UNIVERSITY OF EDUCATION, WINNEBA

AN ASSESSMET OF HEALTH-RELATED FITNESS LEVELS AMONG STUDENTS OF SENIOR HIGH SCHOOLS IN ADA OF GREATER ACCRA REGION OF GHANA

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DECLARATION

STUDENT'S DECLARATION

I, Albert Anyetei Ayeng, declare that this Thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my original work, and has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE…….

DATE…….

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidance for supervision of Thesis as laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: Dr. P.B AKUFFO

SIGNATURE: ……..

DATE: ……

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I wish to thank, Noah, Adiaba, Bruno, Reggie, Abeiku and Irene for their support and suggestions. I am thankful for my entire family: Thank you for your support while I pursued this degree.

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DEDICATION

I dedicate this work to little Philemon Nii Nai Ayeng

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ABSTRACT

The fitness level of students from three Senior High School in the Dangme East of the Greater Accra Region was checked. The researcher used the test items of the Prudential Fitnessgram to carry out this assignment. Out of a population of 1,050 who were between the ages of 15 and 16 in the three Senior High School, a sample size of sixty was selected through the random sampling technique. Each School was represented by ten boys and ten girls. Each subject was physically tested on each of the five components of fitness. Muscular endurance and strength, cardiovascular endurance, body composition and flexibility. Three days were used in each school for the test. Flexibility and body composition were catered for in day one followed by muscular strength and endurance the second day then one kilometer run completed the test. Quasi-Experiment which learns itself to this kind of research was what the researcher employed. Data collected was analyzed. The mean and the standard deviation for the population and for each health-related component were determined. A fitnessgram was then established according to their performance. The researcher compared the strength and weakness of the students established fitnessgram. It was recommended that students should be encouraged to participate in regular physical education activities and the benefits of participation in such activities made known to them. Health-related fitness assessment should be made a regular feature of the Public School Programme. It was also suggested that other researchers in Ghana be made to research into the topic in other parts of the country so as to build a national Health-Related fitness Norms and HFZ levels for Ghanaian Students.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The primary aim of physical education in schools is to make students physically fit, mentally alert, socially wholesome and emotionally sound. In view of this, students are exposed to a wide range of activities, exercises, situations and responses to develop. The United Nations Educational Scientific and Cultural Organization (UNESCO) (1978) charter on physical education and sports considers physical education as a fundamental human right for all people irrespective of colour, race, or nationality to promote good health. Fitness in this context includes emotional, mental, spiritual and social fitness as well as physical fitness.

Today everybody is concerned with total fitness, especially physical educators. Physical fitness according to Miller (1994) is the capacity for sustained physical activity without excessive fatigue or as the capacity to perform everyday activity with reserve energy for emergency situation. By this definition, many persons, especially students, incorrectly classify themselves as physically fit. It is especially, incorrect to accept this definition when the relation between inactivity and health are considered. Some individuals consider physical fitness synonymous to cardiorespiratory fitness whereas other groups limit their perception of physical fitness to muscular strength and endurance. Generally, there are two types of physical fitness:

- Health-related fitness
- Skill-related fitness

Health –related physical fitness includes cardiorespiratory fitness, muscular strength, muscular endurance, flexibility and body composition. It means the organic systems of the body are healthy and function efficiently, so you are able to engage in vigorous tasks and leisure activities. It exerts a positive influence on several risk factors associated with cardiovascular diseases, and it is effective in reducing the risk of back pain, diabetes. Osteoporosis and obesity. Health –related physical fitness enables you to look better and enjoy a healthy, happy and full life (Pate and Hohn, 1994)

Schools have an important role in physical activity and health promotion but little is known about how well this role is being played. There is simply very little data on fitness assessment in our schools. Very often, physical education programmes in our schools turn to favour athletes who are to participate in intramural and extramural games. As a result, many students and teachers have conceptualized physical education to mean sports play and athletics. Hence .many athletes fail to continue an exercise programme after they cease to participate in sports.

The incorporation of regular physical exercises into our school curriculum and our lifestyles has the potential not only to reduce the cost and suffering caused by inactivity but also to improve the quality and enjoyment of life of the participants. Hundreds of research studies gives us the latest standards for the ideal amounts of physical activity that is, 30minutes of moderate intensity physical activity on most if not all days. Activities such as walking at a pace of three miles per hour for 30 minutes, riding a bike for 45 minutes, running for 20

minutes, etc, can all be interwoven throughout the week in order to achieve health benefits from physical activity (Surgeon General‟s Report on health, 2000).

A recent physical activity and health report of the Surgeon General (1996) emphatically states that regular physical activity preferably performed daily will reduce one‟s risk of developing or dying from heart – related disease. Regular and vigorous daily activity increases muscle size, strength and power and develop endurance for sustaining work, and tasks the cardiovascular fitness that produces the quality of physical reserve, power and stamina – endurance. For example, three 20 minute sessions of physical activity per week with intensity producing a heart rate of 80% of estimated maximum will improve cardiovascular fitness (Armstrong, 1990). Evidence also demonstrates that regular exercises combat anxiety and depression (Miller 1994). It promotes psychological well – being and helps build healthy bones flexible muscles and joints (Casperson, 1998). Physical activity also influences mental health. Besides organic vigour fitness, physical activity contributes to improvement in ability, speed co – ordination and skill.

Fitness testing is an important part of any school physical education programme. It is however, difficult to establish a single test that measures all components of health-related fitness, since there is no one item that measures muscular strength, muscular endurance or flexibility. In an attempt to develop national fitness test and norms, the US President Council on Physical Fitness and Sports and AAHPERD in 1992 agreed to use one test battery to measure health-related fitness. The Prudential Fitnessgram followed this also in 1992.

1.2 Statement of the Problem

The primary aim of physical education in schools is to make students physically fit, mentally alert, socially wholesome and emotionally sound. In view of this, students are exposed to a wide range of activities to develop. However, critically observing teachers during physical education lessons, one can conclude that physical education is not being taught properly in the schools. This is because the various topics that they teach are either games or athletics related. Teachers teach the various skills related to these fields of study as directed by the syllabus. Hence the few students who are naturally inclined towards sports benefit from these teachings whilst the majority of the students are left unattended to.

It was observed that a lesson of forty-five minutes in physical education at the senior high secondary school has the following distributions of time:

- General warm-up-------5minutes
- Specific warm-up-------5minutes
- Skills practice ----------25minutes
- Game/Evaluation ------10minutes

With these physical education lessons are directed to the acquisition of skill related component of physical fitness to the detriment of health related fitness of the students which is a basic need for all.

1.3 Purpose of the Study

In view of the fact the content and nature of physical education teaching in the senior high secondary favours the development of sporting skills than the health of the participants, the purpose of this study was to find out the following:

- The health-related fitness levels of students at the senior high secondary school.
- The health-related fitness levels of boys in the senior high secondary.
- The health-related fitness levels of girls in the senior high secondary.

With guidance of the prudential fitnessgram and the information gathered on the students, another purpose was to establish a health-related fitness parameters for senior high secondary schools students.

1.4 Research Questions

The following research questions directed the research.

1. What are the physical fitness levels of the students in the Senior High Secondary School?
2. What are the physical fitness levels of boys in the Senior High Secondary School?
3. What are the physical fitness levels of girls in the Senior High Secondary School?
4. How do physical fitness levels of students in Senior High Secondary School compare with standardized level?

1.5 Significance of the Study

The significance of this study was to establish a baseline from which students could set goals and check their progress in terms of their health related fitness.

It will help students to experience and better understand the components of health-related fitness. Again it classifies students according to their ability or fitness status.

The results of the various test items would be used to identify strengths and weaknesses in individual students. A student who displays weakness in several categories may be

experiencing deteriorating weight change, a sedentary lifestyle or possibly a negative attitude towards physical activity in general. Steps could then be taken to help such student through the use of appropriate programmes.

The results of the tests would also help teachers to identify potential student athletes who are likely to succeed in various types of athletic activities. Fitness testing results will enable teachers to evaluate programme on the fitness levels of their students.

1.6 Delimitations of Study

The subjects for this study were first year students of the three Senior High Secondary Schools located at Dangme East of the Greater Accra Region, namely; Ada Senior High Secondary, Ada Technical Senior High Secondary and Ada Technical Institute.

The researcher was only interested in testing the health related components of students within the ages of 15-16 years. The activities that were chosen for the various test items include the following:

- Body mass index – body composition
- 1 kilometer run – cardiovascular endurance
- Curl – ups – muscular endurance.
- Sit and reach – muscular flexibility.
- Push – ups – muscular strength.

1.7 Limitation of the Study

The absence of reliable literature on fitness testing in Ghana led to the reliance on fitnessgram battery tests and norms as well as review of related literature based on research work done in Europe and America, especially from the Cooper Institute for Aerobic Research – Texas, USA. To this end, norms used for the Health Fitness Zone (HFZ) levels might not be appropriate for the Ghanaian students.

Apart from this, weather posed a great challenge during testing and data collection stage. Second day activities to test student in cardiovascular endurance was postponed to the next three days since that day was a Friday.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

The issue of physical fitness programme in Secondary Schools in Ghana has not been given due attention as shown by the dearth of information in this area in our schools. Physical Education is conceptualized in our schools to mean sports to the neglect of health as well as the cognitive and affective development. Information from other countries was, therefore, found useful and was reviewed as follows.

1. Meaning of fitness and health related fitness.
2. Factors that affect the physical fitness of Students.
3. Prudential Fitnessgram (2000).
4. Physical activity and health benefits.
5. Fitness surveys using the Fitnessgram.
6. Healthy Fitness Zone interpretations.
7. Physical Fitness components.
    a. Body composition.
    b. Muscular strength
    c. Muscular endurance
    d. Flexibility
    e. Cardiovascular endurance.

Fitness testing is an essential element of any health – related physical activity programme for the youth. Fitnessgram (2000) provides the physical fitness testing components that are necessary for successful health – related fitness programme. The Cooper Institute for

Aerobic Research developed the Fitnessgram exclusively for youth fitness. It is based on a solid foundation of fitness knowledge.

Physical fitness development, whether aerobic capacity, muscular strength and endurance or flexibility, follows several physiological principles of fitness.

2.2 Meaning of Fitness and Health Related Fitness

Fitness means different things to different people. More so, it is relative because fitness levels are not the same for everybody. It is related to the work one does. Fitness is a blend of a number of physical qualities (Beashel & Taylor, 1996). We all need these qualities in order to perform our daily tasks.

According to Pate (1983) and Hockey (1985), the widely accepted definition for physical fitness is the one given by Clarke. To him, physical fitness is "the ability to perform daily tasks with vigour and alertness, without undue fatigue, and with ample energy to enjoy leisure time pursuits and to meet unforeseen emergencies".

According to Bucher and Prebtice (1985), fitness is a broad term denoting dynamic qualities that allow you to satisfy your needs, regarding mental and emotional stability, social consciousness and adaptability, spiritual, moral and organic health, consistent with your heredity. Ross and Gilbert (1989) spoke of health as a mirage. You can reach for it, but never fully grasp it. Physical fitness is the same; it is not so much a possession as a procession, not so much something to have as a way to be.

Being physically fit is defined as the "ability to carry out daily tasks with vigour and alertness without undue fatigue and with ample energy to enjoy leisure and to meet unforeseen emergencies" The most frequently cited components fall into two groups.

1. Health – related fitness.
2. Skill – related fitness.

The health – related components of fitness are:

a. Cardiovascular endurance
b. Muscular endurance
c. Muscular strength
d. Body composition
e. Flexibility

Just as the amount of physical activity ranges from low to high, so does the level of physical fitness. The choice of the type of fitness one needs or wants is dependent on one"s personal philosophy of fitness. Health – related fitness components are all achievable, observable and measurable.

2.3 Factors that Affect the Physical Fitness of Students

Physical fitness is a multi – dimensional attribute. Genetic inheritance, age, morphology, nutrition, habitual physical activity, gender and general well – being are commonly cited factors influencing physical fitness status (Goslin and Burden, 1986). These factors are intricately associated with the physical fitness characteristics, such as strength, endurance, flexibility, speed, agility, co – ordination and balance, which are basic components of competitive sports performance.

Environmental factors such as adequate rest, proper diet, proper room ventilation, sanitation, family support and influences, facilities for training, time and physiological factors, greatly affect one‟s physical fitness status in life and affect lifestyle behaviours. Malina (1996) and Gooding and Shepherd (1990) also concluded that experience in physical activity early in childhood is important because it positively influence attitudes and current habits.

Research has shown that factors associated with exercise drop – out can be grounded into two.

a. Those relating to the situation.
b. Those relating to the participant (Mutrie, 1987)

Situation Factors

Situation factors include proximity of the sports centre to the subject with an inverse relationship between distance and adherence. They also include intensity and duration of workout session, poor scheduling of programmes and ineffective communications. Dropout rate increases as all of these variables increase (Pollock & Gateman 1990).

Participants Factors

The most consistent factors associated with exercise drop – out, include work status, self – motivation and social reinforcement. The most common reason for dropping out or not starting an exercise programme is lack of time due to academic work. Others include childhood socialization, social attitudes towards exercise, fear of violence, gender role expectations and discrimination issues (Hedges, 1999). Another common barrier for the sedentary life is that students perceive themselves as getting exercise already. Inconvenience

associated with exercise programmes (disrupting of normal routines, interference with family and friends) consistently explains much of the lack of exercise compliance.

2.4 The Prudential Fitnessgram (2000)

The Prudential Fitnessgram (2000) is a comprehensive fitness programme for school – aged children and youth. It consists of a health – related fitness assessment tests and standards to determine who is fit according to the Healthy Fitness Zones. The fitnessgram measures the components of physical fitness which have been identified as being important because of their relationship to overall health and optimal function. The components are aerobic capacity, body composition, muscular endurance, strength and flexibility. Several test options are provided for each area with one test item being recommended. The fitnessgram is a more effective fitness test for the youth

First, it compares scores to carefully researched and developed health standards, rather than to state averages. By using these standards called Healthy Fitness Zones, the test administrator knows without a doubt whether a child meets the minimum recommendation for being fit on each test item. Second, it emphasizes measures of physical fitness instead of performance of physical or sports – related skills. Third, it goes beyond measuring fitness to recommend physical activity programme option that will help students make it into the Healthy Fitness Zones for those areas where they need improvement.

The fitnessgram was developed by the Copper Institute for Aerobic Research, Texas – Dallas. It has been in use for more than ten years. The Fitnessgram provides everything you need to accurately assess a student‟s fitness levels and identify individualized approach to improve physical fitness. Underlying the fitness standards and fitness zones is the premise

that there is an association between good health and fitness, flexibility, muscular endurance and strength and body fat (may decrease the risk of some diseases).

2.5 Physical Activity and Health Benefits

Physical fitness is a related construct and it is also often assumed that the more habitual and active one is the more fit he is likely to bet and that the relationship is casual (Corbin and Pangrazi 1996, Livingstone, (1994).

Physical activity and physical fitness occur within the context of lifespan transitions and cannot be viewed in isolation. Physical activity refers to any body movement produced by the skeletal muscle and resulting in a substantial increase over the resting energy expenditure (Bouchard Shepherd and Stephen, 1994). Physical fitness in contrast is an adaptive state that is a response to a variety of environments. The concept of physical fitness evolved from a primary motor and strength focus (Performance – related) to a health – related focus. The increased energy expenditure that accompanies regular physical activity contributes to more efficient functioning of the various systems, weight maintenance, reduced risk of several degenerative diseases, reduced risk of mortality and overall improvement of quality of life (Bouchard, Shepherd & Stephen, 1994). Habits, lifestyle behaviour and attitudes towards physical activity developed during childhood are assumed to continue through adolescence into adulthood (Livingstone, 1994).

A recent physical activity and health report of the Surgeon General (1996) emphatically states that regular physical activity preferably performed daily will reduce one‟s risk of developing or dying from heart – related disease. Regular and vigorous daily activity increases muscle size, strength and power and develop endurance for sustaining work, and

tasks the cardiovascular fitness that produces the quality of physical reserve, power and stamina – endurance. For example, three 20 minute sessions of physical activity per week with intensity producing a heart rate of 80% of estimated maximum will improve cardiovascular fitness (Armstrong, 1990). Evidence also demonstrates that regular exercises combat anxiety and depression (Miller 1994). It promotes psychological well – being and helps build healthy bones flexible muscles and joints (Casperson, 1998). Physical activity also influences mental health. Besides organic vigour fitness, physical activity contributes to improvement in ability, speed co – ordination and skill.

The incorporation of regular physical exercises into our school curriculum and our lifestyles has the potential not only to reduce the cost and suffering caused by inactivity but also to improve the quality and enjoyment of life of the participants. Hundreds of research studies gives us the latest standards for the ideal amounts of physical activity that is, 30minutes of moderate intensity physical activity on most if not all days. Activities such as walking at a pace of three miles per hour for 30 minutes, riding a bike for 45 minutes, running for 20 minutes, etc, can all be interwoven throughout the week in order to achieve health benefits from physical activity (Surgeon General‟s Report on health, 2000).

Sports medicine has established that three to five 15 – 30 minutes exercise sessions per week of hard intensity aerobic activity like jogging, swimming or brisk walking is necessary to develop the heart – lung – blood vessel system and that as the heart is strengthened so is the brain. In addition, one is now confident that in exercise one has a strong weapon to help counter the never – ending onslaught of streets, anxiety and depression, associates of our present day economic and social problems in the country. Exercise does act as a buffer,

decreasing the strain of stressful events. Exercise does fortify the brain, helping to alleviate anxiety and depression while elevating mood. Exercise helps the brain function better intellectually. What this means to busy students is that time spent in exercising is not lost. Instead, the half – hour exercise session could mean enhanced mental functioning and greater time efficiency so the allocation of curricular time to physical education does not hamper academic achievement as some people think. Exercise is good for both the body and the brain. Through regular, active use of the body, one can discover a greater sense of well – being, far greater vitality and a calmer, more relaxed attitude towards daily pressures. David Nieman (1986), sums it up thus a healthy body lives in silence, you cannot hear it, you cannot feel it, from deep within comes harmony and peace.

2.6 Fitness Surveys using the Fitnessgram

A fitness survey designed by the Institute for Social Research at the University of Michigan and conducted by the US President"s Council on Physical Fitness and Sports (PCPFS) (1993) involving 18,857 boys and girls revealed that the physical fitness of public school children had shown virtually no improvement in the last 10years and only 36% of American youths had daily physical education.

Other findings include the following.

i. Forty percent (40%) of boys 6 – 17 years could not do more than one pull up. One out of four could not do any at all.
ii. Forty – five percent (45%) of 10 – 17 years of age could not hold their chin over a raised bar for more than ten seconds.
iii. In the 50 – meter dash girls 10, 14 and 16 years were significantly slower than the boys.

iv. In a simple flexibility, curl – up test 40% of boys 6 – 18 years could not reach beyond their toes or beyond 7 inches on the scuffle.

v. Approximately 50% of girls age 6 – 17 years and 30% of boys age 6 – 17 years could not run a mile in less than ten minutes.

It was concluded that many children were not getting the vigorous exercise they needed to develop strong and healthy bodies (George Allen, Chair of the PCPFS, 1993). Knudson (1998) also reports that the resistance during a simple curl – up test for muscular endurance is essentially the weight of the upper body. This resistance is quite low, usually between 10 to 40% of maximum resistance needed. He further suggested that 15 to 30 repetitions with small weights (5 to 10 pounds) held on the chest are likely to be more effective than multiple sets of 50 or more repetitions.

2.7 Physical Fitness Components

The body‟s ability to perform work efficiently and without undue fatigue is directly related to and dependent upon:

i. Cardiovascular endurance.

ii. Muscular strength

iii. Muscular endurance

iv. Flexibility

v. Body composition

In essence, where the physical task to be performed consists of running, walking, cycling or ordinary household chores, efficiency of performance will be dependent upon the efficiency of the circulatory respiratory processes; the effectiveness of muscular action, overall flexibility of the body and body composition of the individual (Awuni, 1999). Physical

fitness components relate to the development of an efficient heart, blood vessels, joints and body with a relatively high percentage of lean weight compared to fat weight. Specific health – related components in this study covered the five main fitness components listed above.

Cardiovascular Endurance

Cardiovascular endurance is defined as the ability of the respiratory, cardiovascular and muscular systems to take up, transport and utilize oxygen during exercise and activity. This implies that a fit person will adapt more efficiently than the stress imposed person. This indicates an increase in efficiency, because less stress is placed on the heart. In short, cardiovascular fitness is the maximal amount of work an individual is capable of doing when the task is continuous and involves large muscle groups.

Aerobic capacity can be improved substantially in a person through regular and sustained physical activities. Pate et al (1995) state that health benefits can result by accumulating 30 minutes or more moderate intensity physical activity on all days of the week. Aerobic capacity is perhaps the most important area of any fitness programme. Research indicates that acceptable levels of aerobic capacity are associated with reduced risk of high blood pressure, coronary heart disease, obesity, diabetes, some form of cancer and other health problems in adults (Blair et al, 1992). Aerobic capacity relative to body weight is considered to be the indicator of a person‟s over – all cardio – respiratory capacity, and a laboratory measure of maximal oxygen uptake is generally considered to be the best measure of aerobic capacity (Fitnessgram, 2000).

Boys and girls who are over – fat may expect an improvement in the aerobic capacity measure with a reduction in body fat. For boys, aerobic capacity relative to body weight stays relatively constant during growing years. For boys, aerobic relative to body weight stays relatively constant between ages 5 and 10 years, but decreases after age 10 years due to increase in specific essential fat (Fitnessgram, 2000).

To estimate cardio – respiratory fitness, the fitnessgram requires students to run one mile in the shortest possible time. Their mile run times are compared to criterion – referenced, health – fitness standards for cardiorespiratory fitness based on maximal aerobic power (Sfrit et al 1992). For cardiovascular endurance assessment, each student must run his or her best time. The better the running time, the better the aerobic capacity (Cureton, Baumgartner and McManus, 1991).

Experience in running skill, body fatness, subjects motivation and training can improve the mile run performance (Saltaerlli and Andreas, 1990; Watkinson and Kohl, 1998). Performance on distance running tests of one mile or longer have been shown to correlate significantly with maximal aerobic power. Correlation coefficients from most investigators have ranged from 54 all the way up to 90 (Jette 1984).

Heart Rate

Heart rate and oxygen consumption during exercise and recovery are good indicators of a person‟s aerobic efficiency (Hockey, 1985). For an average untrained person in a resting position, the heart beats approximately 72 times per minute. This is the heart rate. The heart pulse is caused by the contraction of the ventricular muscles and closure of the atria – ventricular valves. Resting heart rate is best detected by placing a finger on the redial artery

or carotid artery, best used just after exercise. In the highly – trained individual, the heart becomes more efficient and the resting heart rate is often much lower than 72 beats per minute. When possible, the pulse should be counted for a full minute.

Maximal Oxygen Consumption (VO2max)

The ability of the total body to use oxygen for energy supply is called oxygen consumption. It is expressed as a volume of gas per unit time and is abbreviated VO2.

During exercise and recovery, oxygen consumption is the amount of oxygen taken up and used by the body. It reflects the total amount of work being done by the body. During strenuous exercise, there can be a twenty – fold increase in VO2, which increases linearly with increase in the intensity of exercise. As a person approaches exhaustion, his or her VO2 will reach a maximum above which there will not be further increase. This figure is his or her VO2 maximum that is the largest amount of oxygen that a person can utilize within a given time (for example, 50 litres per minute). If you are doing sub – maxinmal exercise (below your limit) you can perform in an aerobic steady state. During maximal aerobic exercise (which usually lasts for five to ten minutes), you reach maximum oxygen consumption values. This is called the VO2 maximum.

An individual‟s oxygen consumption may be decided by body weight (in kilograms and standard this value so that comparison may be made between individuals of different body weight (Hockey, 1985).

For example

Subject‟s body weight = 65kg

VO2 = 3.21/minute

= 30ml/minute

VO2 = 3200/65

= 49.1ml 02/kg body weight / minute

The final 49.1 is the milliliters of oxygen this person has available for use by each kilogram of body weight per minute. It is maximum amount of oxygen able to be taken in, transported to and consumed by the working muscles to produce energy. VO2 maximum is used as the most accurate measure of person‟s aerobic power of fitness. A higher VO2 maximum reflects an increased ability of:

1. The heart to pump blood
2. The lungs to ventilate large volumes air, and
3. The muscles to take up oxygen and remove carbon dioxide.

Therefore, we find a range VO2 maximal expressed in milliliters per kilogram minutes. However, this decline is greater in inactive or overweight people and can be delayed by aerobic exercising. The maximum VO2 an individual can attain measures the effectiveness of the heart, lungs and vascular system in the delivery of 02 during work. Males generally range from 42 to 45 ml/kg/min of work. Trained athletes have been able to achieve values as high as 65 to 80.

Work Heart Rate

Subjects walk very fast for at least, 2 minutes. Within 3 – 5 minutes after walking, subjects located the carotid or the radial artery and count their heartbeat for one minute. The same procedure can be repeated at a faster pace (jogging or running). This provides an excellent opportunity to demonstrate the difference between the non – exercising state of the cardiorespiratory system (Best and Steinhardt, 1991). As speed increases, the heart beats faster and pulse rate increases. Remember to stop quickly, find your pulse and count accurately, elapses between stopping and counting, you will be recording recovery rather than exercising pulse rates (Saltarelli and Andreas, 1990). Exercise heart rate of young boys is relatively high beyond age 20. Maximum heart rate during exercise decreases with age and that young boys have higher HR in response to sub – maximal exercise than order boys (Miller, 1994). The decreasing HR in growing children is closely related to increasing body dimensions.

Target Pulse Rates

Recently, research has shown that boys and girls can sustain a running intensity within 85 to 95% ranges of maximum pulse rate for a one mile run (Salterelli and Andres, 1990). Maximal Heart Rate (MHR) is dependent on the individual‟s age and can be estimated according to the following formula (the karvonen Formula);

- MRH = 220 – age that is 220 – 20 yrs = 200
- Check resting heart rate (RHR)
- Determine the heart rate reserve (HRR). This is done by subtraction the resting heart rate from the maximal heart rate (HRR = MHR – RHR). The heart rate

reserve indicates the amount of beats available to go from resting conditions to all – out maximal effort.

- To calculate the target heart rate range for a 20 years – old student with a Resting Heart Rate of 60 beats per minute is as follows:

1. 220 – 20 years = 200 maximal heart rate
2. Calculate HRR = 200 – 60bpm =140
3. Maximal HRR x 60 + Resting HR = Lower level Target Heart rate (140 x 60 = 84 + 60 = 144).
4. Upper level of Target maximal HR

   MHRR x .90 + Resting HR = Upper level of target

   HR range = 140 x 90 = 126 + 60 = 186.
5. Target Heart Rate range = Lower level of Target HR range and Upper level of target HR range (144 to 186 bpm).

Muscular Strength

Muscular strength is defined as the ability to exert maximum force against resistance. It is measured with a dynamometer. Muscular strength is often approximated by finding the maximum resistance that can be lifted one time. It is an important component of health – related fitness because it can:

1. Improve the quality of life by making daily chores less fatiguing
2. Decrease recovery time from injury
3. Maintain and improve posture
4. Improve athletics performance.
5. Increase or develop muscle size (hypertrophy)

6. Improve self – esteem
7. Prepare a person for emergency situations

There are two types of strength tests:

i. Isotonic (dynamic)
ii. Isometric (static)

Isometric exercises involve a resistance being moved through a muscle‟s full range of (ROM) motion. The greatest resistance that can be filled equals the maximum weight that can be moved at the weakest angle of a joint. Isotonic (no movement) exercise involves a muscular contraction being applied only to one segment of a movement (pulling or pushing) against immovable objects.

Strength training is basically built around the overload principle and the specificity of training. Individual differences in strength is due to differences in body weight moderately correlated (r = 45) to 1 – ROM measures where 1 – ROM is the weight of the last successful lift (Baumgartner and Jackson, 1991).

Muscular strength and endurance are closely related; though weight training methods for them are typically different. Generally, strength is best developed through a high resistance, low repetition programmes, whereas endurance is improved through a low resistance, high repetition programme (Delorme, 1945). It is also necessary to have some strength to develop endurance for example, to develop abdominal muscular endurance through curl – ups or modified sit – ups, you must have the strength to perform at least one sit – up. The inability to perform one sit – up is due to lack of strength not endurance (Miller, 1994). Strength is essential for good health. Strong muscles help protect the joints, making them less

susceptible to sprains, strains and other injuries. Strength is necessary for good posture. Such postural problems as sagging abdominal organs, round shoulders and lower back pain may be prevented if adequate strength is maintained. In addition, strength will enable you to perform routine tasks more efficiency and to experience more satisfaction from leisure sport participation.

Baumgartner et al (1991), measured acquisition of leg extensions against a resistance allowing only 12 repetitions, maximal effort isometric leg extensions, and running up and down stadium bleachers. He found out that the smallest gains in strength were made by those subjects trained by running up and down bleachers. The results revealed that those who were trained for strength gained as much endurance as those who were trained for endurance and vice versa.

Dynamic strength is measured with one repetition maximum (1 – ROM) since a direct relationship exists between body weight and weight lifted (heavier individuals generally can lift more), the maximum weight that can be lifted should be interpreted in relation to the individual‟s weight (Miller, 1994). The 1 – ROM is determined through trial and error. Although 1 – ROM may be administered to measure most muscle groups, the body‟s major muscle groups may be tested with the bench press, standing press, pull – ups and leg press. Individual seeking health – fitness should be able to perform 12 to 15 repetitions of each of the lifts.

Muscular Endurance

Muscular endurance is the ability of a muscle or group to resist fatigue and to make repeated contractions against a defined sub – maximal resistance – dynamic endurance. It also may be

the ability to maintain a certain degree of force over time – static endurance abdominal strength (Mc – Gill, 1998) Isometric abdominal endurance has been hypothesized to be a motor skill related to lumbar or pelvic control and potential back problems (Elia, Bohanon, Camaron and Albro, 1996; „O' Sullivan and Allison, 1998). Generally, endurance is improved through a low – resistance, high repetition programmes. It is also necessary to have some strength to develop endurance. For example, to develop abdominal muscular endurance through curl – ups or modified sit – ups, you must have the strength to perform at least one sit up. The inability to perform one curl up is due to lack of strength, not endurance (Miller, 1994).

Robertson and Magnusdottir (1987), using curl – up test (CUT) found that performers showed greater demand on the abdominal muscles and no demand on the hip flexors, compared to performing the sit – up test with supported feet. Good abdominal endurance helps your appearance and sports performance and it may affect your ability to resist back injury. Young adults in good shape can usually do 70 to 80 curls – up (McGill, 1998).

Recent electromyo graphic (MG) and biomechanical modeling studies have attempted to identify the safest and most effective abdominal exercises based on maximizing abdominal activation and maximizing spinal loads (Axler and McGill, 1997; Juker, McGill, Kropf and Steffen, 1998).

Muscular endurance tests may be relative or absolute. In a relative endurance test, the performance works with a weight that is proportionate to the maximum strength of a particular muscle group or to body weight. In an absolute endurance test, all performers work with the same amount of weight irrespective of body weight and strength.

The need for muscular endurance is demonstrated in many daily activities. For example, while working, your arms, legs, or entire body feel too tired to continue the work. When pushing a stalled car, carrying a heavy suitcase, performing any task that involves sustained muscular contraction or moving the body throughout the day tires the body down. To avoid end of day fatigue, you need muscular endurance. Possessing muscular endurance helps to maintain good posture and reduce backaches and muscle injury while performing routine tasks. The best possible muscular endurance test uses a fixed percentage of the individual‟s body weight as the resistance. In curl up, the resistance is the head and trunk (Willmore, 1983).

Flexibility

Flexibility is the ability to move the body joints through a maximum range of motion without undue strain. It is not a general factor but it is specific to given joints and to particular sports or physical activities (Miller, 1994).

Flexibility is classified as static and dynamic. It depends more on the soft tissues – (ligaments, tendons and muscles) of a joint than on the bony structures of the joint itself. Flexibility is also related to body size, sex, age and physical activity. Any increase in body fat usually decreases flexibility. During early school years, flexibility increases but a leveling – off or decrease begins in early adolescence. The dramatic loss of flexibility in the aging process is probably due to failure to maintain an active programme of movement (Miller, 1994).

Generally, active individuals are more flexible than inactive individuals. The soft tissues and joints tend to shrink, losing extensibility when the muscles are maintained in a shortened position. Habitual posture and chronic heavy work through restricted ranges of motion (ROM) can lead to adaptive shortening of muscles (Miller, 1994). Physical activity with wide ranges of movement helps prevent this loss of extensibility. Medical records indicate that lower back pain is one of the most prevalent health complaints in America and many lower back pains are caused by poor muscle tone, poor flexibility of the lower back and inadequate muscle tone. Anyone with stiff spinal column is at a disadvantage in many physical activities. Furthermore, short muscles limit work efficiency benefit of stretching is decreased in muscle stiffness (greater dynamic flexibility). Stiffness is a measure of dynamic flexibility. The higher the stiffness of a muscle, the greater is lack of elasticity (resistance to stretch) while less stiffness means compliance or extensibility (Knudson, 1995; Magnuson, Simonsen, Aaggard, 1996). Stiffness is the measure of the rate of increase of passive tension as the muscle is stretched (Knudson, 1999).

Flexibility, like cardiovascular fitness, is rapidly lost without training (Wilmore and Costil, 1994). A recent study by Magusson et al (1996), found that passive tension and stiffness significantly decreased with stretching, but returned to baseline levels in one hour. Short – term increase in ROM from stretching has been shown to persist for up to 90 minutes (Moller, Ekstrand, Oberg and Gillquist, 1995).

According to Bandy and Ivion (1997), stretches lasting between 10 – 30 second results in flexibility and ROM gains. There is equally enough evidence that stretching once a week is frequent enough to maintain ROM (Wallin, Ekblom, Grahn and Nordenborg, 1995). The

long – term benefit from stretching is singled out because it has been noted in clinical settings that people with lower back problems often have a restricted range of motion (ROM) in the hamstring muscles and the lower back. The sit and reach test has the subject reach forward and extend the hamstring and lower back muscles. An inability to stretch far enough forward indicates tightness in these muscles (AAHPERD, 1986).

The major limitation to joint flexibility is tightness of soft tissues structures (joint capsule, muscles, tendons, ligaments). Flexibility is related to age and physical activity (Nieman, 1986). As a person ages, flexibility decreases, although this is due more to inactivity than the aging process itself. Musculoskeletal testing centres around the flexibility of the lower back and the muscular strength / endurance of the abdominals, because of the widespread prevalence of lower back pain in the youths and adults. The purpose of the sit and reach in this study was to evaluate the flexibility of the lower back and posterior leg muscles (hamstrings) of subjects for individual exercise counseling.

The four most common types of stretching exercises are passive, static, ballistic and proprioceptive neuromuscular facilitation (PNF) (Knudson, 1999). The type of stretching that is most effective is controversial (Alter, 1996).

Body Composition

Body composition refers to the component parts of the body. For measurement purposes, body composition is interpreted as referring to body fat weight and lean body weight. Research clearly shows that over – fat people are at greater risk of cardiovascular disease, diabetes cancer and early death (Lohman, 1987). Having too little body fat can result in significant health risks. The body needs some fat to provide protection against shock,

insulation against thermal streets or transfer and store vitamins to maintain proper nervous system function, proper reproductive health and to store surplus energy. Eating disorders (anorexia nervosa, and bulimia nervosa) affect body fat levels.

Fitnessgram (2000), provides optimal range of body fatness for males and females of age five to twenty – five as 10 to 25% and 17 to 32% respectively. Fitnessgram considers males with less than 8% and females with less than 13% fat to be very lean. Lohman (1992), reports that a 10 to 22% fat content in men and 20 to 32% in women seems satisfactory.

Many students in high schools in Ghana have inaccurate perception of what healthful levels of body fatness are. This is one factor that may contribute to the high rate of eating disorders exhibited in this age group (Slavin, 1988). The generally accepted standard body composition assessment method is hydrostatic (underwater) weighting. However, the most accurate measure available to schools is skinfold assessment. Hydrostatic weighing if performed properly has an error factor of plus or minus 2 percent ($\pm$ 2) body fat (Safrit, 1990). Skinfold assessment if performed properly has an error factor of plus or minus three percent ($\pm$ 3) body fat (Lohman, 1987). The standards of classification set by Fitnessgram (2000), and Lohman, (1987), are not absolute guideline for what is healthy and what is not healthy.

Fitnessgram (2000,) uses the following equations to calculate percent body fat.

Boys % Fat = (0.735 x sum of skinfolds) + 1.0. Use Triceps and calf skinfolds. Fitnessgram Healthy Fitness Zones (HFZ) to percent fat ranges between 10 – 25 where 25 is the lower end of HFZ and 10 is the upper end of HFZ. Above 25% is over – fat and less than 10% is very lean.

2.8 Summary of the Review

The purpose of the study was to use the Prudential Fitnessgram (2000) battery of test to determine the health – related fitness status of Senior High Secondary Schools.

The assessment measures five components of physical fitness which have been identified as being important because of their relationship to overall health and optimal function. These components are aerobic capacity, body composition, muscular strength, muscular endurance and flexibility. Serveral test options were provided for each area with one test item being recommended. For the purpose of this research work and in line with the Prudential Fitnessgram (2000), the following test items were selected.

Aerobic capacity – 1 mile run / walk.

Flexibility – sit and reach

Muscular strength – pull up for upper body strength.

Aerobic capacity is perhaps the most important area of any fitness programme. Research clearly indicates that acceptable levels of aerobic capacity are associated with reduced risk of high blood pressure, coronary heart disease, obesity, diabetes, some forms of cancer and other health problems in adults (Blair et al 1992). Aerobic capacity relative to body weight is considered to be the best indicator of a person‟s overall cardiorespiratory conditioning activities serve to:

i. Increase physical working capacity of all ages
ii. Decrease the risk of developing obesity and problems associated with obesity.
iii. Decrease the risk of coronary heart disease.
iv. Aid in the management of both stress and depression.

v. Enable most people to feel better, physically and mentally (Blair et al, 1992). A laboratory measure of a maximal 02 uptake (VO2 max) and the resting heart rate are generally considered to be the best measure of aerobic capacity.

The body composition test results provide estimation of the percent of a student‟s weight that is fat in contrast to fat free body mass (muscles, bones, organs). Maintaining appropriate body composition is vital in preventing the onset of obesity, which is associated with increased risk of coronary heart diseases, stroke and diabetes. Children and youth with levels of fat greater than 25 and 30% fat for boys and girls, respectively, have greater risks of developing primary risk factors of heart diseases including high blood pressure and elevated cholesterol (Williams et al, 1992).

Fitnessgram (2000) recommended 10% to 25% fat for boys 5 – 18 years. A number of methods for estimating body composition in children and youth have been developed including underwater weighting, anthropometry, bio – electrical impedance and height and weight ratios. Each approach has some limitations leading to measurement errors of $\pm$ 3% in the estimates based on height and weight result in measurement errors of $\pm$ 5) to 6% fat (Loman, 1992). Because of the lower prediction errors, the recommended test option is the measurement of triceps and calf skin – folds thickness for calculation of the percent body fatness.

Tests of muscular strength, muscular endurance and flexibility have been combined into one broad category, because the primary consideration is determining the health status of the muscular – skeletal system. It is equally important to have strong muscle that can work forcefully and or over a period of time and also be adequately flexible to allow range of motion at the joint, for example, in performing sit – ups or curl – ups. Flexibility is an

important component of health – related fitness and the lack of it can create functional problems or disorders for many individuals, such as low back disorders and muscle stiffness. Strength is essential for good health. Strong muscles protect the joints, making them less susceptible to sprain, strain and other injuries. Muscular endurance is very important in our daily activities such as walking, carrying files from one office to another and climbing up the stairs to our offices that involve sustained muscular contraction.

It is important to remember that the specificity of training is applicable to the development of muscular – skeletal strength, endurance and flexible. The movements included in these test items are only a sampling of the many ways that the abdominal trunk region have been selected as areas for testing because of their perceived relationship to maintaining functional health and correct posture, thereby reducing possibilities of future low back pain and restrictions in independent living. Although most students will not have weaknesses sufficient to cause current problems it is important to educate them regarding the importance of muscle strength, endurance and flexibility in preventing problems as adults. It is essentially important to make students aware of correct postural alignments and body mechanics in the event that they are developing scoliosis, which is the problem for teenage youth.

Some of the ROM, strength, endurance, flexibility and cardiovascular endurance gains are lost, however, after a week of inactivity (Starring et al, 1998). The Surgeon General‟s report (2000) also indicates that many of the beneficial effects of exercise training from both endurance and resistance activities diminish within 2 weeks if physical activity is substantially reduced, and effects disappear within 2 – 8 months if physical activity is not resumed.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter discusses the various methods used in carrying out the study of health-related fitness among Senior High Secondary School students and the establishing of health-related fitness levels for the students. This chapter is divided into the following sub-headings for the discussion; - research design, population, sample and sample techniques, procedure for data collection and procedure for data analysis.

3.1 Research Design

Research design is an arrangement of conditions for collection and analyzing data which will be relevant to the researcher in the most economical manner. It is the programme that guides the researcher in the process of collecting, analyzing and interpreting an observation.

The study therefore employed the quasi-experimental design. This kind of research design is normally used when randomization is impractical and/or unethical; they are typically easier to set up than true experimental designs, which require random assignment of subjects. Additionally, utilizing quasi-experimental designs minimizes threats to external validity as natural environments do not suffer the same problems of artificiality as compared to a well-controlled laboratory sitting.

3.2 Population

Population usually refers to an entire group or aggregate of people or elements having one or more common characteristics. The students‟ population of the three schools involved in this research is 3,110. The breakdown is as follows;

Ada Senior High Secondary School – 1,200

Ada Technical Institute -860

Ada Secondary Technical Senior High -1,050

This population also includes both boys and girls. The target population of the study was the first year students of the above mentioned Senior High Secondary School between the ages of 15 and 16. Out of a population of seven hundred students, a sample size of sixty students was selected for the research.

3.3 Sample and Sampling Technique

In this study the simple random sampling technique was used to select the sample size. This process was considered appropriate for this research because it is considered to be bias free because no factor is present that can affect selection. The simple random technique leaves subject selection entirely to chance. In all sixty students were selected. They were made up of thirty boys and thirty girls. Ten boys and ten girls were sampled from each of the three schools.

3.4 Validity and Reliability of Fitnessgram

The test instrument, fitnessgram has been universally accepted to be a valid and reliable test for the assessment of Health- Related Fitness of children and youth. It was developed by the Copper Institute for Aerobic Research –Texas, USA. Hence the validity and reliability of the test is never in doubt since the test battery was used without any modification.

3.5 Data Collection Procedure

The following three day schedule was utilized to administer the Fitnessgram test items.

Day1 –Sit and Reach for flexibility, height and weight measurement.

Day 2- Curl –ups and Pull – ups tests were administered after warm –ups.

Day 3 –One mile run/walk to time the students as they run.

Both boys and girls were tested together without distinction to avoid a competitive situation. The following were the purpose, facilities, equipment and procedures for the various tests. All tests were conducted at the various school fields. All subjects were tested together on the selected test items. Due to the number of students and the number of test items to be carried out the test lasted for three days.

Standardized protocols were used to measure subject‟s physical characteristics.

Measurement included height and weight which was used to estimate body fat in the subjects.

Push –Ups for Muscular Strength

Purpose: To measure arm and shoulder strength.

Procedures: Students‟ squat with palms placed on the flour shoulder with apart and fingers point forward.

They shoot their legs backwards creating a straight back with the elbow bent to bring the chest lowered to the ground about 2cm away. From this starting position, students push-up by straighten the elbow to lift the body up.

They repeated this activity as many as they can. The number of repetition were therefore recorded for that particular student.

Boys and Girls had their turn individually and separately. There was no time limit.

Scoring: One point was scored each time the student completed a push – up. Only one trial was permitted.

Curl –up: For Muscular endurance.

Purpose: To measure abdominal muscular strength and endurance.

Facilities and Equipment: Mats and Curl up measuring strip, taped to the mat.

Procedure: The student lay flat on the back with his knees bent on the flour. The hands were by the side of the body. They then curl up with his fingers on the measurement strip. When the fingers traversed the strip, the student lowered his head and chest back to the starting position. The exercise was repeated as many times as possible until the student could no longer curl –up. There was no time limit. Scoring one point was done for each correct curl –up.

One – Kilometer Run/Walk for Cardiovascular Endurance.

Purpose: To see how fast a student could traverse a distance of one –kilometre(1,500m) in the shortest possible time to measure cardiovascular fitness.

Facilities and Equipment: A 400 meters athletic oval and stopwatches.

Procedure: Students were divided into two groups for testing purposes to do 4 laps each.

Each student worked with a partner. While one student was running the other partner checked laps and marked the time at the finish of the race.

Instructions: You should begin to run on the sound from clappers and stop on completing the 4 lap. Scoring: The time each runner used to complete the four laps was recorded against his name.

Sit and Reach for Flexibility

Purpose: To measure students flexibility status at the lower back and posterior thigh muscle.

Procedures: Students sat on the mat, stretched one leg forward and placed the sole of the foot fat against the locally manufactured table and flexed the other leg fully. Students placed one hand on top of the other and bent forward with the fully extended arms sliding down the meter ruler to see how far forward they could reach. Students alternated the legs and repeated the same exercise.

Scoring: The distances covered by each student was recorded against his name.

Body Weight

Purpose: To determine student‟s weight.

Equipment: Bathroom weighing scale.

Procedure: Students removed their sandals and wore their physical education uniforms before standing on the scale for their weight to be taken.

Scoring: Students stood still for their weight readings to be taken and recorded.

Height

Purpose: To measure student‟s height.

Equipment: Tailors measuring tape.

Procedure: The tape measure was used to record heights on the walls of the classroom, standing from 0 to 2 meters. All centimeters were also recorded. Students removed their shoes or sandals and stood with their back very close to the wall with feet flat on the flour. A ruler was place on top of students head touching the wall. Students walked away from the wall for the reading to be made.

Scoring: The height of each student was recorded against his or her name in meters and centimeters. To record the body mass indicator for each student, their weight in kilos was divided by their height squared. The result was then recorded against each student"s name as his or her body mass indicator.

3.6 Data Analysis

The data collected were analyzed using SPSS window statistical software. The mean and standard deviation were calculated for all variables. There after a health –related fitness zone was established for Senior High Secondary Students. A probability level of 0.05 or less was taken to indicate significant.

Percentages were also calculated to determine the percentage of subjects achieving the Healthy Fitness zone. Subjects were classified into three levels of HFZ i.e. Better, Good and Needs improvement, based on the scores obtained from the given components of

CHAPTER FOUR

RESULTS, FINDINGS AND DISCUSSION

4.1 Results and Findings

Under this chapter the various research questions that were considered in chapter one will be the guild as solutions are sorted to them one after the other.

This chapter therefore dealt with results and data analysis. The statistical analyses were carried out using Excel and SPSS Computer programmes. The means and standard deviations were calculated for the scores of all subjects on the variables tested.

The first research to consider is; what are the physical fitness levels of the students in the Senior High Secondary School?

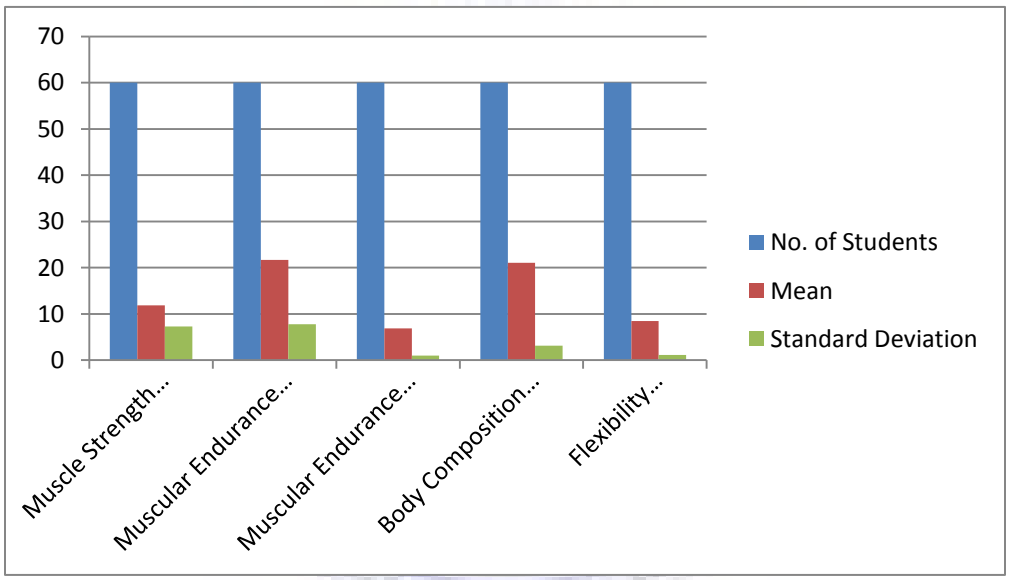
Table 1: Fitness level of students

	Muscle Strength (Push-Ups)	Muscular Endurance (Curl-Ups)	Cardiovascular Endurance (1 Kilometer Run)	Body Composition (Body Mass Index)	Flexibility (Sit-and-Reach)
No. of Students	**60**	**60**	**60**	**60**	**60**
Mean	**11.85**	**21.68**	**6.9**	**21.03**	**8.44**
Standard Deviation	**7.3**	**7.75**	**1.01**	**3.16**	**1.12**

From the table above, it can be seen that the five components of health related fitness which the researcher gathered information on indicated that the students have muscular endurance with a mean score of 21.68. A score of 21.03 was recorded for the students in terms of their body composition. The mean score for muscular strength was 11.85 and that of cardiovascular endurance was 6.9. Flexibility which is one of the components under consideration also recorded a figure of 8.44 as its mean.

The standard deviation of the score which gives an indication of how far or close the variables are to the mean is also recorded for the various components of heath related fitness. Cardiovascular endurance recorded a standard deviation of 1.01. The highest of 7.75 was recorded against muscular endurance. Values ranging from 7.3, 3,16 and1.12 were also recorded for muscular strength, body composition and flexibility respectively.

Fig. 1 The mean and standard deviation of the students.



Research question two; what are the physical fitness levels of boys in the Senior High Secondary School?

Table 2: Fitness level of Boys

	Muscle Strength (Push-Ups)	Muscular Endurance (Curl-Ups)	Cardiovascular Endurance (1 Kilometer Run)	Body Composition (Body Mass Index)	Flexibility (Sit-and-Reach)
No. of Students	30	30	30	30	30
Mean	17.9	24.5	6.05	19.8	7.72
Standard Deviation	3.48	7.78	0.53	1.53	0.71

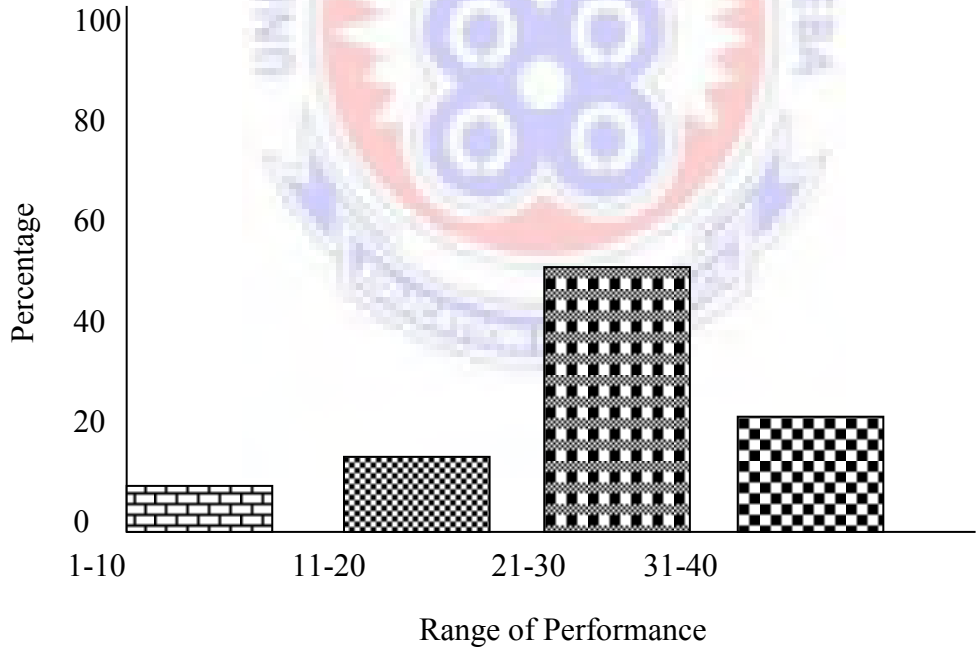
From the population of sixty students, thirty of them were boys hence their level of fitness was recorded. The table above represents the picture of the fitness level of these boys as taken. They recorded a high value of 24.5 as the mean of this component of health related fitness. They also recorded various figures which include 17.9 as the mean for muscular strength, 19.8 for body composition, 7.72 for flexibility and 6.05 for cardiovascular endurance respectively.

The standard deviation for the boys was also captured. The highest for this category was recorded at muscular endurance with a value of 7.78. Muscular strength followed with a standard deviation of 3.48. 1.53, 0.71 and 0.53 were recorded against body composition, flexibility and cardiovascular endurance.

Table 3 presents Curl-up (Muscular Endurance for boys

Number	Number of repetition	Percentage
1-10	2	7%
11-20	5	17%
21-30	15	50
31-40	8	26%
Total	**30**	**100%**

Fig 2 presents Curl-up (Muscular Endurance for boys



Both table four and graph two shows the performance of boys in curl-up test which was used to measure their muscular endurance. Out of a total of thirty, two representing 7 percent were able to do between zero to ten. Five representing 17 percent were able to perform

figures ranging from eleven to twenty. Fifteen representing fifty percent were ranging between twenty-one and thirty. Eight representing twenty-six percent of the total, were the high performers in this category.

Table 4 presents push-up (Muscular Strength) for boys

Numbers	Number of repetition	Percentage (%)
1-10	0	0%
11-20	28	93%
21-30	2	7%
31-40	0	0%
Total	**30**	**100%**

A push-up Muscular strength test was carried out on boys. Out of the total number of thirty (30) for boys that carried out the test, none of them had a number ranging from 1-10, (28) twenty-eight students representing 93% had a number ranging from 11-20 and two (2) students representing 7% had a number ranging from 21-30 also, none one the boys had a number ranging from 31-40.

Fig 3 presents push-up (Muscular Strength) for boys

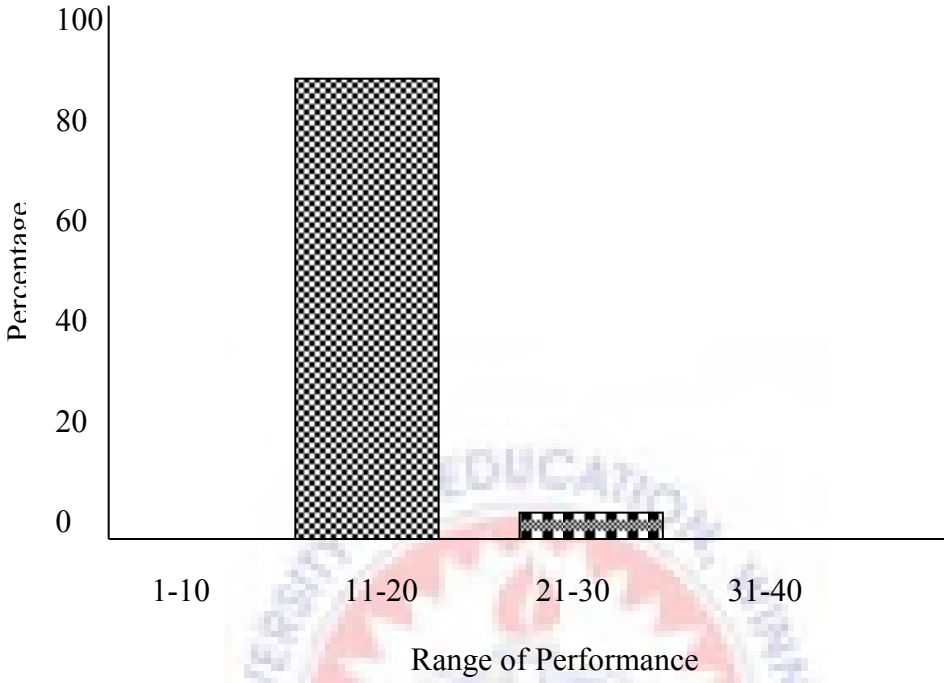
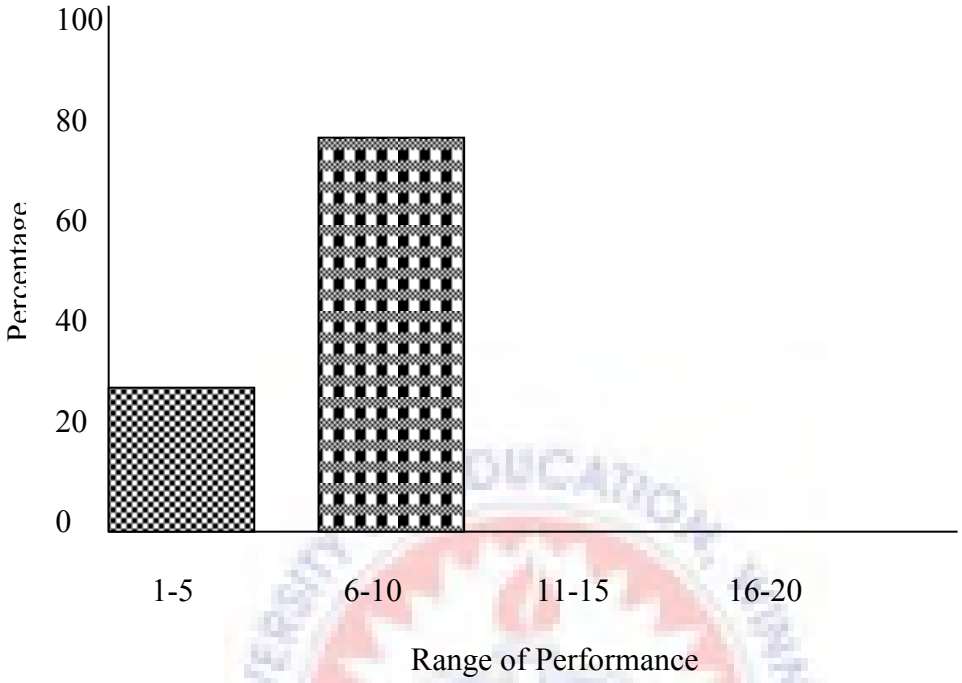


Table 5 presents (Cardiovascular Endurance) test on one kilometer run for boys

Numbers	Number of repetition	Percentage (%)
1-5	12	40%
6-10	18	60%
11-15	0	0%
16-20	0	0%
Total	**30**	**100%**

Fig 4 presents (Cardiovascular Endurance) test on one kilometer run for boys



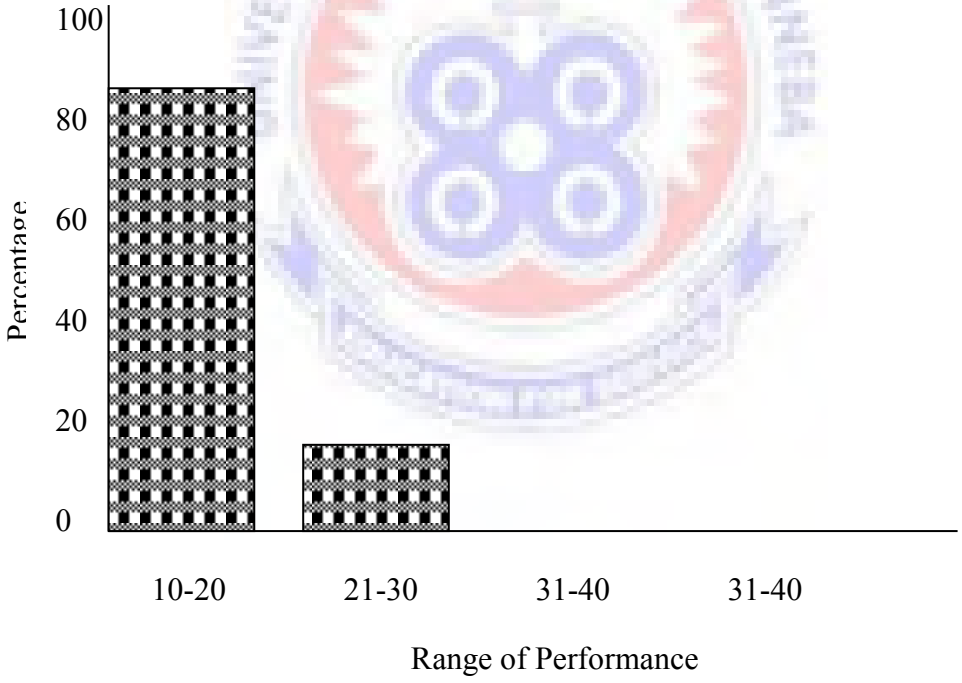
Cardiovascular Endurance test for boys

A cardiovascular endurance test of one (1) Kilometer Run was also carried out on boys. Out of the total number of thirty (30) boys, twelve (12) boys used time ranging from (1-5) which represents 40 percent of the total number of students to complete a one (1) kilometer run, 60 percent of the students however representing eighteen (18) boys used time ranging from 6-10 to complete a one (1) kilometer run. None of the boys used time ranging from 11-15 and none of them also used time ranging from 16-20 to complete a one (1) kilometer

Table 6 presents Body Composition test for boys

Numbers	Number of repetition	Percentage (%)
1-20	25	83%
21-30	5	17%
31-40	0	0%
41-50	0	0%
Total	**30**	**100%**

Fig 5 presents Body Composition for boys



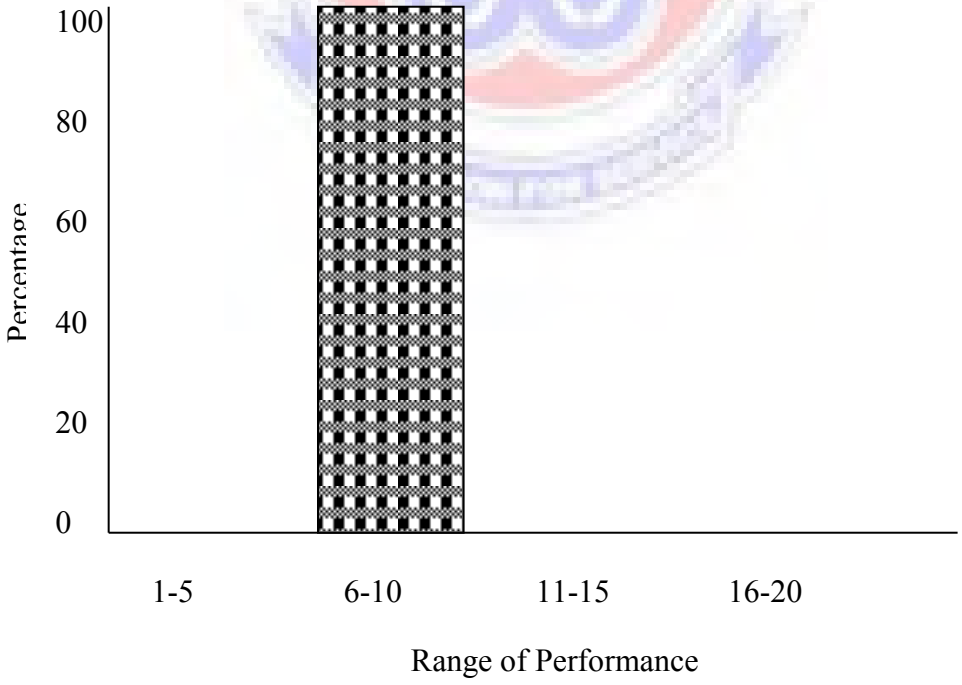
A body composition test was also carried out during the research on boys. Out of the total number of thirty (30) boys, twenty-five (25) of them representing 83% of the total

population had a body mass ranging from 10-20, five (5) of them representing 17% also had a body mass ranging from 21-30, none of them had a body mass ranging from 31-40.

Table 7 presents Sit-Reach (Flexibility) for boys

Numbers	Number of repetition	Percentage (%)
1-5	0	0%
6-10	30	100%
11-15	0	0%
16-20	0	0%
Total	**30**	**100%**

Fig 6: Presents Sit-Reach (Flexibility) for boys



A Sit-Reach test was also carried out on the boys. Out of the total number of thirty (30), none of them had a sit-reach number ranging from 1-5, thirty (30) of them representing 100% had a sit-reach number ranging from 6-10 none or 0% of them also had a sit-reach number ranging from 11-20.

Research question 3; what are the physical fitness levels of girls in the Senior High Secondary School?

Table 8: Fitness level of Girls

	Muscle Strength (Push-Ups)	Muscular Endurance (Curl-Ups)	Cardiovascular Endurance (1 Kilometer Run)	Body Composition (Body Mass Index)	Flexibility (Sit-and-Reach)
No. of Students	30	30	30	30	30
Mean	5.08	18.9	7.79	22.26	9.16
Standard Deviation	4.41	6.74	0.49	3.86	0.99

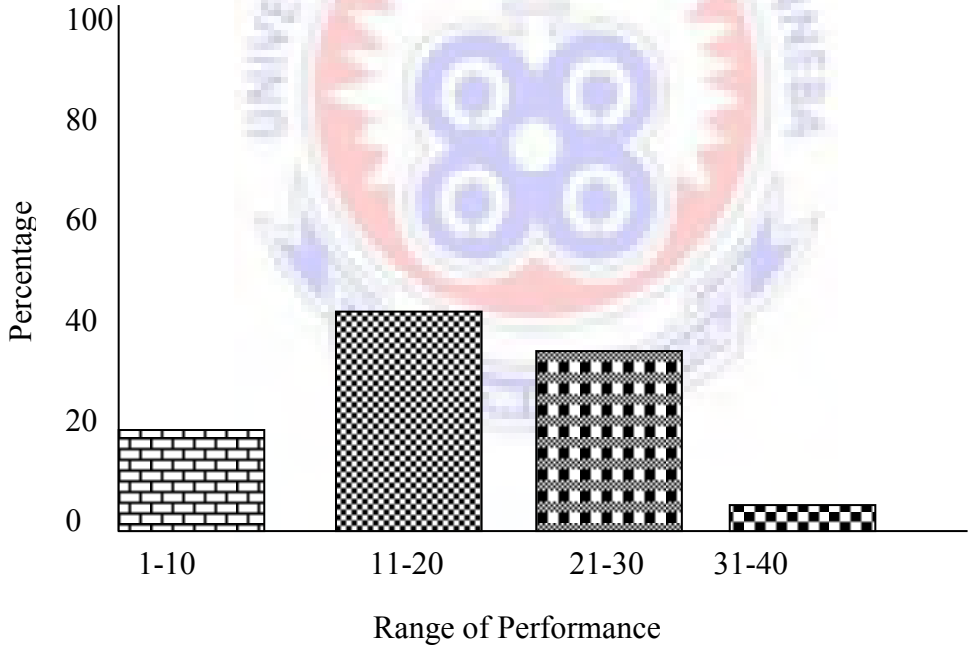
The table above, 22.26 represent the mean for body composition for girls as recorded. They also recorded 18.9 against muscular endurance and 9.16 against flexibility. For cardiovascular endurance from and muscular strength they had 7.79 and 5.08 respectively.

With the standard deviation the girls exhibited varied characteristics. Muscular endurance recorded the highest in this category with the value of 6.74 followed by muscular strength with 4.41. The standard deviation for body composition was 3.86 whilst flexibility and cardiovascular endurance recorded 0.99 and 0.49.

Table 9 presents Curl-up (Muscular Endurance for girls

Numbers	Number of repetition	Percentage (%)
1-10	5	17%
11-20	13	43%
21-30	10	33%
31-40	2	7%
Total	**30**	**100%**

Fig 7 presents Curl-up (Muscular Endurance for girls



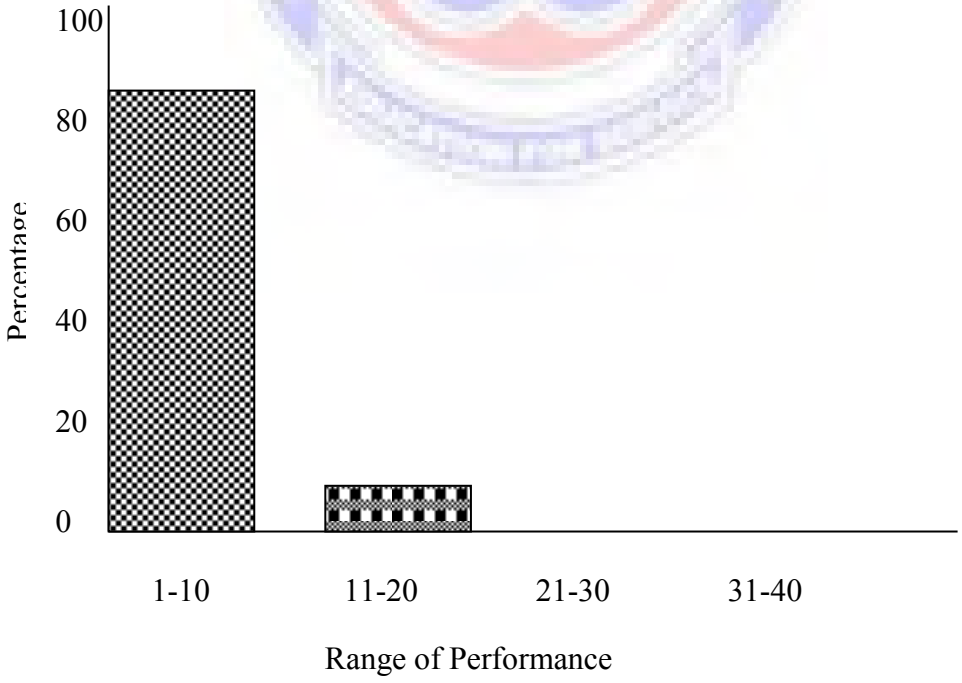
Out of the total population of (30) thirty for girls, (5) five people had a repetition number ranged from 1-10 representing 17% of the population under study,13 people had a repetition number from 11-10, also representing 43%, ten (10) people had a repetition number ranging

from 21-30 representing 33% and finally two (2) people had a repetition number ranging from 31-40 out of the total number of 30 girls. All these are illustrated on both the table and the graph above.

Table 10 presents push-up (Muscular Strength) for girls

Numbers	Number of repetition	Percentage (%)
1-10	25	83%
11-20	5	17%
21-30	0	0%
31-40	0	0%
Total	**30**	**100%**

Fig 8 presents push-up (Muscular Strength) for girls

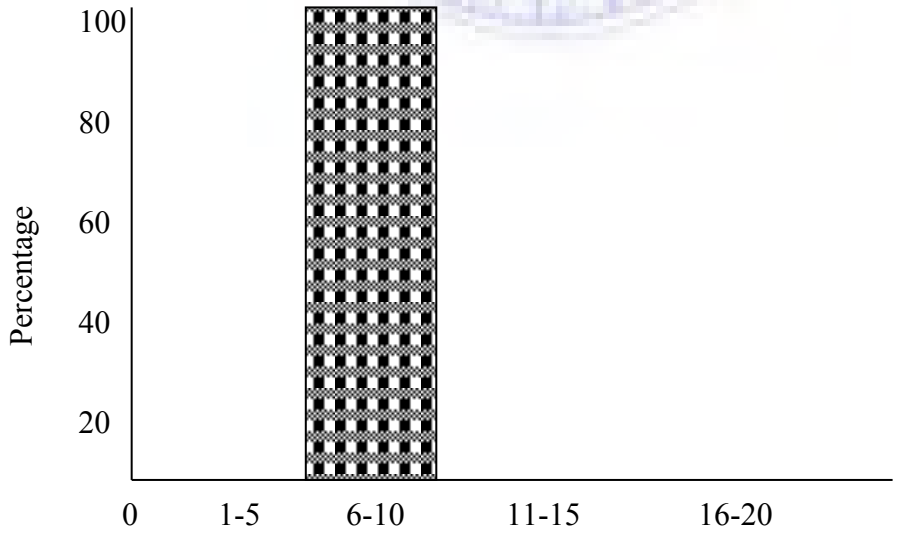


A push-up Muscular strength test was carried out on girls. Out of the total number of thirty (30) for girls that carried out the test, twenty-five (25) students had a number ranging from 1-10, representing 83 percent of the total number of the sample size. Five students had a number ranging from 11-20 which also represents 17 percent of the sample size. None of the students had a number ranging from 21-30 also, none one the girls had a number ranging from 31-40

Table 11 presents (Cardiovascular Endurance) test on one kilometer run for girls

Numbers	Number of repetition	Percentage (%)
1-5	0	0%
6-10	30	100%
11-15	0	0%
16-20	0	0%
Total	**30**	**100%**

Fig 9 presents (Cardiovascular Endurance) test on one kilometer run for girls



A cardiovascular endurance test of one (1) Kilometer Run was also carried out on girls. Out of the total number of thirty (30) girls, (0) none of the girls used time ranging from (1-5) to complete the one (1) kilometer run, thirty (30) girls used time ranging from (6-10) to complete the one (1) kilometer run indicating a hundred percent turnout for that category. None of the girls used time ranging from (11-15) and none of them also used time ranging from (16-20) to complete the one (1) kilometer run.

Table 12 presents Body Composition test for girls

Numbers	Number of repetition	Percentage (%)
10-20	11	37%
21-30	18	60%
31-40	1	3%
31-40	0	0%
Total	**30**	**100%**

Body Composition test for girls

A body composition test was also carried out during the research on girls. Out of the total number of thirty (30) girls, eleven (11) of them had a body mass ranging from (10-20), representing approximately thirty-seven percent of the total number of girls, eighteen (18) of them also had a body mass ranging from (21-30), also representing sixty (60%) percent of the total number of students, only one of them had a body mass ranging from 31-40 thus representing three percent (3%) of the sample size

Fig 10 presents Body Composition for girls

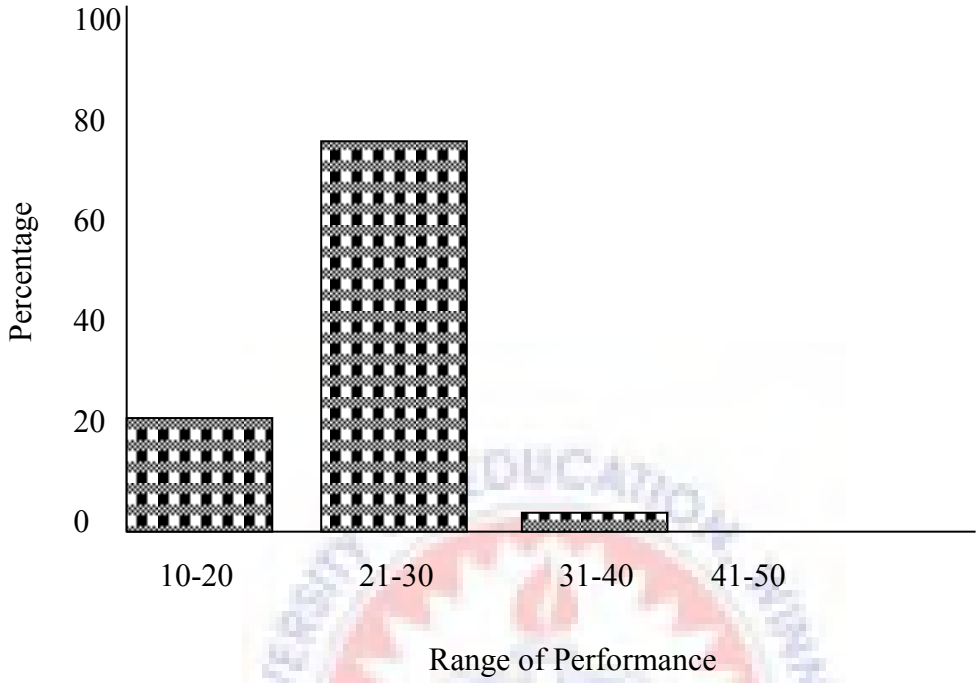
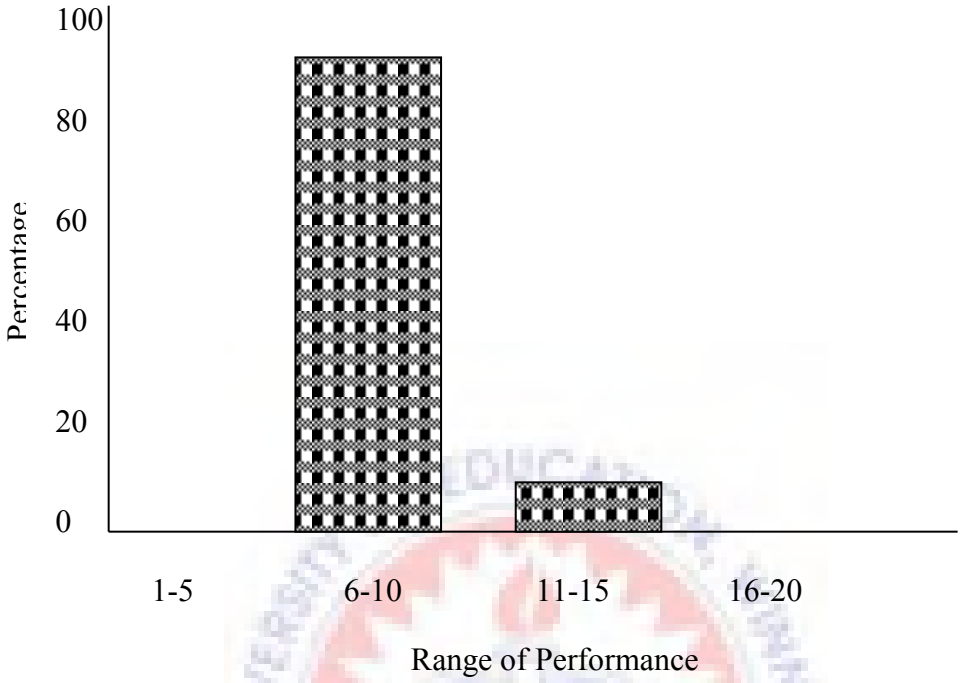


Table 13 presents Sit-Reach (Flexibility) for girls

Numbers	Number of repetition	Percentage (%)
1-5	0	0%
6-10	28	93%
11-15	2	7%
16-20	0	0%
Total	**30**	**100%**

Fig 11 presents Sit-Reach Flexibility) for girls



Sit-Reach test for girls

A Sit-Reach test was also carried out on the girls. Out of the total number of thirty (30), none of them had a sit-reach number ranging from 1-5, twenty-eight (28) of them representing ninety-three percent had a sit-reach number ranging from 6-10 and two (2) of them also representing seven percent had a sit-reach number ranging from 11-20.

Research question 4: How do physical fitness levels of students in Senior High Secondary School compare with standardized levels?

The Prudential fitnessgram which was used as a guide can be found in Appendix N..In this guide the various health-related fitness components and their range of performance as expected from the various categories of ages have been stated. To be able to compare

therefore one has to take the various components under both girls and boys one at time to see what the performances are.

In the boys‟ category, one mile run used to measure the cardiovascular endurance of the participants recorded a time range of 9-8.30minutes for the Prudential fitnessgram as against 6.30-6 minutes recorded for the students when they did the one kilometer run. Although the mile could be a little longer than a kilometer them performance recorded for the students could still be better than the Prudential fitnessgram. This was in the boys division.

With the girls, the students recorded a performance range of 10-8 minutes in the one kilometer run, whilst the Prudential fitnessgram has a performance range of 10.30-8 minutes.

Curl-up was also used to measure the muscular endurance of the students. Whilst the students performance help to establish a health fitness zone of 16-25, the Prudential fitnessgram has a fitness zone of 18-35 repetitions. This is higher than the performance exhibited by the students.

In the boys category the students recorded 20-30 repetition as against Prudential 24-47. The performance of the students at this activity is low.

Whilst the students performance in both boys and girls in Push-ups recorded 16-25 and5-10 respectively that of the Prudential fitnessgram had performance range of 16-35 and 7-15 respectively for boys and girls. Here again the performances of the students fell below expectation.

The only activity which both students the Prudential fitnessgram came into conformity was the Sit and Reach which was used to measure the flexibility of the participants. In all the three, that is boys, girls and the Prudential fitnessgram the performance recorded the fitness zone was 8.

Establishing health related fitness standard for senior secondary high students.

Key;

I – Needs improvement (Does not meet the hearth – related standard)

F – Health Fitness Zone (Meet health related standard)

H – High Fitness Performance Zone (Exceeds health – related standard)

Boys

The table 14 shows the standard fitness zone for boys ages 15 – 16

	One Kilo Run Walk			Sit and Reach			Push – Ups			Curl - Ups			Body Mass		
Zone	I	F	H	I	F	H	I	F	H	I	F	H	I	F	H
	>6.30	6.30-6.00	<5.00	0-7	8	>8	1-15	16-25	>30	0-15	16-30	>30	>25	<25	

The table 15 shows the standard fitness zone for Girls ages 15 – 16

	One Kilo Run Walk			Sit and Reach			Push – Ups			Curl - Ups			Boys Mass		
Zone	I	F	H	I	F	H	I	F	H	I	F	H	I	F	H
	>10.00	10-8	<8	0-8	10-8		0-4	5-10	>10	0-15	16-25	>25	>25	<25	

From the performances of the students in the various health-related fitness components, the researcher with the guidance of their performance mean in the various health-related components came out with the above fitness standard to direct our physical education teachers as to what they should be working towards and expect from our students in terms of their health-related fitness.

4.2 Discussion

The best time for the 1-kilometer run was 5.09 minutes recorded by the boys and the worst time of 8.90 minutes was recorded by girls. The whole population for the research, both boys and girls fell into the category of Health Fitness Zone (F) and High Health Fitness Zone (H)

The results fall in line with the findings of Cureton, Baumgartner and McManus (1991) that the better the running times, the better the aerobic capacity relative to body weight. This is considered the best indicator of a person‟s overall cardiovascular capacity. To him activities like jogging and running put much stress on the heart hence the ability of an individual to complete a one kilometer distance in the shortest possible time can be used to determine his or her overall cardiovascular capacity. This was what the researcher did for both boys and girls and their performances recorded.

Muscular strength test was the worst test performance (mean of the population was 11.85). As few as fifteen (15) subjects attained the health fitness zone (HFZ) of 18- 35 (this is standardized fitness level for muscular strength.) repetition. Seventy-five percent of them fell between health fitness zone (HFZ) that needs improvement.

Most subjects could also not perform above thirty (30) curl-ups that requires both muscular strength and endurance. The mean of curl-ups for boys was 24.5 and that of girls was 18.9. Approximately 20% of the girls fell into the category of (I) that is the Health Fitness Zone that needs improvement. 80% of them were in the HFZ. None was in the HIGH category. The inability of most subjects to perform above thirty curl-ups was may be due to lack of strength and endurance. Research has revealed that students who trained for strength gained as much endurance as those who trained for endurance and the vice versa (Baumgartner et al 1991). This also shows that both strength and endurance can be gotten when one is training for the other. They went on to mention some activities that can be used for this purpose. Activities like curl-up and push –up could be used for any of them.

The subjects showed high performance in flexibility test. The mean for the population was 8.44. The mean for girls was better than the mean for boys. The girls recorded 9.16 as against7.72 of the boys .the performance for both boys and girls were still below the standard as expected by the Prudential Fitnessgram. As many as 47% of the boys were in the Need to Improve category and for the girls none of them fell into the HFZ. In this category the farer you go in terms of recording high marks the better.

This finding was supported by previous finding of Miller (1994), that active individual are more flexible than inactive individual. Since subjects are all youth and active in a wide-range of movement, their loss of extensibility might be minimal.

Stretching during warm-up in physical education lessons improves the flexibility of students greatly. This was supported by the finding of Bandy and Ivion (1997) which states that stretches lasting between 10- 30 seconds results in flexibility and range of motion (ROM)

gains. Stretching once a week is enough to maintain ROM (Wallin, Ekblom, Grahn and Nuremberg 1995). Inability to stretch far enough forward indicates tightness in the low back and hamstrings and that flexibility is related to age and physical activity (AAHPERD,1996) So this could be the reason why in this particular activity the performance of both boys and girls meet the standard set in the Prudential fitnessgram.

Some sport actions of the students involve explosive ballistic movement, for example dance movement can also improve the subject flexibility. This is viewed against muscular background of students.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary of Findings

The focus of the study was to determine the health-related fitness levels of students in the senior high secondary school through the utilization of a fitnessgram test. The various gender of the population was also considered in the study. That is, the boys health-related fitness and that of the girls were also considered separated. The study went further to establish health- related fitness parameters for the students.

The study attracted interest for the following reasons;

1 The life-styles exhibited by subjects.

2 Teachers and students had conceptualized physical education to mean sports play and athletic, hence emphasis was on intramural and extramural games.

3 Physical activity performance as a means of recreation and health practice had declined considerably among students in the senior high secondary school.

4 The area of fitness assessment all these years had not been given any serious attention in our schools, hence the dearth of information on fitness norms in our schools.

The purpose of physical fitness testing is to determine status. Status needs to be determined before individualized exercise counseling could be conducted.

All along, teachers assumed that their students‟ players were fit because they participated in intramural and extramural games.

The study was a research involving students of senior high secondary school between the ages of 15- 17 to obtain their statistical and descriptive information on the current fitness levels of the subjects. The total population for the study was sixty (60) made up of thirty (30) boys and thirty (30) girls. The simple random technique was used to select the population.

The researcher collected data with the help of his assistants using the fitnessgram test battery. The variables tested included the following;

1 Body composition (Body mass index)
2 Cardiovascular endurance – 1 kilometer run time.
3 Muscular endurance - curl-ups
4 Muscular strength - push-ups
5 Flexibility- sit and reach.

The measuring instruments used to collect data included the following;

1 Graduated table for sit and reach (flexibility)
2 Weighing scale for body weight.
3 Stop watches to time students as they run the 1 kilometer.
4 Measuring tape – to measure the students" height.
5 Calculator - to calculate the body mass index of students.

The tests were scheduled for three days thus;

Day 1 sit and reach for flexibility, height and weight for body mass index.

Day 2 curl –ups and push –ups

Day 3 One kilometer run/walk.

Reliability and Validity

The fitnessgram test battery is a universally accepted test for assessing students health-related fitness levels. It was developed by Cooper institute for Aerobic Research Texas, USA.

The researcher realized that the mean of the students health-related fitness in muscular endurance was 21.68 whilst its standard deviation was as high as 7.75. This could mean that some student‟s performance was far from the mean either below or above hence a wide range of performance was recorded in this category.

In the case of muscular strength although it had a mean of 11.85 it also recorded a high standard deviation of 7.3. Which also suggest that many of the students‟ performance were either below or far above the mean.

The researcher also came to the realization that the mean for body composition using the body mass index was 21.03. Although this was below the 25 kilos, the expected target for health- related fitness, considering the age of 15-17 which was used for the study, it looks slightly high. The standard deviation of 3.16 also suggests that they were not too far from the mean.

The study group shows a very strong cardiovascular endurance by scoring a mean of 6.9 which is far below the health-related fitness zone of 8.30 for one kilometer run.

The standard deviation for this category indicated a close performance around the mean. It recorded 1,01 as its deviation from the mean.

Another revealing factor was that the study group was able to record a mean of 8.44 in the flexibility test, which again is good in relationship to the health-related fitness zone of 8-12.

Their standard deviation of 1.12 also indicated how close their performance was.

In critical observing the performances of both boys and girls in the various health related components, this is what the researcher has to say. In the category of the muscular endurance although the mean of the population was 11.85 the boys recorded a mean of 17.9 whilst the girls had 5.08. Obviously the boys exhibited a high performance in this area as against the weak and poor performance by the girls.

Another area were the boys dominated in terms of their performance was muscular endurance. Again they registered a higher performance of 24.5 with the mean of the population standing at 21.68 as against the girls below performance of 18.9.

The girls were more flexible than the boys when it came to sit and reach test which was used to measure their capacity in this area they recorded a mean of 9.16 which was higher than the population mean of 8.44 as against the 7.72 of the boys.

With body composition category, the girls have a higher body mass indicator of 22.26 which is above the population mean of 21.03 whilst the boys recorded 19.8. This means that the

girls are proportionally heavier than boys. Girls should therefore be encouraged to inculcate the habit of exercising to shed some of their weight since this is their formative years.

The last component of health-related fitness to be looked at is cardiovascular endurance. The boys mean score of 6.05 was again high than both the population and girls means of 6.9 and 7.79 respectively.

5.2 Conclusion

In all, five health-related fitness components namely, cardiovascular endurance, body composition, muscular endurance, muscular strength and flexibility were tested using the fitnessgram test battery. A total of sixty (60) students were tested. The means for the population, boys and girls were calculated to ascertain their fitness levels. Again, their standard deviations for the various health-related components were also determined.

In establishing the health-related fitness zones for both boys and girls the researcher took into consideration the means of the various components of health-related fitness. That of the boys was done separately from the girls.

The researcher went on to establish a health-related fitnessgram that will be guide to all physical education teachers who are interested in the health-related issues of their students.

The researcher went ahead to compare the standard of the students physical fitness level in the various components and activities that was carried out with the Prudential fitnessgram.

5.3 Recommendations

For the proper health-related fitness development of our students, the following recommendations could be critically examined and implemented by both health and educational authorities for improved health of our students.

1 Teachers should be encouraged to make their physical education programmes interesting and enjoyable so that students will know the benefit of being healthy and inculcating in them the ability to stay healthy. Because habit formed at this developmental age (15- 17) is likely to be part of once live forever.

2 School administrators and physical education teachers themselves must not allow physical education lessons to be subverted. This situation could be avoided if physical education teachers do their work as employed to do. That is, to teach the subject as it should be taught in their schools.

3 Curricular planners should do well to include health-related fitness activities in the curriculum of pupils and students.

4 The practice of asking pupils and students to run a number of times around the classroom and throwing football to pupils and students to play during physical education lesson must be a thing of the past.

5.4 Suggestions for Future Research

Future research on the health-related fitness level of students utilizing the fitnessgram should be carried out simultaneously in other regions of the country involving the students of the department (HPERS) as their project work. The study should include the following;

1 Students from senior high secondary throughout the country.

2 Boys from the senior high secondary in all the regions.

3 Girls from the senior high secondary in all the regions.

part of the sports development grant which government distribute to the regions and district assemblies should be channeled to the regions and the districts to enable the regional and districts physical education organizers their teams of experts carry out health-related fitness test utilizing the fitnessgram in their various regions and districts and submit their report to the national headquarters to help identify strengths and weakness of the various regions and districts and to help build national fitness norms to avoid reliance on foreign norms. When this is done it will serve as a base for the development of the various sports disciplines since the strength and weakness of each region and district will be taken into consideration before a particular sport will be developed.

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APPENDIX

Appendix A

Data collected on various health-related fitness components

Curl – Up (Muscular Endurance) For Boys

No. Serial	No. of Repetitions
1	20
2	26
3	22
4	15
5	9
6	24
7	30
8	24
9	32
10	16
11	17
12	8
13	34
14	26
15	26
16	21
17	13
18	38
19	25
20	14
21	25
22	28
23	29
24	30
25	40
26	38
27	37
28	33
29	25
30	30

Appendix B

Curl – Up (Muscular Endurance) For Girls

No. Serial	No. of Repetitions
1	13
2	17
3	9
4	19
5	7
6	12
7	22
8	30
9	32
10	10
11	10
12	18
13	22
14	25
15	27
16	19
17	24
18	20
19	15
20	14
21	18
22	25
23	26
24	18
25	20
26	31
27	8
28	19
29	17
30	21

Appendix C

Push – Up (Muscular Strength) For Boys

No. Serial	No. of Repetitions
1	12
2	17
3	22
4	15
5	13
6	20
7	15
8	16
9	21
10	13
11	14
12	18
13	19
14	20
15	21
16	18
17	17
18	13
19	14
20	19
21	20
22	19
23	18
24	19
25	20
26	17
27	19
28	18
29	20
30	21

Appendix D

Push – Up (Muscular Strength) For Boys

No. Serial	No. of Repetitions
1	6
2	11
3	10
4	1
5	3
6	1
7	4
8	3
9	2
10	12
11	1
12	4
13	2
14	10
15	11
16	9
17	2
18	4
19	4
20	9
21	3
22	14
23	5
24	3
25	15
26	8
27	2
28	4
29	9
30	2

Appendix E

1 Kilometer Run (Cardiovascular Endurance) For Boys

No. Serial	Time Used
1	5: 09sec
2	6: 21sec
3	5: 88sec
4	5: 75sec
5	5: 10sec
6	6: 24sec
7	5: 33sec
8	5: 50sec
9	5: 21sec
10	6: 08sec
11	6: 15sec
12	5: 85sec
13	7: 10sec
14	6: 84sec
15	6: 34sec
16	6: 41sec
17	6: 11sec
18	6: 12sec
19	6: 35sec
20	6: 48sec
21	5: 65sec
22	5: 70sec
23	6: 60sec
24	7: 24sec
25	6: 00sec
26	6: 18sec
27	6: 47sec
28	6: 09sec
29	5: 70sec
30	5: 90sec

Appendix F

1 Kilometer Run (Cardiovascular Endurance) For Girls

No. Serial	Time Used
1	7m 13sec.
2	7m 20sec.
3	7m 16sec.
4	7m 85sec.
5	8m. 09sec.
6	8m 15sec.
7	8m 25sec.
8	8m 30sec.
9	7m 75sec.
10	7m 60sec.
11	7m 50sec.
12	7m 24sec.
13	7m 30sec.
14	7m 45sec.
15	8m 10sec.
16	7m 09sec.
17	7m 75sec.
18	7m 81sec.
19	7m 45sec.
20	8m 46sec.
21	8m 41sec.
22	7m 26sec.
23	7m 90sec.
24	8m 19sec.
25	7m 66sec.
26	7m 71sec.
27	7m 85sec.
28	8m 80sec.
29	7m 50sec.
30	8m 90sec.

Appendix G

Body Composition Boys

No. Serial	Body Mass Indicator
1	20: 3
2	22: 0
3	21: 6
4	20: 7
5	20: 4
6	22: 5
7	19: 5
8	18: 3
9	19: 1
10	19: 1
11	20: 5
12	20: 8
13	19: 7
14	20: 7
15	18: 9
16	19: 5
17	19: 3
18	20: 1
19	21: 5
20	17: 9
21	17: 8
22	19: 0
23	19: 0
24	21: 5
25	17: 6
26	17: 4
27	22: 3
28	16: 3
29	19: 3
30	20: 5

Appendix H

Body Composition Girls

No. Serial	Body Mass Indicator
1	22: 0
2	17: 6
3	17: 9
4	26: 7
5	26: 3
6	21: 4
7	37: 7
8	23: 8
9	23: 8
10	22: 3
11	20: 5
12	23: 5
13	20: 9
14	20: 9
15	24: 0
16	22: 4
17	21: 7
18	19: 5
19	20: 1
20	20: 8
21	21: 5
22	17: 9
23	21: 6
24	23: 7
25	21: 9
26	25: 81
27	22: 94
28	22: 76
29	15: 24
30	20: 82

Appendix I

Sit and Reach (Flexibility) For Boys

No. Serial	Reach
1	7. 5cm.
2	8. 10cm.
3	6. 85cm.
4	7. 80cm.
5	8. 5cm.
6	8. 60cm.
7	8. 4cm.
8	7. 60cm.
9	7. 1cm.
10	8. 60cm.
11	9. 00cm.
12	8. 20cm.
13	7. 00cm.
14	6. 70cm.
15	7. 40cm.
16	6. 80cm.
17	8. 25cm.
18	8. 30cm.
19	8. 30cm.
20	7. 70cm.
21	6. 50cm.
22	7. 20cm.
23	7. 40cm.
24	7. 00cm.
25	8. 10cm.
26	6. 80cm.
27	8. 70cm.
28	7. 10cm.
29	8. 20cm.
30	8. 10cm.

Appendix J

Sit and Reach (Flexibility) For Girls

No. Serial	Reach
1	7. 5cm.
2	8. 86cm.
3	9m 80sec.
4	10. 00cm.
5	11. 00cm.
6	8. 00cm.
7	7. 80cm.
8	10. 50cm.
9	10. 40cm.
10	10. 30cm.
11	9. 40cm.
12	8. 60cm.
13	7. 80cm.
14	8. 10cm.
15	9. 45cm.
16	9. 10cm.
17	10. 00cm.
18	11. 00cm.
19	8. 00cm.
20	9. 60cm.
21	7. 5cm.
22	8. 90cm
23	9. 00cm.
24	8. 70cm.
25	8. 90cm.
26	9. 60cm.
27	8. 70cm.
28	9. 00cm.
29	10. 10cm.
30	8. 70cm.

Appendix K

The Prudential *Fitnessgram*

Test Items

AEROBICCAPACITY

Teachers will select one of the following options.

The PACER Fat-recommended for grades K-3 (multistage 20 metershuttle run).

One Mille Walk/Run.

BODY COMPOSITION

Teachers will select one of the following options.

Percent Fat-calculated from triceps & calfskinfolds.

Body Mass Index-calculate from height & weight.

MUSCLESTRENGTH, ENDURANCE & FLEXIBILITY

Teachers will select as indicated:

Abdominal Strength

Must selct

Curl-up Test

Upper Body Strength

Must select

Push-up

Modified Pull-up

Pull-up

Flexed Arm Hang

Trunk extensor & Flexibility

must select

Trunk Lift

Flexibility

May select one

Back-saver Sit-and-reach

Shoulder stretch

THE PRUDENTIAL

FITNESSGRAM

POINTERS FOR PARENTS

Active and Fit Kids: *Goals for the Nation*

Many people may not be aware that the US has a set of health goals we are trying to achieve by the year 2000. *Healthy People 2000* is a comprehensive set of objectives for disease prevention and health promotion and includes goals for reducing tobacco use, improving nutritional status, and reducing violence and abusive behaviors.

Physical activity and exercise for youth are such important health behaviors that they too are included in *Healthy People 2000*. Specifically, by the year 2000, the goal for youth between the ages of 6 and 17 is to participate in moderate physical activities 3 or more days/week for 20 or more minutes per occasion. In addition to the exercise goals, there are also health goals for the specific fitness areas that are part of your child's Prudential *FITNESS*GRAM assessment: developing aerobic capacity, muscular strength, endurance, and flexibility, and reduction of obesity. Another related goal is to increase the number of youth who participate in daily school physical education.

We encourage parents to help their children to be active. By participating in The Prudential *FITNESS*GRAM, your child is helping our nation to

Q&A

Q. *Do American children participate in adequate levels of physical activity?*

A. Studies indicate that while most students engage in adequate levels of activity there is a significant number of youth, 20-30%, who average less than one-half hour of activity each day. The number of youth who do not participate in regular activity becomes larger as students get older and become teenagers. If your child is one who does not participate in moderate to vigorous activity almost every day, you should do all that you can to encourage participation in regular physical activity.

Q. *How can parents help encourage*

Appendix L

FITNESSGRAM 6.0

Body Composition

Percent Body Fat

Boys

% Fat = (0.735 x Sum of skinfolds) + 1.0 Use Triceps and Calf skinfolds

Girls

% Fat = (0.610 x Sum of skinfolds) + 5.0 Use Triceps and Calf skinfolds

Source

Slaughter MH et al. 1988. Skinfold equations for estimation of body fatness in children and youth. *Human Biology* 60:709-723.

For College Age Students

Males

% Fat = (0.309 x Sum of skinfolds) + 3.99 Use Triceps, Calf and Abdominal skinfolds

Females

% Fat = (0.279 x Sum of skinfolds) + 10.15 Use Triceps, Calf and Abdominal skinfolds

Body Mass Index

Weight (kg)/Height (m)²

Appendix M

PHYSIOLOGY PRINCIPLES OF FITNESS DEVELOPMENT

Overload	Working the body at a greater workload or resistance, more often, or for a Longer period of time results in an improvement in fitness level. Exercise workload is determined by Frequency, Intensity and Time (FIT).
Progression	Gradually increasing the workload as the body adapts to a previous level of overload.
FIT	Frequency – how hard a exercises 3 – 4 times per week is generally recommended. Intensity – how hard a person exercises, can refer to heart rate level for aerobic activities, amount of weight being lifted or speed of repetitions of calisthenics. Time – how long (number of minutes of exercise) a person exercises.

GENERAL RECOMMENDATIONS FOR FIT

Aerobic Capacity	Muscular Flexibility
F – 3-4 per week	F – 3-4 times per week
1 – 60-80% of maximum	1 – stretch to point of discomfort

Aerobic capacity (target heart rate)	and not beyond
T – 30-30 minutes each day	Concentrate on lengthening the
	Time of the stretch.

Muscular Strength and Endurance

F – 3-4 time per week

1 – Pre-pubescent: strength and endurance can be developed by using calisthenics and circuits increasing resistance by doing more repetitions or the same number of repetitions in a shorter period of time.

Post-pubescent: weight training may be introduced in very gradual progressions use no resistance until proper form is achieved.

Increase resistance only – 3 1bs at a time always maintaining proper form.

T – 1 set of 6-15 repetitions, when one can achieve 1 set, then 1 to 3 sets.

Dose Level of overload. Dose necessary for fitness improvement is directly related to initial level of fitness. Less fit individuals require a smaller dose to achieve an increase fitness. The more fit individual requires ever increasing doses to increase fitness. Dose may remain fairy constant to maintain fitness level.

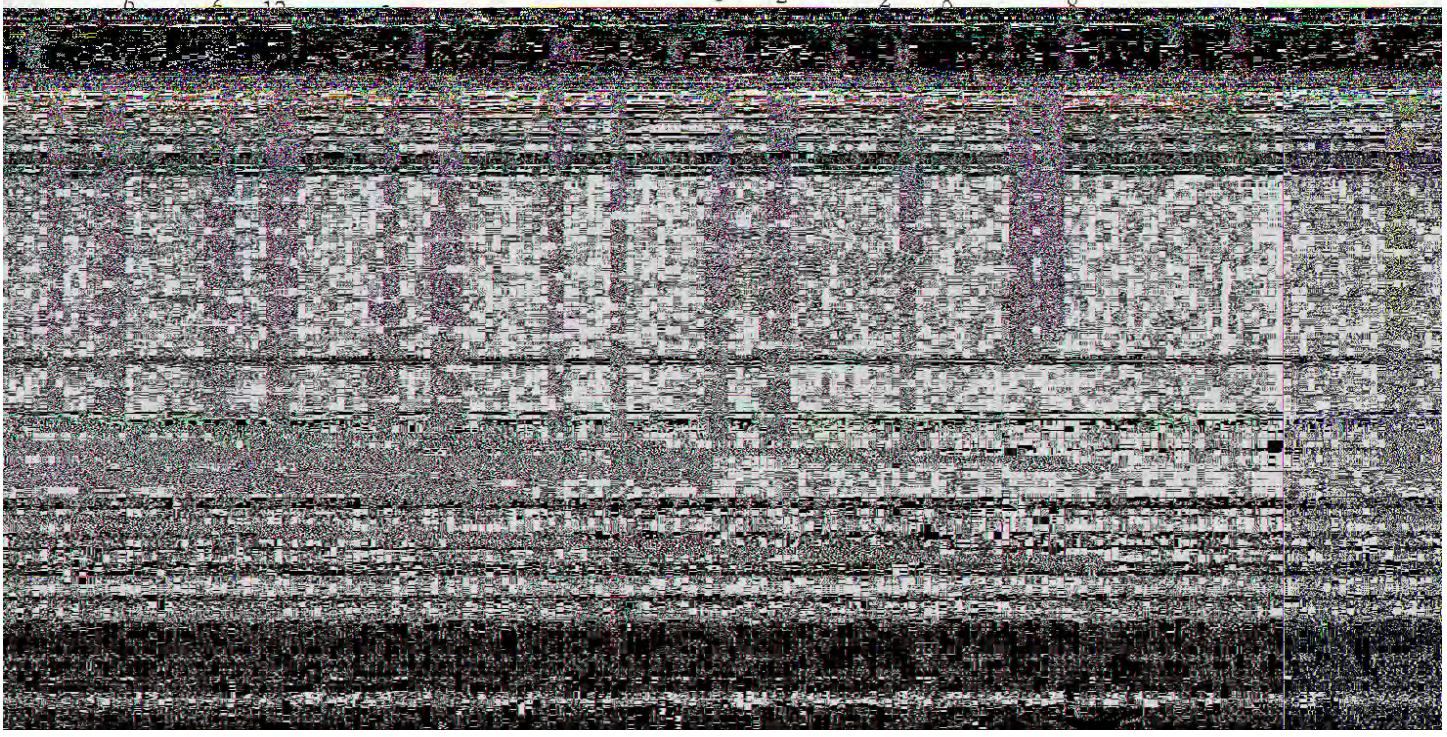
Specific Exercises that are specific to specific parts of the body e.g. curl-up for muscular endurance and pull-ups performed to develop the upper parts of the body.

Table 2. The Prudential *FITNESS*GRAM Standards for Healthy Fitness Zone*

BOYS

	One Mile *min:sec*		PACER *# laps*		$\dot{V}O_{2max}$ *ml/kg/min*		Percent Fat		Body Mass Index		Curl-up *# completed*	
5	*Completion of*		*Participate in*				25	10	20	14.7	2	10
6	*distance. Time*		*run. Lap count*				25	10	20	14.7	2	10
7	*standards not*		*standards not*				25	10	20	14.9	4	14
8	*recommended.*		*recommended.*				25	10	20	15.1	6	20
9							25	10	20	15.2	9	24
10	11:30	9:00	17	55	42	52	25	10	21	15.3	12	24
11	11:00	8:30	23	61	42	52	25	10	21	15.8	15	28
12	10:30	8:00	29	68	42	52	25	10	22	16.0	18	36
13	10:00	7:30	35	74	42	52	25	10	23	16.6	21	40
14	9:30	7:00	41	80	42	52	25	10	24.5	17.5	24	45
15	9:00	7:00	46	85	42	52	25	10	25	18.1	24	47
16	8:30	7:00	52	90	42	52	25	10	26.5	18.5	24	47
17	8:30	7:00	57	94	42	52	25	10	27	18.8	24	47
17+	8:30	7:00	57	94	42	52	25	10	27.8	19.0	24	47

	Trunk Lift *inches*		Push-up *# completed*		Modified Pull-up *# completed*		Pull-up *# completed*		Flexed Arm Hang *seconds*		Back Saver Sit & Reach** *inches*	Shoulder Stretch
5	6	12	3	8	2	7	1	2	2	8	8	
6												



Standards for Health-Related Fitness Zones

I = Needs Improvement Zone *(does not meet health-related standard)*
F = Health Fitness Zone *(meets health-related standard)*
H = High Fitness Performance Zone *(exceeds health-related standard)*

Boys

Age	20-meter PACER			15-Meter PACER			One-Mile Run/Walk			Sit-and-Reach			90° Push-Ups			Curl-Ups		
Zone	I	F	H	I	F	H	I	F	H	I	F	H	I	F	H	I	F	H
8	0-22*	23-61*	>61*	0-29*	30-80*	>80*	>12:30*	12:30-10:00*	<10:00*	0-7	8		0-4	5-13	>13	0-5	6-20	>20
9	0-22*	23-61*	>61*	0-29*	30-80*	>80*	>12:00*	12:00-9:30*	<9:30*	0-7	8		0-5	6-15	>15	0-8	9-24	>24
10	0-22	23-61	>61	0-29	30-80	>80	>11:30	11:30-9:00	<9:00	0-7	8		0-6	7-20	>20	0-11	12-24	>24
11	0-22	23-72	>72	0-29	30-94	>94	>11:00	11:00-8:30	<8:30	0-7	8		0-7	8-20	>20	0-14	15-28	>28
12	0-31	32-72	>72	0-41	42-94	>94	>10:30	10:30-8:00	<8:00	0-7	8		0-9	10-20	>20	0-17	18-36	>36
13	0-40	41-83	>83	0-53	54-108	>108	>10:00	10:00-7:30	<7:30	0-7	8		0-11	12-25	>25	0-20	21-40	>40
14	0-40	41-83	>83	0-53	54-108	>108	>9:30	9:30-7:00	<7:00	0-7	8		0-13	14-30	>30	0-23	24-45	>45
15	0-50	51-94	>94	0-66	67-123	>123	>9:00	9:00-7:00	<7:00	0-7	8		0-15	16-35	>35	0-23	24-47	>47
16	0-60	61-94	>94	0-79	80-123	>123	>8:30	8:30-7:00	<7:00	0-7	8		0-17	18-35	>35	0-23	24-47	>47
17	0-60	61-106	>106	0-79	80-138	>138	>8:30	8:30-7:00	<7:00	0-7	8		0-17	18-35	>35	0-23	24-47	>47
17+	0-71	72-106	>106	0-93	94-138	>138	>8:30	8:30-7:00	<7:00	0-7	8		0-17	18-35	>35	0-23	24-47	>47

Girls

Age	20-meter PACER			15-Meter PACER			One-Mile Run/Walk			Sit-and-Reach			90° Push-Ups			Curl-Ups		
Zone	I	F	H	I	F	H	I	F	H	I	F	H	I	F	H	I	F	H
8	0-6*	7-41*	>41*	0-8	9-54*	>54*	>12:30*	12:30-10:00*	<10:00*	0-8	9		0-4	5-13	>13	0-5	6-20	>20
9	0-6*	7-41*	>41*	0-8	9-54*	>54*	>12:30*	12:30-9:30*	<9:30*	0-8	9		0-5	6-15	>15	0-8	9-22	>22
10	0-6	7-41	>41	0-8	9-54	>54	>12:30	12:30-9:30	<9:30	0-8	9		0-6	7-15	>15	0-11	12-26	>26
11	0-14	15-41	>41	0-18	19-54	>54	>12:00	12:00-9:00	<9:00	0-9	10		0-6	7-15	>15	0-14	15-29	>29
12	0-14	15-41	>41	0-18	19-54	>54	>12:00	12:00-9:00	<9:00	0-9	10		0-6	7-15	>15	0-17	18-32	>32
13	0-22	23-51	>51	0-29	30-67	>67	>11:30	11:30-9:00	<9:00	0-9	10		0-6	7-15	>15	0-17	18-32	>32
14	0-22	23-51	>51	0-29	30-67	>67	>11:00	11:00-8:30	<8:30	0-9	10		0-6	7-15	>15	0-17	18-32	>32
15	0-31	32-51	>51	0-41	42-67	>67	>10:30	10:30-8:00	<8:00	0-11	12		0-6	7-15	>15	0-17	18-35	>35
16	0-31	32-61	>61	0-41	42-80	>80	>10:00	10:00-8:00	<8:00	0-11	12		0-6	7-15	>15	0-17	18-35	>35
17	0-40	41-61	>61	0-53	54-80	>80	>10:00	10:00-8:00	<8:00	0-11	12		0-6	7-15	>15	0-17	18-35	>35
17+	0-40	41-72	>72	0-53	54-94	>94	>10:00	10:00-8:00	<8:00	0-11	12		0-6	7-15	>15	0-17	18-35	>35

*Indicates experimental performance standard, based on expert opinion

6/11/09