number of PE lessons taught per week

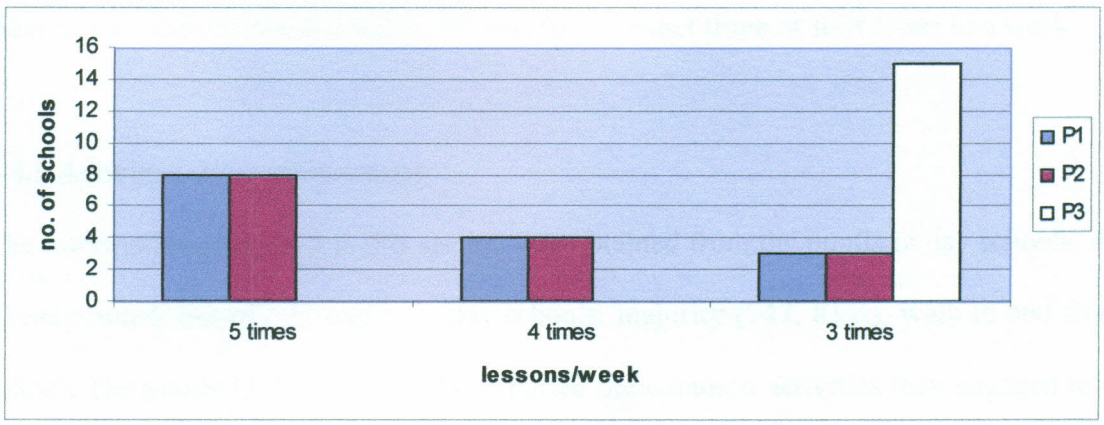


Figure 4.13 Number of PE lessons taught per week in the studied schools

The directors of studies reported the number of times PE lessons taught in a week in their respective schools and the findings are presented in figure 4.13. It was found that the number of lessons taught varied in different schools. For primary one and two, in eight (53%) out 15 schools PE was taught everyday, in four (27%) schools PE was taught four times a week and in three (20%) other schools PE was taught three times a week. For primary three, in all the 15 schools studied PE was taught three times a week (figure 4.12). It is observed that the number of lessons allocated for PE tends to reduce in upper primary classes. This finding is similar to what NASPE (2004) reported where PE lessons are usually reduced in upper primary section. Epstein (1996) criticizes this tendency because it reduces the opportunity for pupils to learn physical skills necessary for the development of the psychomotor domain.

The eight schools (53%) that teach PE everyday for primary one and primary two met the recommended 30 minutes of daily PE set by NASPE (2004). However, in some schools (47%) for primary one and two and all primary three the number of PE lessons did not meet this recommendation because PE was taught either three or four times in a week.

4.4.5 Activities done after school

The information presented in this section was obtained from the pupils in day schools. As already noted, out of 922 pupils in day schools, majority (747, 81%), walk to and from school. The pupils in day schools also reported the common activities they engaged in at home which included doing homework (834, 90%), sleeping (509, 55%) and doing house chores (574, 62%) as presented in figure 4. 13. All pupils reported that they played and

engaged in activities such as racing and football for boys. The girls engaged basically in dodge ball (commonly known as "Kwepena") and simulation play activities. 632 (69%) out of 922 pupils reported that they watched Television in the evening. The findings therefore reveal that pupils engaged in both passive and active physical activities with girls apparently engaging in less vigorous activities than boys. These findings are similar to those of Crespo (2004) and Guthold, et al (2009) who reveal that girls irrespective of age participate in less vigorous activities than boys. This may account for boys' significantly higher cardiovascular endurance fitness than girls.

The directors of studies reported that pupils are given homework everyday and during weekends. This definitely reduces the free time pupils have at home to engage in active physical activities.

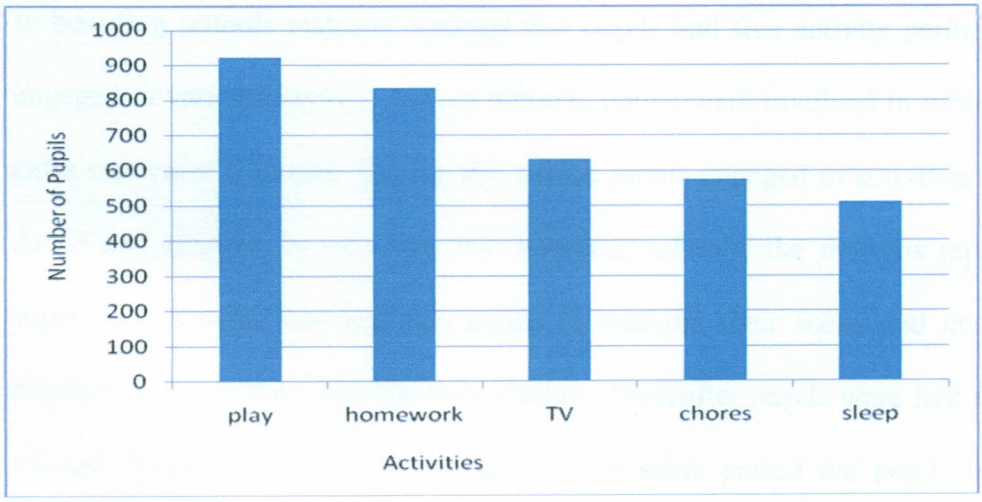


Figure 4.14 Common activities done at home

The most common house chores done and reported by pupils included washing utensils (213, 23%), sweeping and mopping houses (115, 12%) as well as fetching water (107, 12%). Other chores done pupils included activities such as washing their uniforms and

sweeping the courtyard. Such activities were classified as moderate physical activities which may influence their health- related fitness status (USDHHS, 1996 and Lawlor et al., 2007). The common types of chores that pupils do at home are presented in Figure 4.15.

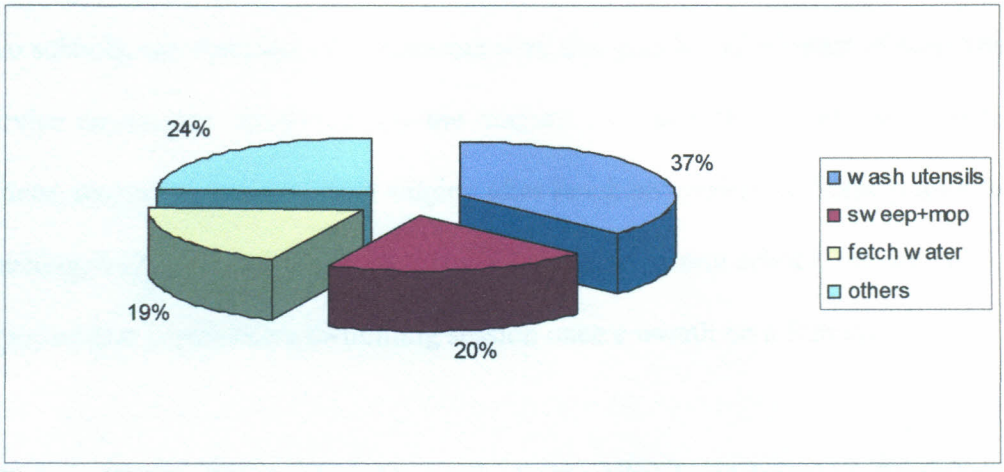


Figure 4.15 Types of chores done by pupils in day schools

In boarding schools matrons reported that pupils had free activity period in which they engaged in varied activities. In two schools, pupils were involved in what was known as extra curricular activities. During this period pupils engaged in activities such as games, dance and singing. In the other two boarding schools, the matrons reported that they supervised primary one and two pupils in washing their socks and underpants, while pupils in primary three washed their clothes. Thereafter pupils were free to do what they wanted. It was also reported that during this same period the pupils bathed and had dinner. USDHSS (1996) classified daily living tasks such as washing under moderate activity whereas formal exercises were categorised as vigorous activity. Thus, some of the activities enable pupils to actively engage in moderate and vigorous physical activity and this may have an impact on their health-related fitness status.

4.4.6 Activities done during weekends

In day schools, the directors of studies reported that no weekend classes were conducted but pupils carried homework to do at home. For boarding schools, all matrons reported that pupils engaged in free activity on Saturdays and after church service on Sundays. In two schools, the directors of studies recorded that pupils had an hour of prep after church service on Sunday. In all schools the matrons indicated that pupils watched television, videos, danced and/or practiced singing after lunch on weekends. Some pupils engaged in washing their clothes under supervision of matrons. In one school, the director of studies reported that pupils had a swimming session once a month on a Sunday.

All the activities that are done by pupils during school and free time form their habitual physical activity. According to Bouchard and Shephard (1994) habitual physical activities include leisure time, occupational (for this study, school activities for the pupils) and daily living tasks (chores). The study included chores as some of the activities that gave an opportunity for pupils to engage in physical activity as Malina et al (2004) note. Therefore, if all such activities were considered, most pupils may be meeting the recommended 60 minutes of moderate intensity physical activity (Lee, et al, 2006). Such activities are likely to affect the health-related fitness of pupils (Bouchard and Shephard, 1994 and Lawlor et al, 2007). However, the test results indicated that some pupils in both day and boarding schools were weak or critically lacking with respect to cardiovascular fitness (Tables 4.9 and 4.10). In addition, most pupils had poor flexibility of the low back and hamstring muscles (Tables 4.23 and 4.24) and had weak abdominal muscles (Tables 4.24 and 4.25). It may be implying that although the activities pupils engaged in may be

adequate in terms of duration, the physical activities they do may not be sufficient enough to develop health related fitness especially in terms of stretching and strengthening of their low back, hamstring and abdominal muscles.

Therefore schools must devise means of providing activities that develop these fitness components. This can be attained if the Ministry of Education and Sports develops strong school policies such as compulsory teaching of quality PE which are fundamental in enhancing physical activity among school children. Although, PE has been made compulsory in primary schools in Uganda, there is need to establish whether this is implemented in schools. Quality PE programmes not only help in developing fitness during childhood but also help in inculcating practices that are likely to be effective in promoting life long physical activity (Lee, et al, 2006). Thus including the teaching of PE in primary schools should be emphasized to enable children learn activities that they can use during their leisure time and become more physically active. Unfortunately, many children who do not have PE classes do not compensate by being more active outside of school hours (Epstein, 1996).

In addition, parents/guardians need to be sensitised on the importance of helping their children keep physically active. This can be done by the parents themselves engaging in physical activities which can in turn influence children's engagement in physical activity. Crespo (2004) confirms that children with active parents are more likely to be active than those whose parents live sedentary lives.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary, conclusions and recommendations of the study.

5.2 Summary of the findings

The study was conducted to assess the health-related fitness status of pupils in day and boarding schools aged between 6 and 9 years in Mukono and Wakiso districts in central Uganda. The study compared the health-related fitness of pupils with respect to type of school and gender. The study further examined the pupils' level of involvement in physical activities and the common types of physical activities they engaged in.

To attain the purpose of the study, objectives were designed and the following hypotheses and research questions were formulated:

$H0_1$ There would be no significant difference in cardiovascular endurance between day and boarding primary school pupils.

$H0_2$ There would be no significant difference in body composition between day and boarding primary school pupils.

$H0_3$ There would be no significant difference in low back flexibility between day and boarding primary school pupils.

$H0_4$ There would be no significant difference in abdominal muscular strength/endurance between day and boarding primary school pupils.

$H0_5$ There would be no significant difference in the health related fitness status of boys and girls.

The following research questions guided the study:

1. What is the health-related fitness status of the pupils in Mukono and Wakiso districts?
2. How do pupils in day schools get to and from school?
3. What physical activities do pupils engage in before, during and after school?
4. What common physical activities do pupils engage in during weekends?

Data was collected through field tests that were conducted on each health-related fitness component namely, cardiovascular endurance, low back flexibility, abdominal muscular strength/endurance and body composition. The test scores recorded were used to determine the fitness status of the cohort using the AAHPERD (1980) age and gender percentile norms for cardiovascular endurance, low back flexibility and abdominal muscular strength/endurance. For body composition, anthropometric data for height and weight was taken from which BMI was computed by dividing weight in kilograms and height in meters squared (kg/m^2). The pupils were classified under four weight categories determined by the WHO (2007) CDC percentile norms. Data about the physical activities pupils in day schools engage in were obtained from the pupils and the directors of studies. For pupils in boarding schools, data was collected from matrons and directors of studies.

Data obtained were descriptively analysed using frequencies, percentages, means and standard deviations. Inferential statistics using one-way analysis of variance (ANOVA) was also employed to analyse the hypotheses. The null hypotheses were accepted or rejected at $p \leq 0.05$ alpha level.

The following are the major findings on the differences in the health-related fitness status of pupils in day and boarding schools; the differences between boys and girls; comparison of the fitness status with the established percentile norms and the level of pupils' engagement in various physical activities.

5.2.1 Findings on the difference in health-related fitness status of pupils in day and boarding schools

Study findings reveal that there is a significant difference in cardiovascular endurance fitness between pupils in day and boarding schools. More pupils in day schools had an acceptable cardiovascular endurance fitness compared to their counterparts in boarding schools. Secondly, there is a significant difference in the body composition of pupils in day and boarding schools. There were more pupils in day schools that had lower BMI (less body fat) than in boarding schools. The study also reports cases of underweight, overweight and obesity among the pupils. The study findings indicate a significant difference in abdominal muscular strength/endurance between pupils in day and boarding schools. There were more pupils in boarding schools with strong abdominal muscles than those in day schools. However, the study reveals no significant difference in low back flexibility between pupils in day and boarding schools. This implies that pupils in day and boarding schools were equally flexible.

5.2.2 Findings on the difference in health-related fitness status of boys and girls

The study indicates a significant gender difference in cardiovascular endurance, body composition, abdominal muscular strength/endurance and low back flexibility among pupils in Mukono and Wakiso districts. Boys had significantly higher cardiovascular endurance fitness and stronger abdominal muscles than girls. On the other hand, girls had significantly higher BMI (more body fat) and were flexible than boys.

5.2.3 Findings on the fitness status of pupils

The results of the study indicate that majority of pupils met standards set by the AAHPERD (1980) percentile norms with respect to cardiovascular endurance fitness. However, majority of pupils did not meet the standards set by AAHPERD (1980) percentile norms with respect to low back flexibility and abdominal muscular strength/endurance. The majority of pupils had a normal weight, although there were cases of underweight, overweight and obese pupils classified according to WHO (2007) CDC BMI age-sex specific percentile norms.

5.2.4 Findings on the level of engagement in physical activity

The study reveals that majority of pupils met the recommended 60 minutes of daily physical activity through engaging in a variety of physical activities before, during and after school. All schools that participated in the study PE was scheduled on the time table although some schools did not teach it. Pupils utilized the time for free activity to engage in various types of physical activities and boys engaged in more vigorous activities than girls. However, the type of physical activities that most pupils engaged in

were not adequate enough to enable them meet the recommended standards set by AAHPERD (1980) especially with regard to abdominal muscular strength/endurance and low back flexibility.

5.3 Conclusion

Based on the findings of the study, it can be deduced that most pupils aged between 6 to 9 years in Mukono and Wakiso districts demonstrated poor health-related fitness status especially with respect to abdominal muscular strength/endurance and low back flexibility. Secondly the activities that pupils engaged in are not adequate enough to develop their abdominal, low back and hamstring muscles. There is therefore a need to develop or improve pupils' fitness status so that they meet the acceptable levels of fitness. Intervention strategies need to be devised that will improve pupils' fitness status and safeguard them against preventable diseases and conditions that may threaten their health.

5.4 Recommendations

Based on the findings of this study, the following recommendations that have implications for practice, policy change as well as further research, are made.

5.4.1 Recommendations for practice and policy change

The Ministry of Education and Sports needs to ensure that Physical Education is taught in all schools to enable pupils have an opportunity of attaining the desirable fitness status. More physical activities that develop and improve of all health related fitness components

should be incorporated in PE curriculum. Furthermore, the PE content should constitute activities that promote life long activity and may be used by the pupils to maintain fitness now and even during adulthood. This requires the ministry to provide national standards for quality PE curricula that guide implementers in developing physically fit pupils.

In addition, the Ministry of Education and Sports should ensure that PE teachers conduct regular health-related fitness tests to evaluate pupils and keep record of their progress. The records they obtain from the testing may help them in designing necessary interventions.

The Ministry of Education and Sports should ensure that school teachers restrain from behaviours that negatively affect pupils' health-related fitness status especially their low back flexibility. For instance, simple stretching exercises should be integrated within the teaching of academic subjects to regulate the long hours of sitting.

The Ministry of Education and Sports must also ensure that pupils are fed well to ensure their growth and development since this ultimately affects both their physical and mental fitness.

The society needs to be sensitized on the values and the long term benefits of including PE in school curriculum. Local authorities like city, municipal or town councils should provide safe and well-maintained parks and recreational centres for children lacking adequate space to play from at home. This will give opportunity to children to engage in

outdoor activities. To influence children in adopting active lifestyle, parents and guardians should serve as role models by engaging themselves in active physical activity. Campaigns should be initiated to dissuade people from sedentary lifestyles that can result in preventable diseases and conditions. Such initiatives require an inter-sectoral approach where the Ministry of Health, the Ministry of Education and Sports and the Ministry of Agriculture, Gender and Community Services to work together with non governmental organizations (NGOs).

5.4.2 Recommendations for further research

A nationwide study in Uganda should be conducted to determine the health-related status of schoolchildren since findings of this study cannot be generalized to other areas in Uganda.

There is need to conduct a study to examine the interaction between age, sex and type of school (day and boarding) and their impact on the health-related fitness status of schoolchildren.

There is also a need to conduct a comparative assessment of health-related fitness status between rural and urban school children in Uganda. In addition, assessment of health-related fitness status of adolescents, youth and adults in Uganda should be carried out and a comparison done with similar populations in other related developing regions.

The study also recommends that research be conducted to establish the influence of diet on the health related fitness status of children in Ugandan. Lastly, research should be carried out to assess the prevalence of health-related fitness conditions like cardiovascular diseases, overweight, obesity, low back pain and type II diabetes among children in Uganda.

REFERENCES

American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) (1980). **Health Related Fitness Manual**. Washington, D.C.

American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) (1998). **Health Related Fitness Manual**. Washington, D.C.

America College for Sports Medicine [ACSM], (2000). **ACSM's guidelines for exercise testing and prescription (6th ed.)**. Philadelphia, PA Lippincott, Williams and Wilkens.

American College for Sports Medicine [ACSM], (2005). **Health Related Fitness Assessment Manual**. Baltimore, Lippincott, Williams & Wilkins.

Andersen, R.E., Crespo, C.J., Berlet,S.J. Cheskin, L.J., & Pratt, M. (1998). Relationship of physical activity and television watching with body weight and level of fatness among children-Results from the Third National Health and Nutrition Examination Survey. **Journal of the American Medical Association**, 279, 983-942.

Arabas, J.L., Anderson, E.P., Arabas, J.R., Arabas, C.D. & Mayhew, J.L. Estimation of VO_2max from 9-minute run performance. **Illinois Association for Health Physical Education Recreation and Dance (IAHPERD) Journal,** 29 (2). 1996. Retrieved on 14 March 2007 http://www.iowaahhperd.org/journal/j96s_run.html.

Armstrong, N. and Welsman, J.R. (2000) Maximal Oxygen Uptake, Sex, Age, and Maturity of children. PE Association Research Center. Retrieved on 12 August 2010 from http://www.sportsci.org/encyc/drafts/Child_VO_2max_Armstrong.doc

Bakibinga, P. British Broadcasting Corporation BBC documentary on Globesity on Wednesday, 25th July 2007 at 3.15 to 3.45 pm.

Bary, T., Crawford, D., Hill, M., Roberts, G., and Spence, J. (2004). **Revise for Advanced PE for Edexcel UK**. London. Heinemann.

Beashel, P. Sibson, A. Taylor, J. (2001). (eds) **The World of Sport Examined**. London. Nelson Thornes.

Bender, J.M., Brownson,R.C.,Elliot,M.B. and Haire-JoshuaA.L.(2005). Children's Physical Activity: Using Accelorometers to Validate a Parent Record in Medicine and Science in Sports and Exercises. **Official Journal of the ACSM**, 35 (8), 1409-1413.

Bessesen, D.H., and Kushner, R. (2002). **Evaluation and Management of Obesity**. Philadephia: Hanley and Belfus.

Bourchard, C. and Shephard, R.J. (1994) in Tammelin, T. Physical Activity Adolescents to Adulthood and Health-Related Fitness at Age of 31. Cross-sectional and Longitudinal Analyses of the Northern Finland Birth Control of 1966. Oulu University. Retrieved on 16 July 2007 from http://herkules.oulu.fi/isbn951427233/html/index.html.

Brunet, M., Chaput, J. P. and Tremblay, A. (2007). The association between low physical fitness and high BMI/WC is increasing with age in children: The 'Quebec en Forme' Project. **International Journal of Obesity**. 31 (4) 637-643. retrieved on 17 July, 2008 from http://www.nature.com/ijo/journal/v31/n4/abs/0803448a.html.

Bungum, T.J. and Vincent, M. L. (1997). Determinants of physical activity among female adolescents. **American Journal of Preventive Medicine**, 13, 115-122.

Cherubini, J. (2008). Principles of Physical Conditioning and Training. Retrieved on October, 2008 from http://www.HRF.org./home.

Clarke, H. and Clarke, H, D. (1987). **Application of measurement of Physical Education**. New Jersey: Prentice-Hall Inc.

Corbin, C. B., (2001). The "untracking" of sedentary living. A call for action. **Pediatric Exercise Science**, 13 (1) 347-356.

Corbin, C. B. and Dale, D. (2000). Measurement issues in assessment of physical activity in children. Retrieved on 7 July, 2007 from http://www.nsw.gov.au/...CPAH_physical_activity_measurement_in_children_byparental_self_report.

Corbin, C. B. and Pangrazi, P.R. "Physical Activity for Children: Current Patterns and Guidelines" in the President's Council on Physical Fitness and Sports. **Research Digest**. 5, (2) June 2004.

Crespo, C. J. "Physical Activity in Minority Populations: Overcoming a Public Health Challenge" in the President's Council on Physical Fitness and Sports. **Research Digest**. 6, (2) June 2004.

Davis, J. (2005). Health-Related Fitness Testing For Elementary Children. **Journal of the American College of Sports Medicine**. 37 (5), 19-24

Deckelbaum, R. J. & Williams, C. L. (2001). Childhood obesity: The health issue. **Journal of North American Association for the study of obesity.** 9, 239-243.

Dehghan, M., Akhtar-Danesh, N., and Merchant, A.T. (2005). Childhood Obesity, prevalence and prevention. **Nutrition Journal**. Retrieved on 6 June, 2008 from http://www.nutritionj.com/content/4/1/24.

Dishman, R.K., Washburn, R.A. and Heath, G. W. (2004). **Physical Activity Epidemiology**. Champaign, Illinios: Human Kinetics.

Doyle, A. (1998). The Exercise and Physical Fitness Page. George State University. Retrieved on 16 July, 2007, from http://www2.gsu/wwwfit/flexibility.html.

Duke, J. Huhman, M., and Heitzler, C. (2003). Physical activity levels among children aged 9 to 13 years: United States, 2002. **Morbidity and Mortaliity Weekly Reports**. 52(33); 785-788.

Ekeland, E., Hallard, B., Refsnes, K.A., Skroppa, A.G., Volidal, B., Oines, L. & Hagen, K.B. (1999). Are children and adolescents more physically active today than in the past? Retrieved on 10 September, 2010 from http://www.ncbi.nim.nih.gov./pubmed/10414202

Epstein (1996). Guidelines for Appropriate Physical Activity for Elementary Children. Retrieved on 7 July, 2007 from http://www.afterschoolresources.org.kernel/images/copec.pdf

Erdmann, L.D., & McMillan, C.S., (2005). Longitudinal Comparisons of 1-mileRun/ Walk Performance and Body Composition in Chronically Over-weight Children. **Journal of the American College of Sports Medicine**, 37 (5), 15-19.

Fahey, T.D., Insel,P.M. and Roth,W.T. (2003). (eds.)**Fit and Well : Core Concepts and Labs in Physical Fitness and Wellness.** Boston. McGraw Hll.

Fink, B., Neave, N. and Manning, J.T. (2003). Second to fourth digit ratio, body mass index, waist-to-hip ratio, and waist-to-chest ratio: their relationships in heterosexual men and women. **Annals of Human Biology,** 30 (6): 728-738.

Foss, L.M.,and Keteyian, J.S. (1998). **Physiological Basis for Exercise and Sports**. Massachussets: McGraw- Hill.

Fox, S.I. (2004). **Human Physiology**. (8th eds.) New York. McGraw-Hill Publishers.

Freedman, D., Dietz, W.H., Srivivasan, S.R., & Benenson, G.S. (1999). The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa Heart Study. **Pediatrics**, 103(6) 1175-1182.

Fry, A.C., Irwin, C.C., Saunders, J.P., Richey, C.M. (2005). Muscular Strength and Power in 3-7 Years Old. **Official Journal of the American College of Sports Medicine**, 37(5).

Goon, D.T., (2006). Evaluation of physical fitness and body composition of Nigerian children. Retrieved on 17 July, 2010 from http://libeser5.tut.ac.za:7780/pls/eres/wpg_docload.download_file?p_fitlename=F1386269323/TerGoon.pdf.

Goss, F., Robertson, R., Williams, A., Sward, K., Abt, K., Ladewig, M., (2003). A comparison of skin folds and leg-to-leg bioelectrical impedance for the assessment of body composition in children. **Dynamic Medicine Journal**, 15, 216- 222.

Gunstream, S.E. (2000) (eds.) **Anatomy and Physiology with Integrated Study Guide**. Boston: McGraw- Hill.

Guthold, R., Cowan,M., Auternrieth,C., Kann,L. and Riky. Physical inactivity and sedentatry behaeviour among schoolchildren: A 24-country comparison in **World Health Organisation (WHO) Report** (2009).

Hahn, W. P. (2000). **Understanding Your Health**. Boston. McGraw-Hill Publishers.

Heyward, V. H. (1998). **Advanced Fitness Assessment and Exercise Prescription**. (eds). Canada: Bugress Publishing Company.

Hui, S.C., Sum, K.W., & Morrow, J.R. (2005). Secular Changes in Health Related Physical Fitness of Primary Students in Hong Kong. **Journal of the American College of Sports Medicine.** 37 (5), 21

Honeybourne, J., Hill, M., Moors, M. (2002) **Advanced Physical Education and Sport for A-level** (2nd ed.) London. Nelson Thornes.

Insel, P.M. and Roth, W.T. (1998). **Instructor's Resource Binder to Accompany Core Concepts in Health**. (eds). California. Mayfield Publishing Company.

International Society for the Advancement of Kinanthropometry (2001). **International standards for anthropometric assessment**. Retrieved on 9 July, 2007 from http://www.toendsports.com/testing/isak/htm.

Kirya, J. (2006). "Diabetes epidemic: How safe are you?" and "Diabetes hits more children" in The New Vision, Vol.20 Wednesday, December 13, 2006. 22-23.

Kyeyune, R (2009) Challenges in Education. Retrieved on October on 19, 2009 from http://www.good.is./post/who-should-feed-hungry-school-kids.

Lance, C., Dalleck, M.S. & Kravtiz, L. The History of Fitness. Retrieved 9 July, 2007 from http:// www.unm.edc/1kravitz?Article% folder/history.html.

Lawlor, D. A., Taylor, M., Bedford, C. & Ebrahim, S., (2007).Is housework good for health? Levels of physical activity and factors associated with activity in elderly women from the British Women's Heart and Health Study. **Journal of Epidemiology and Community Health**. 56 (6), 473-478.

Le Masurier, G. C., and Tudor-Locke, C. (2003). Motion sensor accuracy under controlled and free-living conditions. **Medicine and Science in Sports and Exercise**, 36(5), 867-871.

Le Masurier, G. C. (2004) Physical Activity for Children: Current Patterns and Guidelines. President's Council on Physical Fitness and Sports **Research Digest**. 5 (2) June 2004.

Lee, S.M.; Welchester, H. and Balling. The Role of Schools in Preventing Childhood Obesity. President's Council on Physical Fitness and Sports: **Research Digest.** 7 (3) September, 2006.

Macfarlene, D. J. & Tomkinson, G.R. (2007). The evolution and variability in fitness performance of Asian children and adolescents. In G.R. Tomkinson & T.S. Olds (Eds), Pediatric fitness: Secular trends and geographic variability. **Medicine and Sport Science Series** 50, 143-167. Basel:Karger.

Malina, R. (1999). Tracking physical activity across lifespan. President's Council on Physical Fitness and Sports. **Research Digest**. 3 (14), 1-8.

Malina, R.M., Bouchard, C. and Oded Bar-Or. (2004). **Growth, Maturation and Physical Activity.** USA. Human Kinetics.

Mallo, J.K. (2004). Obesity and factors that contribute to obesity among pre-adolecsents attending day private primary schools in Nairobi. Unpublished Masters dissertation, Kenyatta University.

Marrow, J.R., Jackson, A.W., Disch, J.G. and Mood, D.O. (2000). **Health at work: Fitness Self-Assessment.** Boston. Human Kinetics.

Marchione, M., (2005). Too fat to fight? Obesity takes a heavy toll on the military. Associated Press, p.1. Retrieved May 19, 2006, from http://www.ap.org.

McArdle, W.D., Katch, F.I. and Katch, V.L. (2000) **Essentials of Physiology**: (2nd ed) Philadephia, PA; Lippincott Williams & Wilkens.

McCallister, (2004). Days of rest between stretching bouts increased hamstring flexibility **Journal of Athletic Training Supplement** 39 (2).99-100. Retrieved on November 10, 2008, from http://www.exrx.net/ExInfo/Strecthing .html.

Ministry of Education & Sports. (2006). **Education Abstract**. Kampala: Ministry of Education & Sports.

Monyeki, M.A., Koppes, L.L.J., Kemper, H.C.G., Monyeki,K.D., Toriola, A.L., Pienaar, A.E. and Twisk, J.W.R. (2005). Body composition and Physical Fitness of undernourished South Africa rural primary school children. **European Journal of Clinical Nutrition.** 59 877-883. Retrieved on 10 November, 2009 from http://www.dol:10.1038/sj.e.jcn.1602153.

Myers, M. D. (2004). Objective medical information on obesity, weight management, eating disorders and related topics. Retrieved on 13 July 2007 from http://www.weigh.com/defin.asp.

Nabadda, M. (2002). Life Long Physical Activities For Better Health. Unpublished Paper presented in Kyambogo University, Kampala.

Namutebi, J. "Uganda Health Records Improve" The New Vision. Retrieved on 23 July, 2007 from http://www.newvision.co.ugp/812/555402.

National Academic Press (NAP). Committee on Evaluation of Children's Health. National Research Council: Retrieved on May 28, 2007 from http://www.napedc/catalog/10886.html.

National Association for Sport and Physical Education (NASPE) (2004). **Moving into the Future: National Standards for Physical Education** (2nd ed). Retrieved on 15 September, 2008 from http://www.aapherd.org/naspe/standards/national standards/PEstandards.cfm.

National Center on Physical Activity and Disability (NCPAD): **Exercise/Fitness: Assessing Your Child's Health Health-Related Fitness.** Retrieved on 24 April, 2008, from http://www.ncapd.org/exercise/fact- sheetphp?sheet=1028view=9.

National Institute of Low Back Pain [NILBP](2008). Low Back Factsheet. Retrieved on 10 November, 2008 from http://www.ninds.nih.gov/disorders/backpain/detail_backpain.html.#119423102.

Natukunda, W. "Exercise Boosts Brain Records Improve". The New Vision. Retrieved on 17 July, 2007, from http://www.newvision.co.ug.

Nsibambi, C. N., Waiswa, A., Mukiibi, B. C., Soita, P.W. (2005). **Theory and Foundations of Physical Education and Sports.** Teacher Education Self-Study Materials for Diploma in Education Primary External (DEPE) Programme. Physical Education Module, DPEP/1. Kampala: Intersoft Business Services.

Onywera, V.O., Adamo, K.B., Sheel, A.W., Boit, M.K., Waudo, J.N., and Tremblay, M.S.(2010) Emerging evidence of the physical activity transition in Kenya. **Journal of Physical Activity and Health**. Champaign. Human Kinetics.

Oso, W.Y. & Onen, D. (2005). **A General Guide to Writing Research Proposal and Report**. Kisumu: Options Press and Publishers.

Padilla, J., Wallace, J.P. and Parks. (2005) Accumulation of Physical Activity reduces Blood Pressure in Pre- and Hypertension in **Medicine and Science in Sports and Exercise**. 1264-1275.

Pate, R.R. and Shephard D.J.(1989). Characteristics of physical fitness in youth. In Gisolfi, C.V. and Lamb, D.R. Perspectives of Exercise Science and Sports Medicine. **Youth, Exercise and Sport** 2, 1-46. Indian Polis. Benchmark Press.

Payne, W. A. & Hann D.B. (2002). **Understanding Your Health**. Boston. McGraw Hill.

PE and Fitness. Retrieved on July 23, 2007, from http://wwww.bbc.co.uk/schoolgscbite/pe/fitnessv4.html.

Prentice, A. M. (2006). The emerging epidemic of obesity in developing countries. **International Journal of Epideomology,** 35, 93-99.

President's Council on Youth Fitness (PCYF). Retrieved on July 6, 2007 http://www.presidentschallenge.org/misc/new_research/press.

Prista, A. (2000) Growth, Physical Fitness and Nutritional status of Mozambican children and youth: Summary of findings. **African Journal for Physical, Health Education, Recreation and Dance** (AJPHERD) Suppl.(October) 77-79

Prista, A. Maia J.A.R., Damasceno, A., Beunen, G. (2003). Anthropometric Indicators of Nutritional Status: Implications for Fitness, Acitivity and Health in School-age Children and Adolscents from Maputo, Mozambique. **The American Journal of Clinical Nutrition.** 77(4), 952-959.

Ridgers, N.D., Stratton, G. and Fariclough, S (2005). Physical Education in America's Public Schools: PE and school performance. Retrieved 7 July, 2007 from http://sitemaker.umich.edu./356.speregen/physical_education_andschool_performance.

Rosser, M. (2005). (eds.) **Body Fitness and Exercise; Basic Theory and Practice for Therapists**. London. Martin the Printers Ltd.

Rowland ,T. W. (1996). **Developmental Exercise Physiology**. Champaign, IL. Human Kinetics Publishers.

Rowland, T., Goff, D., Martel, L. and Ferrone, L. (2000). Influence of Cardiac Functional Capacity on gender differences in maximal oxygen uptake in children. **Chest Journal.** 117(3).629-635.

Rubahamya, J. B. (2003). **UACE Biology Revision Notes for "A" Level.** Vol. 2. Kampala: Makerere University Printery.

Ruiz, J.R., Ortega, F.B., Gulierrez, A., Sjostrom, M. and Castillo, M.J. (2006). Health-related fitness assessment in childhood and adolescence: A Eurpoean approach based on the AVENA, EYHS and HELENA studies. **Journal of Public Health.** 14, 269-277. Retrieved on 14th May, 2007 from http://www.eufic.org/article/en/diet-related-diseases/cardiovascular/artid/Teen-fitness-Europe.

Rukiya, I. (2004, September 20). "How and What To Eat" – Your Health. **Procurement News.** Kampala. Kampala Printery.

Sallis, J.F., McKenzie, Alcarazje (1993). Habitual physical activity and health-related physical fitness in fourth grade children. Retrieved on 12 August 2010 from http://www.ncbi.nih.gov.pubmed/8352224.

Schneider, P.L., Crouter, S.E., Lukajic, O., and Bassett, D.R., Jr. (2003). Accuracy and Reliability of 10 pedometers over 400-m walk. **Medicine and Science in Sports and Exercise**, 35(10), 1779-1784.

Shaw, N.J., Crabtree, N.J., Kibirige, M. S., and Fordham, J.N. (2007). Ethnic and gender differences in body fat in British schoolchildren as measured by DXA. London.

Stewart, J.A., Dennison, D.A., Kohl, H.W., & Doyle, A (2004). Exercise level and energy expenditure in the Take 10! in-class physical activity program. **Journal of School Health**, 74(10), 397-400.

Strauss, R. S., & Pollack, H.A. (2003) Social Marginalisation of Over-weight Children. **Archives Pediatric and Adolescent Medicine**, 157, 746-752.

The Sports Fitness Advisor. How to Calculate Body Fat… The Best and Worst Techniques. Retrieved on 16 July, 2007, from http://www.sport-fitness-advisor./calculatebodyfat.html.

The President's Challenge Physical Activity & Fitness Awards Program. **Get Fit and Be Active. A Handbook for Youths Ages 6-17.** Retrieved on 7 July 2007 from http://www.presidentschallenge.org..

Tomkinson, G.R., and Olds, T.S. (2007). Secular changes in aerobic fitness test performance of Australasian children and adolescents. In G.R. Tomkinson and T.S. Olds(Eds), Pediatric fitness: Secular trends and geographic variability. **Medicine and Sport Science Series**. 50, 168-182. Basel:Karger.

Topendsports (2008). **Fitness Testing: Rob's Home of Fitness Testing**. Retrieved on 27 April, 2008 from http://www.topendsports/com/testing/guide_interpret.htm.topendsports.com.

Toriola, A.L. (2002).Promotion of Physical Activity: Health and Wellness in the Third Millenium: Focus, Directions and Misdirections. Unpublished inaugural lecture presented in Technikon, Pretoria.

Trost, S.G., Pate, R.R., Dowda, M., Ward, D. S., Felton, G., & Saunders, R. (2002). Psychosocial correlates in physical activity in white and African-American girls. **Journal of Adolescent Health**, 31, 226-233.

Turley, K.R., and Wilmore, J.H. (1997) Cardiovascular responses to sub maximal exercise in 7- to 9- year old boys and girls. **Medicine and Science in Sports and Exercise**. 29, 824-832. Retrieved on 14 October 2010 from http://chestjournal.chestpubs.org/content/117/3/629.full.

Twisk, J.W.R. (2001) Physical activity guidelines for children and adolescents: A Critical view. **Sports Medicine**. 31 (8): 617-627.

United States Department of Human and Health Services [USDHHS], (1996). **Surgeon's General on Physical Activity and Health.** The President's Council on Physical Fitness and Sports. Retrieved on 17 July, 2007 from http://www.fitness.gov/digest_mar 2000.htm.

United States Department of Human and Health Services [USDHHS] (2000). **Healthy People 2010: Understanding and Improving Health Objectives for Improving Health.** Part A. Focus Area 1-15. Washington, DC: US Government Printing Office. Retrieved on 17 July, 2007 from http://onlinelibrary.wiley.com/o/cochrane/clsyrey/articles/CD006936/bibliograpy.html.

Vincent, S. D., and Pangrazi, R. P. (2002). An Examination of the activity patterns of elementary school children. **Pediatric Exercise Science**, 14 (4), 432-452.

Wanjiku, K. J. (2008). Prevalence of Obestiy Among Primary School Children In Nairobi Province, Kenya and effect of Aerobics in its Management. Nairobi: Unpublished Doctorate Thesis. Kenyatta University.

Welk, G.J., Corbin, C.B. and Dale, D. (2000). Measurement Issues in the Assessment of Physical Activity in Children. **Research Quarterly for Exercise and Sport**, 71(2) 59-73.

Wikipedia. Map of Uganda (2010). Retrieved on 20 August, 2010 from http://www.ugandatravelgiude.com/uganda-map.html.

Wikipedia. Districts of Uganda. Retrieved on 20 August, 2010 from http://www.en.wikipedia.org/wiki/Districts_of_Uganda

Williams, C.L. (2002). Cardiovascular Health in Childhood. A Statement for Health Professionals from the Committee on Atherosclerosis, Hypertension and Obesity in Young (AHOY) of the council on CVD. **Young American Heart Association Circulation.** 106; 143. Retrieved on 7 July, 2007 from circ.ahajournals.org/cgi/content/full/106/1/143.

World Health Organisation [WHO] (1998). Life in the 21st Century: A Vision For All. Retrieved on 7 July, 2007 from http://www.who.int/whr/1998/en/index.html.

World Health Organisation [WHO] Report. (2005). Make every mother and child count. Retrived on 7 July, 2007 from http://www.who.int/whr/2005/en/index.html.

World Health Organisation, (2007). BMI for age percentile ranks. Retrieved 14 November, 2008 from www.channelnetwork.com.com/teacher/articles/2007/11/10/clinton/tips 08 pdf.

Youth Media Campaign Longitudinal Survey of Center for Disease Control [YMCLS of CDC] (2002). Physical Activity Levels Among Children Aged 9-13 Years. Retrieved on 6 June, 2007 from http://www.cdc.gov/youthcampaign/research/ymcls.htm.

APPENDIX I

FITNESS PERFORMANCE ASSESSEMENT CHART

Instruction: Tick whenever applicable

Section A: Demographic data

ID No. ---------- CLASS: P -----

AGE(years) : 6 ☐ 7 ☐ 8 ☐ 9☐

SEX: boy ☐ girl ☐

Where do you live: ----------

1a) Any particular medical condition recorded? YES ☐ NO☐

b)If YES, what it is? .....

2a) Any form of medication required to take? YES ☐ NO☐

b) If YES, what it is?

Section B: Physical activities done

3) How do you normally get to school? Walk ☐ Car ☐ Taxi ☐ Motorcycle ☐
(for day scholars)
4) What do you do during break time? .....
5) Do you have classes after lunch? Yes No

6) If yes, what do you do during lunch time after eating? .....

7a) I do housework at home or house Always ☐ Sometimes ☐ Rarely ☐ Never ☐

b) If yes, give 2 housework activities you often engage in
i).....ii).....

8) Mention 2 games you enjoy playing i)..... ii).....
9) What else do you do at home before it gets dark?

THANK YOU

APPENDIX II

FITNESS TESTING PROCEDURE

1. Body composition determined by body mass index (BMI)

A measuring tape was used to measure the height in meters of the pupils and a weighing scale was used to measure the weight in kilograms. The weight was divided by the height squared. The result for each pupil was compared with the WHO (2007) CDC-BMI for age and growth charts for girls and boys.

2. Cardiovascular endurance

Pupils were instructed to run as far as possible in nine minutes. On the signal "ready" the whistle was blown and pupils begun to run on a green, safe and demarcated track field. They continued to run and verbal encouragement was given to go on until the whistle was blown at the ninth minute. Walking was allowed but the objective was to cover as much distance as possible during the nine minutes. The distance covered was later recorded to the nearest 10 meters on the data entry form.

3. Low back flexibility

The sit-and-reach test was used to measure the low back and hamstring flexibility. The pupil sat on the floor with legs out straight ahead. Feet (shoes off) were placed against the box. Both the knees were held flat against the floor. The feet were approximately shoulder-width apart such that a tape measure was equidistance between the feet. The arms were extended forward with one hand placed on top of the other. The pupil leaned forward slowly as far as possible, palms facing down and held the greatest stretch for one

second. The researcher and the assistants made sure that there were no jerking movements and that the fingertips remained level and the legs flat. The best of the three trials was recorded in centimeters on the data entry form as the best and final score.

4. Abdominal muscular strength/endurance

Each pupil performed as many modified sit-ups as she or he can in one minute. The pupil removed the shoes and laid on the back, knees flexed (90 degrees) and feet held flat by the researcher on the mat placed on the ground. The arms of the pupils were crossed on the chest so that the hands rested on the opposite shoulders. The heels were about thirty centimeters from the hips. The pupil was on the back until the mid-back touched the ground. Then rolled up and touched the elbows to the knees with the elbows. To complete the sit-up the pupil was expected to return to the down position until the mid-back made contact with the testing surface. A stopwatch was used and the number of correctly performed sit-ups in one minute were counted and recorded on the data entry form.

APPENDIX III

DATA ENTRY FORM

ID No.....

Body composition/Percent body fat

Height (cm) ..... Weight (kg) .....

Cardiovascular endurance

Distance covered in 9 minutes ... . in meters

Low back flexibility

Sit-and-reach (cm)

First trial: ..... Second trial: ..... Final trial: ..... Best: .....

Abdominal muscular strength/ endurance

Modified Sit-Ups: Total counts ..... in 60 seconds

Research Assistant

Name:

Signature:

Telephone No.:

Date:

APPENDIX IV

QUESTIONNAIRE FOR THE MATRONS

An important study to assess the health-related fitness of schoolchildren in this district is going to be carried out and your school has been randomly selected to represent the district. The information you give will be confidential and there is no need for personal identification.

School : ..... District ..... ID.....

Instruction: Please answer all the questions.

1. What time do children wake up in the morning? .....am

2 a) Are there major activities/housework that they do before they go for classes in the morning? include the time scheduled for each activity

If YES, state them i).....ii).....iii).....

3) Do you ensure that every pupil participates in these activities?

If YES, how do you do it?

4 a) Name two common physical activities that pupils do after school

i)..... ii).....

b) For how long do each these activities last?
i) ..... minutes ii).....minutes.

5. Are there scheduled physical activities that pupils engage in during weekends?
If YES, name them starting with the most common and the time each of them lasts.
On Saturday i).....ii).....iii).....
On Sunday...i).....ii).....iii).....

6.Do you provide entertainment programmes during free time, outside classroom hours?
If YES, state four common programmes in order from the most common.
i)..... ii) .....
iii) ..... iv) .....

THANK YOU

APPENDIX V

QUESTIONNAIRE FOR DIRECTORS OF STUDIES

An important study to assess the health-related fitness of schoolchildren in this district is going to be carried out and your school has been randomly selected to represent the district. The information you give will be confidential and there is no need for personal identification.

School ID …….. District …… ID ……

Instruction: Please answer the questions and where applicable tick the best alternative.

1. At what time do classes begin? ……..am

2. How long is the break time? ……..minutes
3. What common activities do pupils engage in at break time?
   Boys i)……ii)…… Girls i)……..ii)……

4. Is PE taught in this school? ……..
   If NO, state two reasons.

5. If YES, how long does the PE lesson last for:
   P1……minutes P2……minutes P3 ……minutes

6. How many lessons are scheduled for PE in a week for each class?
   P1 ……. P2 ……. P3 ……..

7. Are there physical activities pupils engage in outside classroom but during school time (co-curricular activities)?
   a) If YES, name 3 of them. i…… ii…… iii……

   b) How often are these activities scheduled in a week?
   5 days ☐ 3-4 days ☐ 1-2 days ☐

   c) For how long does each activity last? ……
   less than 30 min☐ about 30 min☐ one hour☐ more than one hour☐

8) When do classes end?
   P1 ……..pm P2 ……..pm P3……..pm P4 ……..pm

9) Classes conducted over the weekend? Always ☐ Sometimes ☐ Rarely ☐ Never ☐

10) Pupils are given weekend home work Always ☐ Sometimes ☐ Rarely ☐ Never ☐

THANK YOU

APPENDIX VI

KENYATTA UNIVERSITY
DEPARTMENT OF EXERCISE, RECREATION AND SPORT SCIENCE

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20th May 2008

To Whom It May Concern

Dear Sir/Madam,

INTRODUCTION OF DOCTOR OF PHILOSOPHY (PhD) RESEARCH STUDENT

The bearer of this letter, **Ms. Constance Adron Nakayiza Nsibambi** is a PhD research student (Reg. No. I84/10304/06) in this Department.

She is conducting research on her PhD in Sports Science entitled, ***"THE ASSESSMENT OF HEALTH-RELATED FITNESS OF 6 TO 9 YEAR OLD PRIMARY SCHOOL PUPILS IN WAKISO AND MUKONO DISTRICTS, CENTRAL UGANDA"***

The purpose of this letter is to introduce to you the student and request you to assist her conduct research in your organization.

Looking forward to your cooperation,

Yours faithfully,

Dr Mwangi P Wanderi
Chairman,
DEPT. OF EXERCISE, RECREATION AND SPORT SCIENCE

KENYATTA UNIVERSITY
FOR...
2 6 ... 2008
P O Box 43844, NAIROBI

APPENDIX VII

Telegram: "EDUCATION"
G/Line: 234451/4
Fax: 234920

In any correspondence on
This subject please quote No ADM/55/153/01

THE REPUBLIC OF UGANDA

Ministry of Education and Sports
Embassy House
P.O. Box 7063
Kampala, Uganda

27th May, 2008

TO WHOM IT MAY CONCERN

Dear Sir/Madam

RE: INTRODUCTION OF A RESEARCHER

The bearer of this letter, Ms. Constance Adron Nakayiza Nsibambi is conducting a research entitled "***The Assessment of Health –related Fitness of 6-9 year old Primary School Pupils in Wakiso and Mukono Districts, Central Uganda***".

The purpose of this letter is to allow her use your school as part of the study area.

Your co-operation will be highly appreciated.

Yours faithfully

Resty Muziribi
For: PERMANENT SECRETARY

CONSENT LETTER FROM THE HEAD TEACHER

With reference to the letter dated 27th May 2008 from the Ministry of Education and Sports about a study entitled **" Assessment of Health-related fitness of 6-9 year old primary pupils in Wakiso and Mukono districts, central Uganda"** I hereby grant you permission to use the pupils in this school as part of your study. The research procedure has been explained and the tests do not involve injury risks or torture to the pupils.

By this permission you are to:

i) conduct the research on..... day .....month .....year beginning at 7.00 am or 7.30 am.

i) carry out only those exercises stipulated in the attached letter describing the activities and ensure the safety of the pupils.

ii) ensure utmost confidentiality with respect to the data you obtain from all the respondents you are going to use in the data collection.

Head teacher

Date----------