

UNIVERSITY OF CAPE COAST

**COMPARISON OF HEALTH-RELATED PHYSICAL FITNESS
LEVELS OF GIRLS IN DAY AND
BOARDING SENIOR HIGH SCHOOLS IN CAPE COAST**

CHARITY NORDZRO

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**COMPARISON OF HEALTH-RELATED PHYSICAL
FITNESS LEVELS OF GIRLS IN DAY AND
BOARDING SENIOR HIGH SCHOOLS IN CAPE COAST**

BY

CHARITY NORDZRO

**Thesis submitted to the Department of Health, Physical Education and
Recreation of the Faculty of Education, University of Cape Coast in
partial fulfillment of the requirements for the award of Master of
Philosophy Degree in Physical Education**

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DECLARATION

CANDIDATE’S DECLARATION

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this University or elsewhere

Signature Date.....

Candidate’s Name: CHARITY NORDZRO

SUPERVISORS’ DECLARATION

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Signature..... Date.....

Supervisor’s Name: DR. JOSEPH K. OGAH

Signature..... Date.....

Supervisor’s Name: DR. BENHARD L. BOATENG

ABSTRACT

Despite the good intentions of why the boarding school system was introduced into the Ghanaian Education system, present day parents and even students think that boarding facilities and services are not adequate and are of poor quality and therefore, will affect the health of students.

The purpose of the study was to find out any differences in the health-related physical fitness levels of day and boarding girls in the SHS in Cape Coast, Ghana. One hundred and sixty SHS girls from Aggrey Memorial Senior High School and Ghana National College were used for the study.

The Prudential Fitnessgram (2002) battery of tests was used to test the five components of health-related physical fitness of each subject for the study. The scores were processed and analyzed using the independent samples t-test and the Healthy Fitness Zone (HFZ).

From the HFZ values and the t-test statistics results, there is an indication that the boarding girls were at higher risk in respect to the health related physical fitness components tested. The day girls were fitter in all the five health-related physical fitness components tested. This may be due to the fact that the nature and intensity levels of physical activities differ between the two groups.

The comparatively poor health-related physical fitness condition of the girls in the boarding house is not good at all and needs an urgent, practical and comprehensive approach to deal with it, such as designing physical education, sporting and recreational activities to be interesting and attractive for students to participate.

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DEDICATION

I dedicate this piece of work to my beloved son Deladem John Paul Gbemu and my entire family.

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CHAPTER ONE

INTRODUCTION

Background of the Study

For sometime now there has been an increase in the awareness of being physically fit as a positive health habit that has a major impact on the wellness of every individual. There is now strong scientific evidence linking physical fitness, not only to better health but also to decreased medical cost, improved academic work and improved job productivity (Robins, Powers & Burgess, 1994).

In recent times, the awareness to be fit or to stay healthy in order to enjoy a meaningful life has been the concern of the young and old as well as the Government of Ghana. The need to increase physical fitness through healthy lifestyle is of paramount importance to most people in the urban communities. This accounts for the coming up of so many keep fitness programmes in the cities.

Physical fitness is a general concept with two specific components being the health-related physical fitness and the motor-related physical fitness. This study however is concerned with the health-related physical fitness levels of day and boarding girls in SHS in Cape Coast. Health-related physical fitness is defined by

Corbin, Lindsey, Welk & Corbin (2002) as the body's ability to function efficiently and effectively without undue fatigue, and to enjoy leisure time, be healthy, resist hypokinetic diseases and meet emergency situations.

Health-related physical fitness activities are gradually gaining root in the Ghanaian society as part of healthy living. The Ghana Health Service (GHS) of the Ministry of Health (MOH) has committed itself to helping people improve their health status in the country through comprehensive health promotion and disease prevention like educating the populace on the need to take part in keep fit programmes, cut down on fatty foods, eat healthy and balanced diet and do more physical activities. In the public health centres, programmes emphasise disease prevention, health promotion, and not treatment of disease alone (Akorsah, 2006) With this idea, the GHS wants to help individuals to lead healthier lives that will help them to live long, improve the health and the fitness status of the nation's children, youth, and the aged, and reduce the disparities in health status among different population groups.

Apart from the GHS, the Ghana Education Service (GES) has also outlined comprehensive programmes in the teaching of physical education (P.E.) and sporting activities (from inter-house to regional games) to help improve the health of students. At a recently held super-zonal competition on the schools and colleges field at Adisadel College in 2007, The Central Regional Minister, Mr. Isaac Edumadzi made mention of the fact that students who take part in physical activities hardly fall sick. He emphasized fitness as a basis for good health and excellence in academic work in schools in the country.

For individuals to be healthy, they must commit themselves to physical dimensions of health, which deals with the functional operation of the body; in other words, is your body the best machine possible? The physical dimension involves the health-related components of physical fitness which are cardiovascular endurance, muscular strengths, muscular endurance, flexibility and body composition. It also includes medical self-care, regular self-tests, check-ups, and proper use of medications.

Bucher and Prentice (1985), defined physical fitness as the capacity of the heart, lungs, blood vessels and muscles to function at optimal efficiency. The fit individual is able to complete the normal routine for the day and still have ample reserve energy to meet the other demands of daily recreational sports, rewarding relationships, and other leisure activities. Also, the fit individual has adequate energy to handle life's emergency or crisis situations whenever they arrive.

Blair, as cited in Robbins et al.,(1994), has said that a sedentary lifestyle is a risk factor for diseases such as high blood pressure and obesity. Boateng a renowned Ghanaian Heart Surgeon has during a GTV interview in 2006 to celebrate world heart day said that the sedentary life style of present day youth has resulted in the high rate of hypokinetic diseases among students girls in our SHS in Ghana.

The growing interest of SHS boys in sporting activities has made them more physically active than their female counterparts, especially the SHS girls who stay away from active sports due to fear of becoming muscular, and other misconceptions. The lack of vigorous physical activities in the lifestyle of the girls in SHS might be the reason for the generally accepted low levels of

cardiovascular endurance, muscular strength, muscular endurance, flexibility and body composition which are the main component of the health-related physical fitness.

Statement of the Problem

The frequent report of sickness by the SHS boarding girls has gradually become a problem of discussion during staff meetings. From the beginning of the term there is not a single day that a student is not found at the sick bay or being referred to general hospitals in Cape Coast. This is not a peculiar problem to a school but a common problem that has developed among the SHS with boarding girls. Hardly would you see a day girl at the sick bay or being referred to the hospital.

The frequent visits of the boarding girls to the sick bay and the hospitals go a long way to affect their academic work and also put unnecessary pressure on the housemistresses who have to stop teaching and to accompany them to the hospitals. The cause of the frequent sickness of the boarding girls could be attributed to their health-related physical fitness levels.

The general lifestyle of the SHS day girls which involve walking longer distances to school and home coupled with other physical activities at home seem to improve their health-related physical fitness levels which might account for their not reporting frequently to the sick bay and to the hospital.

Purpose of the Study

The purpose of the study was to find out whether there existed any differences in the health-related physical fitness levels of day and boarding SHS girls in Cape Coast.

Research Question

What is the difference between the health-related physical fitness levels of day and boarding SHS girls in Cape Coast?

Sub-Questions

1. What is the difference in cardiovascular endurance levels between day and boarding SHS girls in Cape Coast?
2. What is the difference in muscular endurance levels between day and Boarding SHS girls in Cape Coast?
3. What is the difference in muscular strength levels between day and boarding SHS girls in Cape Coast?
4. What is the difference in flexibility levels between day and boarding SHS girls in Cape Coast?
5. What is the difference in body composition levels between day any boarding SHS girls in Cape Coast?

Major Hypothesis

There is a significant difference between the health-related physical fitness levels of day and boarding SHS student girls in Cape Coast. The health-related physical fitness level of day students will be higher than that of the boarding girls.

Sub- Hypotheses

1. There is a difference in cardiovascular endurance levels between girls in day and boarding SHS in Cape Coast. The cardiovascular endurance level of the day girls will be higher than that of the day girls.

2. There is a difference in muscular endurance levels between girls in day and boarding SHS in Cape Coast. The muscular endurance level of day girls will be higher than that of the boarding girls.
3. There is a difference in muscular strength levels between girls in day and boarding SHS in Cape Coast. The muscular level of day girls will be higher than that of the boarding girls.
4. There is a difference in flexibility levels between girls in day and boarding SHS in Cape Coast. The flexibility level of day girls will be higher than that of boarding girls.
5. There is a difference in body composition levels between girls in day and boarding girls SHS in Cape Coast. The body composition levels of day girls will be higher than that of boarding girls.

Significance of the Study

The findings of the study would be useful to the management of SHS with boarding facilities, especially to come out with policies and regulations to improve, sport and recreational facilities and encourage participation in physical education, sports and recreational activities.

Physical education tutors in SHS schools would also use the findings to assess their physical education, sports and recreational activities and adjust them accordingly to help improve the health-related physical fitness of students girls in their respective schools.

During Parents and Teachers Association meetings, parents could be informed about the finding for them to assist in kind or money towards the provision of

modern sporting and recreational facilities and to encourage their daughters in SHS to take keen interest in physical education and sporting activities.

The students will also be informed about the results for them to change their negative lifestyles towards, physical education, sports, and recreational activities which could end up affecting their health.

Delimitation of the Study

The study was delimited to the health-related physical fitness levels of Aggrey Memorial day and boarding Senior High School girls and Ghana National day and boarding Senior High School girls in Cape Coast in the Central Region of Ghana.

The study was delimited to the measurement of health-related fitness components with the following instruments:

1. Cardiovascular endurance was measured with one mile or 1600m run/walk.
2. Body composition was measured by Precalibrated pair of skinfold calipers taking skin fats on participant hamstrings, iliac crest, triceps, abdominal, calf etc.
3. Flexibility was be measured by sit and reach on the Acuflex box.
4. Muscular endurance was measured by trunk curl-ups.
5. Muscular strength was measured by modified push-ups.

The Prudential Fitnessgram test norms were used to interpret the results of the test whiles the SPSS window 12.0 was used for the statistical tests.

The independence samples t-test was used to determine the significant differences between the two selected groups.

Limitations of the Study

The unavailability of a locally developed instrument for testing physical fitness led to the reliance on foreign instruments, therefore, the possibility of slight inaccuracies in the results were expected since the subjects being tested had different cultures, lifestyles, as well as different environmental conditions from those who were used to develop the instrument.

The use of BMI to determine obesity was also a problem since the weight of person is not a good indicator of the level of obesity. According to Lindsey et al., (2000) weight varies from day to day and even hour to hour based on the level of hydration at the time of measurement. Muscle weighs more than fat, therefore, a muscular person will naturally weigh more than a fatty person. This problem might slightly affect the results of body composition since muscular people may be classified as obese.

Definition of Terms

Dearism: A word used to describe how girls who practice lesbianism call their partners.

Hypokinetic Diseases: Is a term referring to those diseases that can be associated in some respect to sedentary lifestyle.

Lesbianism: A situation where women are attracted to women on sexual issues.

White: It is a candidiasis which affects the private part of women.

Sugar daddy: An older man who gives younger women expensive presents especially in exchange for a romantic or sexual relationship.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

For the purpose of the study, related literature was reviewed following the sub-headings below;-

1. Definition and Meaning of Health.
2. Health-Related Physical Fitness and its Components.
3. Physical Activity and Its Health Benefits.
4. Factors that Affect the Physical Fitness of Students.
5. Lifestyles of Boarding and Day Girls.

Definition and Meaning of Health

Health is an elusive word. Most people who consider themselves healthy are not and many people, who are suffering from some known disease, may be relatively healthy. Health is a concept which does not merely relate to the absence of disease, or healthy working of organs, or having good thoughts. Health is a holistic concept. It relates to a person as a whole (Webster, 1991).

According to David (1986), World Health Organization (WHO) defines health as a state of complete physical, mental, and social well-being and not merely the

absence of disease or infirmity. From the definition, being healthy does not mean the absence of diseases which is the traditional way of defining health. In 1986, the WHO, in the Ottawa Charter for Health Promotion, said that health is a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities.

According to Payne and Hahn (1998), health is defined as a reflection of the ability to use the intrinsic and extrinsic resources within each dimension of health in order to participate fully in the activities that contribute to growth and development during each stage of the life cycle. Developmentally, the process of moving through young adulthood does not occur simply because of the passage of time, but because people of that age can participate in those experiences considered appropriate for that phase of life. Clearly, if the process is markedly impeded by health problems, their ability to complete those developmental tasks would be impeded. Payne and Hahn (1998), believe it is essential to understand that the very ability to define and then recognize the existence of needed resources depends on an understanding of growth and development itself. It also requires the ability to determine whether needed resources exist or must be cultivated. In the light of the above, Ross & Gilbert (1989) see health as a mirage. One can reach for it, but never fully grasp it.

Health for All does not mean an end to disease and disability, or that doctors and nurses will care for everyone. It means that resources for health are evenly distributed and that essential health care is accessible to everyone. Personal health depends partially on the social structure of one's life. The maintenance of strong social relationships is linked to good health conditions, longevity, productivity,

and a positive attitude. This is due to the fact that positive social interaction as viewed by the participant increases many chemical levels in the brain which are linked to personality and intelligence traits (Mackenbach & Bakker, 2002).

Health-Related Physical Fitness and its Components

Physical 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. Physical fitness is a blend of a number of physical qualities (Bouchard, Shepherd & Stephens, 1994). Physical fitness is very important in our daily lives considering the health benefits one gains every day as compared to sedentary living. We all need these qualities in order to perform our daily tasks.

According to Prentice (1994) fitness is a broad term denoting dynamic qualities that allow one to satisfy one's needs, regarding mental and emotional stability, social consciousness and adaptability, spiritual, moral, and organic health, consistent with one's heredity.

According to Prentice (1999), Physical fitness is not entirely dependent on exercise. Desirable health practices also play an important role. Physical fitness affects the total person: intellect, emotional stability, physical conditioning and stress levels.

Being physically fit is defined as the ability to carry out daily tasks with vigor and alertness without undue fatigue and with ample energy to enjoy leisure and meet unforeseen emergencies. On the other hand, a number of measurable components do contribute to physical fitness and these components have been broadly divided into two categories. The most frequently cited components fall

into two groups: - health-related physical fitness and motor skill-related physical fitness.

Siedentop (2001) states that health-related physical fitness is important for the prevention and remediation of hypokinetic degenerative diseases most of which have been those related to the heart and vascular system. Medical, health and professionals refer to this as a cardiovascular problem. Health-related physical fitness has five major components which are cardiovascular endurance, muscular endurance, muscular strength, flexibility, and body composition. Beneath are the discussions on the various components.

Williams (1997), believes that health-related physical fitness includes not only a healthy body weight and composition, but cardiovascular-respiratory fitness, adequate muscular strength and endurance, and sufficient flexibility.

Health-related physical fitness according to Prentice (1999), is concerned with the development of qualities necessary to function efficiently and maintain a healthy lifestyle.

Cardiovascular Endurance

Cardiovascular fitness is frequently considered the most important aspect of physical fitness because those who possess it have a decreased risk of heart diseases, the number one killer in our society. This is supported by statements of the American Association commissions and Surgeon General's Report on Physical Activity and Health which indicate sedentary living as a primary risk factor for heart disease. (Anderson, Broom, Pooley, Schrodt and Brown 1995).

According to Prentice (1999), cardiovascular endurance is the ability to persist in a physical activity requiring oxygen for physical exertion without experiencing

undue fatigue. The functioning of the heart, lungs, and blood vessels is essential for distribution of oxygen and nutrients and removal of wastes from the body. For performance of vigorous activities, efficient functioning of the heart and lungs is necessary.

According to Wuest and Bucher (1995), cardiovascular endurance is the body's ability to deliver oxygen effectively to the working muscles so that an individual can perform physical activity. Efficient functioning of the cardiovascular system, that is, the heart and blood vessels, and the respiratory system, that is, the lungs, is essential for the distribution of oxygen and nutrients and removal of wastes from the body.

Physical activities improve the cardiovascular and the respiratory system. Physical activity and fitness can be a significant contributor to disease or illness treatment. Even with the best disease-prevention practices, some people will become ill. Regular exercise and good fitness have been shown to be effective in alleviating symptoms and aiding rehabilitation after illness for such hypokinetic conditions as diabetes, heart attack, back pains, and others. Physical activity and fitness are methods of health and wellness promotion. They contribute to quality living associated with wellness, the positive component of good health. (Corbin, Linsey, Insel & Roth, 2002).

It is probably the most important fitness component. It is the ability to deliver essential nutrients especially oxygen to the working muscles of the body, and to remove waste products during prolonged physical exertion. Sometimes, it is referred to as cardiorespiratory endurance. The reason being that it requires the utilization of oxygen, which is only possible if the circulatory and respiratory

systems are capable of these functions. It is expressed in terms of maximal oxygen intake (max VO_2), which is the greatest amount of oxygen that can be utilized by the body in intense exercise. Vigorous exercise improves the functioning of the cardio respiratory system and is directly related to coronary risk.

The heart is a muscle and to be stronger it must be exercised like any other muscle in the body. If the heart is exercised regularly its strength increases and if not, it becomes weak. The American Medical Association states that exercise is the most significant factor contributive to the health of individuals (Robbins et al., 1995)

The benefits of cardiovascular endurance far outweigh the benefits of the other components of health-related physical fitness. With an efficient circulatory and respiratory systems, people experience little difficulty in keeping pace with the body's needs for oxygen, fuel and waste removal.

Regular endurance exercise also improves metabolism at the cellular level. It increases the number of capillaries in the muscles so that they can be supplied with more oxygen and fuel. It also trains the muscles to make the most used of available oxygen and fuel so that they work more efficiently.

Regular endurance exercises lower the risk of many chronic diseases and disabling diseases. It can also help individuals with those diseases improve their health, increase their capacity to sustain a given level of energy production for a prolonged period. (Anderson, Broom, Pooley, Schrodt & Brown, 1995)

Good cardiovascular fitness reduces the risk of heart diseases, hypokinetic conditions and early death. The best evidence indicates that cardiovascular fitness

is associated with reduced risk for heart disease. A classic research study at the Cooper Institute for Aerobics Research showed that less fit people are especially at risk (Fahey Insel & Roth, 2002). In addition, it has now been demonstrated that improving fitness (moving from low fitness to good fitness zone) can reduce the risk of early death.

A recent study found that women who accumulated at least 3 hours of brisk walking each week cut their risk of heart attack and stroke by more than half. Obesity is also on the list of risk factors. A person whose body weight is more than 30% above the recommended level is at a higher risk for heart disease and stroke, even if no other risk factors are present. Excess weight increases the strain on the heart by contributing to high blood pressure and high cholesterol levels. It can also lead to diabetes, another cardiovascular diseases (CVD) risk factor. Diabetes is a disorder in which the metabolism of glucose is disrupted, causing a build up of glucose in the bloodstream. People with diabetes are at an increased risk for CVD, partly because elevated blood glucose levels can damage the lining of arteries, making them more vulnerable to atherosclerosis; diabetics also often have other risk factors, including hypertension, obesity, and unhealthy cholesterol and triglyceride levels (Fahey et al, 2002).

Development of cardiovascular endurance helps your body to work longer and at a greater level of intensity (Corbin et al. 2002). Payne and Hahn, (1998) state that occasionally the body cannot produce the energy it needs for long-term activity. The need to engage in good endurance programmes is therefore important to minimize this problem which is caused by oxygen debt.

To develop a successful endurance exercise program, the individuals must set goals. Cardiovascular fitness assessment tests results can be used to set a specific oxygen consumption goal for cardiovascular endurance program. The goal should be high enough to ensure a healthy cardio respiratory system but not so high that it will be impossible to achieve. Through endurance training, an individual may be able to improve maximal oxygen consumption (VO_2 max) by 10-30% (Fahey, et al 2002).

Apart from setting goals, choosing the appropriate physical activities is important. Cardio-respiratory endurance exercise includes activities that involve the rhythmic use of large-muscle groups for an extended period of time, such as jogging, walking, cycling, aerobic dancing, and other forms of group exercise, and swimming. Having fun is a strong motivator; select a physical activity program that is easier to stay with. Exercising with a friend can also be helpful as a motivator. (Booher and Inbodeau, 2000)

Another issue is determining frequency of training: To build cardiovascular endurance, you should exercise 3-5days per week. Beginners should start with 3 per week up to 5days per week. Training more than 5 days per week can lead to injury and it is not necessary for the typical person on exercise designed to promote wellness.

Determining the intensity of training is also important. Intensity is the most important factor in achieving training effects. The individual must exercise intensely enough to stress the body so that fitness improves. In monitoring the intensity of exercises, two methods can be employed. These are target heart zones and rating of perceived exertion. (Booher and Inbodeau, 2000)

Another factor is to determine duration of training: A total duration of 20-60 minutes is recommended. Exercises can take place in a single session or multiple sessions lasting 10 or more minutes. The total duration of exercise depends on its intensity. To improve cardiorespiratory endurance during a low-to-moderate-intensity such as walking or slow swimming, there is the need to exercise 45-60 minutes. For high intensity exercise performed at top of the target heart rate zone, duration of 20 minutes is sufficient. Studies have shown that 5-10 minutes of extremely intense exercise {greater than 90% of maximal oxygen consumption} improves cardio respiratory endurance.

Warming up and cooling down must also be considered: It is important to warm up before every session of cardiorespiratory endurance exercises and to cool down afterward. Because the body's muscles work better when their temperature is slightly above resting level, warming up enhances performance and decrease the chance of injury. It gives the body time to redirect blood to active muscles and the heart time to adapt to increased demands. Warming up also helps spread synovial fluid throughout the joints, which help protect their surfaces from injury. (Booher et al., 2000)

Building fitness is as much as a science. The rate of progress will depend on the age, health status, initial level of fitness, and motivation. The fitness improves with overload of one's body. However, one must increase the intensity, frequency, and duration of exercise carefully to avoid injury and overtraining. For the initial phase of the program, which may last anywhere from 3-6 weeks, exercise should be at the low level of the target heart rate zone. One should begin with a frequency of 3-4 days per week, and choose duration appropriate for fitness

level. The next phase of the program is the improvement phase, lasting from 4-6 months. During this phase, one should slowly and gradually increase the amount of overload until the target level of fitness is reached. (Fahey et al., 1994).

Williams (1997) observed that during a prolonged exercise, an individual with a high level of cardiovascular endurance is able to deliver the required amount of oxygen to the tissue with relative ease. On the contrary, an individual with low level of cardiovascular endurance has to work much harder since the heart has to pump more blood to often supply the same amount of oxygen to tissue. It is therefore, recommended that regular participation in aerobic exercises or endurance activities will help achieve and maintain recommended body weights.

Insel and Roth (2002) state that the cardiovascular endurance depends on such factors as the ability of the lungs to deliver the oxygen from the environment to the bloodstream, the heart's capacity to pump enough blood, the ability of the nerve system, the blood vessels to regulate blood flow, the muscles' capacity to generate power, and the capacity of the body's chemical systems to use oxygen and process fuels for exercise. When levels of cardiovascular fitness are low, the heart has to work very hard during normal daily activities and may not be able to work hard enough to sustain high-intensity physical activity in an emergency.

As cardio-respiratory fitness improves, the heart begins to function more effectively. It does not have to work as hard at rest or during low levels of exercise. The heart pumping more blood to supply the tissues improves, the body is better able to cool it, and resting blood pressure decreases. A healthy heart can better withstand the strains of every day life, the stress of occasional emergencies, and wear and tear of time. Endurance training also improves the functioning of

biochemical systems, particularly in the muscles and liver, thereby enhancing the body's ability to use energy supplied by food and to do more exercise with less effort from the oxygen transport system (Fahey et al ,1994).

There are two main ways by which cardiovascular endurance can be measured or assessed. These are field and laboratory assessments. In the case of this study, the researcher utilized the field assessment due to its numerous advantages, some of which are; easy access to facility and equipment, time saving, personnel available to help the researcher to conduct the test, and the fitness level of the people being tested. The laboratory assessment is more expensive due to the nature of complex and sophisticated equipment used.

Maximal oxygen consumption can be measured precisely in an exercise physiology laboratory through analysis of the air a person inhales and exhales when exercising to a level of exhaustion. This procedure can be expensive and time consuming, making it impractical for the average person. For the field assessment, there are four tests.

1. The 1-mile run/ walk test which estimates the level of cardiorespiratory fitness (maximal oxygen consumption) based on the amount of time it takes to complete 1-mile brisk walking and running.
2. The 3-minutes step test; the rate at which the pulse returns to normal after exercise is also a good measure of cardiorespiratory capacity, heart rate remains lower and recovers faster in people who are more physically fit. For the step test one steps continually at a steady pace and then monitors the heart rate during recovery.

3. The 1 -mile run /walk test oxygen consumption increases with speed in distance running, so a fast time on this test indicates maximal oxygen consumption.
4. The Astrand-Rhyming cycle ergometer test estimates maximal oxygen consumption from the high heart rate after pedaling the bicycle ergometer for 6-minutes at a constant rate and resistance (power output). A low exercise heart rate after pedaling a high power output indicates high maximal oxygen consumption. (Fahey et al, 2002)

Cardio-respiratory endurance is considered a critically important component of health-related fitness because of the functioning of the heart and lungs being so essential to overall cause of death in Ghana according to Boateng, a renowned heart surgeon in 2006. Cardio-respiratory endurance increases the capability to sustain a given level of energy production for a prolonged period. It helps your body to work longer and at greater levels of intensity.

The body cannot always produce the energy it needs for long-term activity. Certain activities require performance at a level of intensity that will outstrip the cardio respiratory systems ability to transport oxygen efficiently to contracting muscles fibers. When the oxygen demands of the muscles cannot be met, oxygen debt occurs. Any activity that continues beyond the point at which oxygen debt begins requires a form of energy production that does not depend on oxygen.

Activities not generally associated with anaerobic energy production (walking, distance jogging, and bicycle touring) become anaerobic activities when they are increased in intensity or continued for an extended period. If one usually works or plays at low intensity but for a long duration, one develops the ability to

maintain anaerobic (without oxygen) energy production. As long as the body can meet its energy demands in this oxygen-rich mode, it will not convert to anaerobic energy production. Thus, fatigue will not be an important factor in determining whether one can continue to participate. Marathon runners, serious joggers, distance swimmers, cyclists, and aerobic dancers can perform because of their highly developed aerobic fitness. The cardiorespiratory systems of these aerobically fit people, take in, transport, and use oxygen in the most efficient manner possible. (Payne & Hahn, 1998).

Muscular Strength

Muscular strength is essential for the body to accomplish work; according to Robbin, Powers & Burgess. (1997) It is the ability of muscles to exert maximal force against resistance. It is characterized by activities of short duration intensity. The ability to maintain posture, work, push, and pull makes muscles maintain their level of contraction. According to Wuest & Lombardo, (1994), muscular strength is concerned with the maximal amount of force that can be exerted in a single contraction. Corbin et al., (2002) defined muscular strength as the amount of force that can be produced with a single maximal effort of a muscle group.

Nelson (1997) defined muscular strength as the amount of force a muscle can produce with a single maximum effort. Strong, powerful muscles are important for the smooth and easy performance of everyday activities, such as carrying groceries, lifting boxes and climbing stairs, as well as for emergency situations. They help keep the skeleton in proper alignment, preventing back and leg pain and providing the support necessary for good posture. Muscular strength has obvious importance in recreational activities. Strong people can hit a tennis ball harder, kick a soccer ball further, and ride a bicycle up hill more easily.

Muscle tissue is an important element of overall body composition. Greater muscles mass makes possible a higher rate of metabolism, and faster energy use, which help to maintain a healthy body weight.

Muscular strength depends on such factors as the size of muscle cells and the ability of nerves to activate muscles cells. Strong muscles are important for the smooth and easy performance of everyday activities like lifting boxes, climbing stairs, as well as emergency situations.

Muscular strength can best be improved by training activities that use the overload-principle. By over- loading or gradually increasing the resistance (load, object, or weight) the muscles must move and it can increase muscular strength. The overload principle is based on the following three types of training exercises:

1. Isometric exercise, which means the “same measure”, the resistance, is so great that contracting muscles cannot move the resistance object at all. Thus, the muscles contract against immovable objects. Because of the difficulty of precisely evaluating the training effects, isometric exercises are not usually used as a primary means of developing muscular strength.
2. Progressive resistance exercises, also called Isotonic or “same-tension” exercises are currently the most popular type of strength-building exercises. Progressive resistance exercises include the use of traditional free weights as well. People who perform progressive resistance exercise use various muscle groups to move specific fixed resistance or weights. Although during a given repetitive exercise the weight or resistance remains the same and the muscular contraction efforts required varies according to joint angles in the range of motion.

3. Isokinetic exercises, also known as “same motion” use mechanical devices that provide resistances consistently over load muscles throughout the entire range of motion. (Fall, Baylor and Dishman, 1996)

For it to be effective, a user must apply maximal force. Isokinetic training requires elaborate, expensive equipment. Thus, the use of Isokinetic equipment may be limited to certain athletic teams, diagnostic centers and, rehabilitation clinics. Some people prefer machines because they are simple to use, do not require stacking the weights, and are already balanced and less likely to drop and cause injury. Other people prefer free weights because they encourage the user to work harder to maintain balance during the lift (Payne and Hahn 1998).

Fall, Baylor and Dishman, 1996 defined strength as the relative ability of a muscle group to exert force against some external resistance. The stimulus for strength is maximal exertion; therefore, strength training should utilized high resistance overload with low repetition.

There are so many benefits as far as muscular strength is concerned, some of which are:-

1. Improved performances of physical activities. A person with moderate-to-high level of muscular strength can perform everyday tasks like recreational activities, daily routines without undue fatigue.
2. Injury prevention: Increased muscle strength provides protection against injury because it helps people to maintain good posture and appropriate body mechanics when carrying out everyday activities, like walking, running, lifting, carrying and many other. Strong muscles in the abdomen,

hips, low back and leg support the back and proper alignment and help prevent low back pain.

3. Improved body composition: Healthy body composition means that the body has high proportion of fat free mass (primarily composed of muscle) and relatively small portion of fat. Strength training improves body composition by increasing muscle mass, thereby tipping the body composition ratio toward fat-free mass away from fat. Building muscle mass through strength training also helps with losing of fat because metabolic rate is related to muscle mass. A high metabolic rate means that a nutritionally sound diet coupled with regular exercise will not lead to an increase in body fat.
4. Enhanced self-image and quality of life: strength training leads to an enhanced self-image by providing stronger, firmer-looking muscles and a toned, healthy looking body. (Getchell, 1993)
5. Improved muscle and bone health with aging: Good muscular strength helps people to live healthier lives. A lifelong program of regular strength training prevents muscle and nerve degeneration that can compromise the quality of life and increase the risk of hip fracture and other potentially life-threatening injuries.
6. Preventing and management of chronic diseases: Strength training helps in the prevention and management of several major chronic diseases. Strength training improves glucose metabolism, an important factor in the prevention of the most common form of diabetes. It also modifies risk factors for cardiovascular diseases. Regular strength training associated

with increased maximal oxygen consumption, decreases diastolic blood pressure and in some people. Improvement in body composition and glucose metabolism are also beneficial for cardiovascular health. As described earlier, strength training also boosts bone mineral density, helping to prevent osteoporosis associated bone fracture.

7. Lindsey Welk and Corbin (2000) have stated that the importance of strength in our daily activities decrease the chance of injury, prevent low back pain gives us good posture and other hypokinetic conditions.

Although there are so many benefits from strength training, there are other misconceptions as far as female participation is concerned. Due to increase in muscle size to strength training which is called hypertrophy, as in the case of men, some women also share the idea that strength training makes them develop large muscles and makes them look masculine. But some researchers are of different opinion.

Payne and Hahn, (2003) believe the quality of muscle in men and women are the same, endocrinological differences cannot allow women to achieve the same amount of muscle hypertrophy in men. Men have greater muscle fibers and due to the male sex-specific hormones, each fiber had a potential for hypertrophy. It is, therefore, a fallacy for women to claim that strength training makes them look masculine.

For effective muscular development, the following guidelines should be followed:

1. Sequence: Ideally, work large muscle groups first, ending with small muscle groups. It is difficult to adequately exercise large muscle groups if you have already fatigued the smaller supporting muscles.
2. Form: After progressive overload, correct exercise form is the most important factor in maximizing strength gains and minimizing risk of injury. Improvement is more rapid if correct technique, not just quantity of weight is emphasized.
3. Muscle balance: Since muscles work in pairs, it is important to strengthen muscles on both sides of bone so that they pull evenly across joint and maintain body alignment. For example, if pectorals are stronger than upper back muscles, rounded shoulders result. When upper back muscles are strengthened, shoulders are naturally held erect.
4. Breathing: Before lifting, inhale, and then exhale on the exertion. Do not hold the breath.
5. Speed of movement: Exercising in a smooth, controlled manner maximizes strength gains and reduces injuries. Movement should be controlled. (Payne and Hahn, 2003)

Muscular strength can be assessed by usually measuring the maximum amount of weight a person can lift at one time. This single maximal movement is referred to as repetition maximum (IRM). One can assess the strength of the major muscle groups by taking the one-repetition maximum test for the bench press, the leg press, military press and press-ups done with heavy load or high resistance.

To develop muscular strength, a frequency of 3-6 days per week with high intensity or resistance or heavy load used at the rate of sets for repetition ranging from 6-12 is required, (Fahey, Insel & Roth, 2002).

Muscular Endurance

Muscular endurance is the capability of the skeletal muscles or group of muscles to continue contracting over a long period of time. One needs both strength and muscular endurance to increase work capacity, to decrease the chance of injury, to prevent low back pain, poor posture and other hypokinetic conditions, as well as to improve athletic performance; and perhaps to save a life or property in emergency. Muscle fitness training increases the fitness of the bones, tendons, ligaments, as well as the muscles.

Progressive resistance is the type of physical activity done with the intent of improving muscle fitness. The many types of progressive resistance exercise designed to promote or maintain muscular fitness are important in muscular endurance fitness. (Corbin et al., 2002).

Robbins, Powers and Burgess (1997) defined muscular endurance as the ability of the muscles to exert sub-maximal force against resistance repeatedly or to sustain muscular contraction continuously over time. It is characterized by activities of long duration but low intensity. Fahey et al (2002) has also defined muscular endurance as the ability to sustain a given level of muscle tension-that is, to hold a muscle contraction for a long period of time, or to contract a muscle over and over again. This is more of a static contraction.

Lindsey et al (2000) defined muscular endurance differently by refereeing to it as the capacity of the skeletal muscles or group of muscles to continue contracting over a long period of time. They also posited that progressive resistance training

exercise promotes muscular fitness that permits efficient and effective movement, contribution to ease and economy of muscular effort, promote successful performance, and lower susceptibility to some types of injuries, musculoskeletal problems and some illnesses.

Apart from the above definitions, Wuest (1994) also sees muscular endurance as the ability to perform a movement repeatedly and is generally measured by time or the number of repetition. Examples of muscular endurance are performing repetition of push-ups, or sits-ups. Both muscular strength and muscular endurance are vital in accomplishing daily activities, recreational sports and to enjoy meaningful life..

Most of the time, muscular endurance is often neglected in discussion of fitness programs and is usually mentioned only in connection with strength as if the two are synonymous. (Lindsey et al (2002) defined muscular endurance as the ability of the muscle to continue to function over a long period of time. It is primarily dependent upon the strength and physiological condition of the muscle groups involved in the movement. Experts would agree that muscular endurance is a distinct and separate component of health-related fitness.

Muscular endurance is important for good posture and for injury prevention. Muscular endurance helps people to cope with the physical demand of everyday life and enhance performance in sports and walk. It is also important for most leisure and fitness activities. Like muscular strength, muscular endurance is developed by stressing the muscles with a greater load (weight) than they are used for, the type and the amount of stress that is applied.

Muscular endurance is characterized by activities of long duration but low intensity. Examples of muscular endurance activities are performing repetitions of push-ups, sit-ups or chin-ups. Endurance is essential in everyday activities such as housework and recreational sports. The development of muscular endurance is an important aspect of health-related fitness. For endurance development, the amount of weight selected should allow the individual to perform 3 sets of 10-12 repetitions.

The amount of resistance used should be changed if the individual finds it too difficult or too easy to accomplish the task. Muscular endurance tends to improve with muscular strength. To achieve improvements exercise should be done as least 8-10 consecutive weeks. Attention should be given to the development of the various muscle groups of the body. It is developed with activities that stress the systems such as running, cycling and swimming.

Weight training develops muscular endurance in the same way that endurance exercise develops cardiovascular fitness. When the muscles are stressed by a greater load than they are used to, they adapt and improve their function. The type of adaptation that occurs depends on the type of stress applied.

Muscular endurance is usually measured by counting the maximum number of repetition of a muscular contraction a person can do (such as in-push-ups) or the maximum amount of time a person can hold a muscular contraction (such as in the flexed-arm hang).

Flexibility

Robbins, Powers and Burgess, (1997) defined flexibility as the movement of a joint through a full range of motion. Flexibility is essential to smooth, efficient

movement and may help prevent injuries to ligaments and joints. The human is naturally flexible but as human advances in age, flexibility tends to decrease. Disuse, injury, excessive body fat and muscle imbalances are common factors in this loss of range of motion.

Corbin et al (2002) defined flexibility as a measure of the range of motion available at a joint or group of joints. It is determined by the shape of bones and cartilage in the joint and by the length and flexibility of muscles, tendons, ligaments and fascia that cross the joint. The range of movement at a joint may vary. In some cases the joint will not bend or straighten, and is said to be tight or stiff, or to have contractures.

Wuest and Lombardo (1994) also defined flexibility as a range of motion possible about a given joint or series of joints. In terms of fitness, an individual possesses good flexibility can move through the full range of motion at a specific joint.

Flexibility is influenced by several factors. It includes age and sex and race. As children grow older, their flexibility increases until adolescence when they become progressively less flexible. As a general rule, girls tend to be more flexible than boys. This is probably due to anatomical differences in the joints, as well as to difference in the type and extent of activities the two sexes tend to choose. In adults, there is less difference between the sexes. Some races and ethnic groups have been reported to have specific joints that are hypermobile. Some people are also unusually flexible because of genetic trait that makes their joints hypermobile. In some families the trait for loose joints is passed from

generation to generation. This hyper mobility is sometimes referred to as joint looseness.

Payne and Hahn (1998) defined flexibility as the ability of the joints to move through their natural range of motion. This fitness trait, like so many other aspects of structure and function, differs from point to point within the body and among different people. Inability to move easily during physical activity can be a constant reminder that aging and inactivity are the foes of flexibility.

There are so many benefits associated with flexibility some of which are;

1. Joint health: Good flexibility is essential to good joint health. When the muscle and other tissues that support a joint are tight, the joint is subjected to abnormal stresses that can cause joint deterioration. For example, tight muscle causes excessive pressure on the kneecap, leading to pain in the joint. Tight shoulder muscles can compress sensitive soft tissues in the shoulder, leading to pain and disability in the joint.
2. Prevention of low-back pain: Low-back pain can be related to poor spinal alignment which puts pressure on the nerves leading out on the spinal column. Strength and flexibility in the back, pelvis and thighs may help prevent this type of back pain.
3. Temporary reduction of post exercise muscles soreness: Delayed on set muscle soreness, occurring 1-2 days after exercise, is thought to be caused by damage to muscle fibres and supporting connective tissue.
4. Flexibility aids athletic performance and can help to reduce injury risk.
5. Relief of aches and pains: Flexibility exercises help relief pain that develops from stress or prolonged sitting. Studying or working in one

place for a long time can make the muscles tense. Stretching helps to relieve tension.

6. Maintenance of good posture: Good flexibility also contributes to body symmetry and good posture. Bad posture can gradually change the body structures. Sitting in a slumped position, for example, can lead to tightening in the muscles in front of the chest and over stretching and looseness in the upper spine, causing a rounding of the upper back.
7. Relaxation: Flexibility exercises are a great way to relax. Studies have shown that during flexibility an exercise reduces mental tension, slows breath rate and reduces blood pressure. (Fahey et al, 2002).

Flexibility can be measured with sit-and-reach test; use a modified Wells and Dillon flexometer or constructing a measuring device using a firm box of two pieces of wood 12 inches (25 centimetres) high attached at right angles to each other. A metric ruler to measure the extent of reach is attached to the box.

A 26-centimeter mark of the ruler is fixed at the foot line of the box. V-sit, trunk lift goniometer: A goniometer is a large protractor with measurement in degrees. By aligning the two arms parallel to the longitudinal axis of the two segments involved in motion about a specific joint, it is possible to maintain relatively accurate measures of range of motion for injury rehabilitation programs. Because it is most appropriate to talk about flexibility as being specific to a given joint or movement, there is no doubt that the most accurate methods of assessing joint movement is through the use of a goniometer. However, for the average person, it is not practical to assess joint movement using goniometry, (Prentice 1994).

There are many factors affecting flexibility, some of which include the following;

Joint structure: the amount of flexibility in the joint determined in part by the nature and structure of the joint. Ball-and-socket joints, like the hip, enable movement in many different directions and greater range of motion. Heredity also plays a part in joint structure and flexibility. For example, although everyone has a broad range of motion in the ball-and-socket hip joint, not everyone can do a leg split.

Muscle elasticity and length: Soft tissue, including skin, muscle, tendons and ligaments also limit the flexibility of a joint. Muscle tissue is the key to developing flexibility because it can be lengthened if it is regularly stretched.

Nerve system activity: muscles contain stretch reporters that control their length. If a muscle is stretched suddenly, stretch receptors send signal to the spinal cord, which then send signal back to the same muscle causing it to contract. These reflexes occur frequently in active muscles. They help the body know what the muscles are doing for fine control of muscle length.

A successful program for developing flexibility contains safe exercise executed with the most effective techniques some of which are;

Type of stretch techniques: Stretch varies from simply stretching the muscles during the course of normal activities to sophisticated methods based on patents of muscles reflexes. Improper stretching techniques can do more harm than good, so it is important to understand the different types of stretching exercise and how they affect the muscles.

There are three basic techniques commonly used. These are static stretching: which encompasses the use of slow, steady, gentle stretching movements. The individual gently and smoothly stretches the muscle to the point of where tightness or resistance to the movement is felt, eases off slightly, and holds the stretch for an extended period of time.

Ballistic Stretching involves the repetitive bouncing movement to increase the range of movement. Proprioceptive neuromuscular facilitation (PNF); PNF techniques use reflexes initiated by both muscles and joint receptors to cause greater training effects.

- 1) The most popular PNF stretch technique is the contract-relax stretching methods, in which a muscle is contracted before it is stretched. For example, in a seat stretch of calf muscles, the first step in PNF is to contract the calf muscles. The individual or a partner can provide a resistance for an isometric contraction.
- 2) Duration: For each exercise, slowly apply stretch to your muscle to the point of slight Intensity and tension or mild discomfort. Hold the stretch for 10-30 seconds. As you hold the stretch, the feeling of slight tension should slowly subside at that point try to stretch a bit further. Through the stretch, try to relax and breathe easily. Rest for about 30-60 seconds between each stretch, and do at least 4 repetition of each stretch.
- 3) Frequency: It is recommended that stretching exercises be performed a minimum of 2-4 days a week. Many people do flexibility training more often 3-5 days a week for even greater benefits (Fahey et al., 2002).

- 4) Stop at the point of tension, not pain. Stretching to the point of pain, or until muscles quiver, can risk stretching injury.
- 5) Since flexibility is specific to a joint, a well-balanced program for general flexibility will contain 8-12 stretches, one for each major muscle group (Robbins et al., 1994).

Body Composition

In spite of uncertainty regarding the point at which excess weight becomes a medical concern, there is little debate for our image-conscious general population about overweight being a problem related to perceived physical attractiveness. This concern is caused by the media, which tell people that being overweight is undesirable because it does not conform to certain ideal body images (such as being tall, thin and cute with muscular definition. In light of this challenge, people may become dissatisfied and concerned about their inability to resemble this ideal.

Robbins et al (1997) defined body composition as the amount of fat in proportion to fat-free weight. The ratio between body fat-free weights is a better fatness than is body weight. The body composition of an individual is an important aspect of total fitness. The body's relative amount of fat and fat-free mass is an important component of fitness for wellness. People whose body composition is optimal tend to be healthier, to move more efficiently, and to feel better about them. To reach wellness, you must determine what body composition is right for you and then work to achieve and maintain it.

Wuest and Lombardo (1994) defined body composition fitness as attainment and maintenance of the appropriate proportion of lean body tissue to fat body tissues. The degree of fitness is expressed as the percentage of body fat for age, sex and height.

Payne and Hahn (1998) has said that body composition is a “make up” of the body in terms of muscle, bone, fat and other elements. Of particular interest to fitness experts are percentages of body fat and fat-free weight. Health experts are especially concerned about the large number of people who are overweight and obese in our society. Cardiorespiratory fitness trainers increasingly are recognizing the importance of body composition and including strength-training exercises to help reduce body fat.

Corbin et al, (2002) posited that body composition refers to the relative percentage of muscles, fat, bone and other tissue of the body. There are standards to determine how much body fat an individual should possess. Every body should possess at least a minimal amount of fat for good health. This fat is called essential fat and it is necessary for temperature regulation, shock absorption and regulation of essential body nutrients. It also includes lipids incorporated into the nerves, brain, heart, lungs, liver and mammary glands. These fat deposits, crucial for normal body function, make up approximately 3-5% of total body weight in men and 8-12% in women. For females, an exceptionally low body fat percentage (under fat) is especially of concern. Amenorrhea, when associated with low body fat levels, is a reversible condition that is merely the body’s method of preventing pregnancy.

However, low body fat levels, accompanied by amenorrhea, place a woman at risk of bone loss (osteoporosis). A body fat level below 10% is criterion often used by clinicians for diagnosing eating disorder such as anorexia nervosa. Non-essential fat is fat above essential fat levels that accumulate when you take in more calories than you expect. Non-essential fat exists primarily within fat cells or adipose tissues often located just below the skin and around major organs.

Much of our body fat, on the other hand, serves only as an extra burden. The more excess fat we carry, the less efficiently our bodies' can move. Think about how much more difficult to climb three flights of stairs carrying twenty pounds of books, compared to carrying nothing as you climb. Having twenty extra pounds of fat to carry around with you daily creates a comparable workload. Maintaining an ideal level of body fat allows your body to function actively in an efficient manner, lending a valued boost to your quality of life and level of wellness.

Health professionals over the years have linked many diseases with the risk factor of obesity. Experts in health often distinguish between two types of obesity: moderate and morbid. Moderate obesity is currently defined as 20-50% overweight according to height/weight tables, while morbid obesity is considered anything above 50% over normal weight. Once again, common definitions of obesity confuse the concepts of weight which includes lean and fat weight with the concept of over fat.

The amount of storage fat varies from individual to individual based on many factors, including gender, age, heredity, metabolism, diet, and activity level. When non-essential fat accumulates in excessive amount, over-fatness or even obesity can occur. Excess storage fat is usually the result of consuming more energy than is expended (in metabolism and physical activity).

Body composition is considered a component of health-related fitness but can also be considered a composition of metabolic fitness. Body composition is related to health, but it is not like the other components of health-related fitness including cardiovascular, strength, muscular endurance and flexibility. The reason being that the others are measured by performance but body composition requires no movement.

Obesity is defined as a more serious degree of overweight; the cut off point for obesity may be set in terms of percentage body fat. Obesity is a widespread problem and, therefore, retention of body fat at any age is a health problem. Obesity can contribute to degenerative diseases and can even shorten life. It is recommended that a combination of regular physical activity and dietary restrictions are the most effective means of losing body fat (Williams 1997).

There are so many health problems associated with body overweight according to WHO (2008), some of which are obesity, which is associated with unhealthy blood fat levels, impaired heart function, and death from cardiovascular diseases. Other health problems associated with obesity include hypertension, many kinds of cancer, impaired immune function, gall-bladder and kidney diseases, skin problems, sleep and breathing disorders, impotence. Too much body fat makes all types of physical activity more difficult because just moving the body through everyday activities means working harder and using more energy. In general, over fat people are less fit than others and do not have the muscular strength, endurance and flexibility that make normal activity easy. Because exercise is more difficult, they do less of it, depriving them of an effective way to improve body composition. (Fahey et al, 2002)

There so many factors that affect body composition. These factors have been placed under three main headings:

1. Genetic factors: Estimates of genetic contribution to obesity vary widely, from about 5%-40%. More than 20 genes have been linked to obesity. Genes influence body size and shape, body fat distribution and metabolic rate. Genetic factors also affect the ease in which weight is gained as a result of overreacting and where on the body's extra weight is added. If both parents

are overweight, their children are twice as likely to be overweight as children who have only one overweight parent. There are also hereditary and environmental factors, however, hereditary influences must be balanced against the contribution of environmental factors. Environmental factors like diet and exercise can also affect body composition.

2. Physiological factors: Metabolism is a key physiological factor in the regulation of body fat and body weight: Hormones also play a role. Another physiological factor that has proposed as contribution to obesity is weight cycling.
3. Lifestyle factors: Genetic and physiological factors may increase the risk for excess body fat, but they are not sufficient to explain the increasingly high rate of obesity seen in some societies. The gene pool has not changed dramatically in the past 40 years, during which time the rate of obesity among Ghanaians has doubled. Clearly, other factors are work, particularly lifestyle factors such as increased energy intake and decreased physical activities. (Schrivers, Lawrence, Powers and Vorhaus, 1996)

There are so many techniques that can be used to measure body composition. Some are common and are routinely used by the general public. Others are expensive and of limited availability these are:

1. Height-weight tables: Height and weight tables were originally developed to assist people in determining the relationship between their weight and desirable standards. Nearly every version of this table has come under criticism for not considering valuables such as gender, age, and frame size and body composition.

2. Body mass index (BMI). Another method for assessing healthy body weight is the BMI. BMI indicates the relationship of body weight (expressed in kilogram) to height (expressed in meters) for both men and women. The BMI does not reflect body composition (fat versus lean tissue) or consider the degree of fat accumulated in the central body cavity; nor its adjustment for age.
3. Skinfold measurement is a relatively precise and inexpensive indicator of body composition. In this assessment procedure, constant-pressure calipers are used to measure the thickness of the layer of fat beneath the skin's surface, the subcutaneous fat layer. These measurements are taken at key places on the body. Through the use of specific formulas, skinfold measurement can be used to calculate the percentage of the body fat. The percent body fat value can also be used in determining desirable weight.
4. Hydrostatic weighing: Hydrostatic (underwater) weighing is another precise method of determining the relative amounts of fat and lean body mass that make up body weight. A person's percentage of body fat is seen by comparing the underwater weight with the body weight out of water. The need for expensive facilities (a tank or pool) and experienced technicians make the availability and cost of this procedure limited to small-scale application, such as a large research university or teaching hospital.
5. Body Composition System: The newest method of determining body composition involves the use of the body composition system, an egg-shaped chamber in which a subject is briefly enclosed to determine how much air he or she displaces in the chamber. Once the amount of

displaced air is known, a mathematical formula is used to calculate the subject's body density. Body density can then be used to determine the percentage of the subject's body that is composed of fat.

6. Electrical impedance: Electrical impedance is a relatively new method used to determine body composition. This computerized assessment procedure measures the electrical impedance (resistance) to a weak electrical flow directed through the body. Electrodes are attached to the arm and leg. Because adipose tissue resists the passage of the electrical current more than muscle tissue does, electrical impedance can be used to accurately calculate the percentage of body fat. Fortunately, electrical impedance measurements are painless.
7. Appearance: Perhaps the simplest method of determining obesity may be to look in the mirror. The old saying that “mirrors don't lie” speaks for itself for most people. This method is fairly accurate and certainly inexpensive. Unless a person is very muscular or has retained an excessive amount of water, the reflection in the mirror should be a good indicator of whether one's weight is appropriate. Although this simple method does not allow a person percentage, the person should be able to visually determine whether he or she is excessively fat. (Payne and Hahn 1998).

The benefits of healthy body composition can be physical and psychological. The physical benefits are; reduced body fat percentage, increased lean body mass and firmer, more toned muscle and the psychological benefits are enhanced sense of well-being and self esteem, resulting in increased energy, alertness and vitality; increased sense of self-discipline due to the determination needed to

stick to an exercise program; reduced state of anxiety and mental tension, thereby increasing stress coping ability; improved quality of sleep, resulting in the ability to fall asleep faster and with less tossing and turning during sleeping time; decreased level of mild to moderate depression; increased release of endorphins (brain chemical) producing a relaxed state (Robbins et al., 1994).

Factors that affect Health-Related Physical Fitness

Physical fitness is a multi-dimensional attribute. Genetic inheritance, age, morphology, nutrition, habitual physical activity, gender and general well-being are common factors. Agility, coordination and balance, which are basic components of competitive sports performance, intricately associated with the physical fitness characteristics, such as strength, endurance flexibility are cited factors influencing physical fitness statutes (Goslin and Burden 1986). Environmental factors such as adequate rest, proper diet, proper room ventilation, sanitation, family support and influence, facilities for training, time and physiological factors greatly affect one's physical fitness status in life and affect one's lifestyle. Malina (1996) and Goding and Shepherd, (1990) concluded that experience in physical activity in early childhood is important because it positively influences attitudes and healthy habits in later life.

Physical Activity and its Health Benefits

The term 'physical activity' can mean many different things to different people. For public health professionals, it is a health-enhancing behaviour; others may see it as a phrase summing up a wide range of sports, leisure pursuits or active travel. But it is easy to forget that physical activity or human movement is actually one of the most basic human functions.

According to Devries and Housh (1994), the human body evolved to move, and our physiological systems are continuously working to balance the energy we expend through physical activity with the energy we take in as food. A century ago, obesity was rare, as people spent far more energy in manual work and walked more for transport, and energy-dense food was less easily available. (Canadian Population Health Initiative, 2002)

However, in the twenty-first century, our lifestyles have changed beyond all recognition: so much physical activity has been removed from our lives that we have at last discovered how essential it is to human health and well-being. It remains the foundation of our health throughout life. The first steps a baby takes mark a critical milestone in that child's development, as it sets off toddling into the world. Throughout childhood, physical activity offers opportunities to develop basic motor skills that are essential for healthy active living. As we enter old age, physical activity becomes a critical component of a healthy, happy and independent life. Physical fitness is a related construct and it is also often assumed that the more habitually active are fitter and that the relationship is casual Corbin et al (2002) and Livingstone (1994).

Physical activity, according to Wuest and Bucher (1995), is any bodily movement produced by the skeletal muscles that result in the expenditure of energy. Hoegar and Hoegar (1992) have also observed that movement and physical activity were basic functions for which the human organism was created to ensure health and longevity. Whether formal or informal, they are geared towards the healthy living of an individual.

Physical activity and physical fitness occur within the context of lifespan transitions and cannot be viewed in isolation. Physical activity refers to any bodily movement produced by the skeletal muscles and resulting in a substantial increase over the resting energy expenditure (Bouchard et al., 1994).

Physical fitness in contrast is an adaptive state that is a response to a variety of environment. The concept of physical fitness evolved from a primary motor and strength focus (performance-related) to a health-related focus.

Physical activity provides essential stimuli for most organs of the human body, in order to develop and maintain their structures and functions in meeting the requirements of life. Chronic physical inactivity leads to deterioration while physical activity leads to maintenance or increase or improvement in organ function. Many of these effects are related to conditions that are classified as diseases or their precursors or risk factors.

In the musculoskeletal system, physical activity is effective in decreasing the risk of developing sarcopenia or muscle waste, osteoporosis and related fractures, and low back pain, and in secondary prevention and rehabilitation of osteoarthritis and chronic low back pain. Regarding metabolic conditions, overweight and obesity, type 2 diabetes mellitus, hypertension and metabolic syndrome, physical inactivity increases the risk while physical activity is effective in decreasing the risk and in the management of these conditions, especially in combination with proper diet (Williams, 1997).

Physical activity in the prevention and treatment of obesity and its co morbidities: evidence report of independent panel to assess the role of physical activity in the treatment of obesity and its Physical inactivity has shown to be one

of the major risk factors of cardio-respiratory diseases, particularly coronary heart disease and stroke.

Evidence is sufficient to include physical inactivity as a risk factor of colon and breast cancer, and suggestive for the same conclusion regarding some other cancers as well as some common neurological disorders such as cognitive impairment, dementia and Alzheimer's disease (Grundy, Blackburn, Higgins, Lauer, Perri and Ryan, 1999). Habits, lifestyles, behaviours and attitudes towards physical activity developed during childhood are assumed to continue through adolescence into adulthood (Allen and Harrison, 1995).

Regular physical activity preferably performed daily will reduce one's risk of developing or dying from heart-related disease. For example, three 20-minute sessions 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), promotes psychological well-being, and helps build healthy bones, flexible muscles and joints (Casperson, Nixon and Durant, 1998). Physical activity also influences mental health, besides organic vigour fitness; and contributes to improvement in agility, speed, co-ordination and skill.

Lifestyles of boarding and day girls compared

The two groups under study are day and boarding girls who live in two different environmental conditions that can either affect their health related physical fitness levels positively or negatively.

Boarding Girls (Residential Students)

These are girls who are housed on the school campus in dormitories. They are

under the direct supervision of house mistresses. The atmosphere here is serene for academic work. These students are fed in the dining hall three times daily on a well-prepared menu. The food in the dining hall is rationed.

Boarders have no choice in the type of food they want unless in few cases, where, for medical purposes, they are not to take a particular type of food. Their food is believed to have all the food nutrients in their correct quantities which are supposed to keep them healthy. They are provided with such food items ranging from milk, sardine, gari, sugar, soup through to canned foods, biscuits and soft drinks supplied by parents. According to William (1999), nutrition is the sum total of the processes involved in the intake and utilization of food substances by living organisms, including ingestion, digestion, absorption, and metabolism of food. This definition stresses the biochemical and physiological functions of food. The food we eat must provide us with certain amount of nutrient which will determine how healthy we will be.

The lives of these girls are strictly controlled, right from the rising bell at 5.00 o'clock in the morning through the day to 10.0'clock in the night when the bell goes for them to go to bed. The routine work for the girls includes sweeping the dormitories and their compound, scrubbing their bathrooms and gutters on Wednesdays and Saturdays, weeding the compound and sometimes fetching water for their housemistresses. They do morning jogging sometimes on Saturdays. Extra-curricular activities include afternoon games for exercise which keeps their body healthy.

Boarding girls are well supported by their parents in terms of cash or in kind thereby reducing their stress levels, anxiety and worries. They are mostly

focused on their studies and leisure activities. They attend physical education classes and participate in afternoon games and attend to their clubs activities like cadets corps, actors' guild, writers and debaters club (WDC) among others.

Day Girls (Non-Residential Girls)

These are student girls who stay with their parents or relatives in their homes to go to school. Some rent rooms in the town and stay on their own while others stay in hostels which are now common everywhere there are Senior High Schools in the whole country. Day girls are hardly controlled; therefore, they are exposed to all forms of environmental hazards. Some of these students whose parents are poor do not have three square meals a day while those from good homes eat well everyday. Day girls have freedom of choice of food as well as quantities to eat at a time. Day girls have no specified meal times or sleep time.

After interviewing the Day girls, it was revealed that the Day girls after walking distances home, will sometimes prepare their own food. Sometimes the girls go to the farm after school for their foodstuffs. Their feeding habits are irregular. These students go through a whole lot of mental stress, poor diet, poor room ventilation and lighting system and low levels of family support.

According to William (1997), improved health-related physical fitness depends on eating well-balanced meals, getting the proper sleep each night, avoidance of stress and training in moderation.

Day girls normally walk distances such as 2 to 3 kilometers to and from school every day. Most of them walk distances to sell their mothers wares on Saturday and help them do the family washing and cook the family's meals. Their daily home chores include sweeping the compound, their rooms, the rooms of

their parents, walking distances with basins to fetch water for family use and fetching firewood at weekends.

In most cases, Day Students get back home from school completely exhausted, but still have time for vigorous organized recreational activities. They take part in school physical education classes and other activities. They usually carry their PE kits to school. Those who send their kits to school are confronted with the problem of where to change as they are not allowed to enter the dormitories to change their clothes. They manage to move to the assembly hall to change themselves.

Summary

In summary, it is important to mention again that health-related-fitness is a component of the general physical fitness, and has five components namely, the cardio-respiratory endurance, muscle strength, muscle endurance, flexibility, and body composition.

Cardiorespiratory Endurance probably the most important fitness component. It is the ability to deliver essential nutrients especially oxygen to the working muscles of the body, and to remove waste products during prolonged physical exertion. Sometimes, it is referred to as cardiorespiratory endurance. The reason being that it requires the utilization of oxygen, which is only possible if the circulatory and respiratory systems are capable of these functions. It is expressed in terms of maximal oxygen intake (max VO_2), which is the greatest amount of oxygen that can be utilized by the body in intense exercise. Vigorous exercise improves the functioning of the cardio respiratory system and is directly related to coronary risk.

Muscular strength is the amount of force a muscle can produce with a single maximum effort. Strong, powerful muscles are important for the smooth and easy performance of everyday activities, such as carrying groceries, lifting boxes and climbing stairs, as well as for emergency situations. They help keep the skeleton in proper alignment, preventing back and leg pain and providing the support necessary for good posture. Muscular strength has obvious importance in recreational activities. Strong people can hit a tennis ball harder, kick a soccer ball further, and ride a bicycle up hill more easily.

Muscle tissue is an important element of overall body composition. Greater muscle mass makes possible a higher rate of metabolism, and faster energy use, which help to maintain a healthy body weight.

Muscular endurance is the ability of the muscles to exert sub-maximal force against resistance repeatedly or to sustain muscular contraction continuously over time. It is characterized by activities of long duration but low intensity. It is important for good posture and for injury prevention. It also helps people to cope with the physical demand of everyday life and enhance performance in sports and work. It is also important for most leisure and fitness activities. Like muscular strength, muscular endurance is developed by stressing the muscles with a greater load (weight) than they are used for, the type and the amount of stress that is applied.

Flexibility is generally referred to as the range of movement at the joints. It should not be confused with the softness of the body. This component is necessary for smooth, coordinated, and efficient movement, promotes good health and posture.

Unfortunately, body composition, another vital component of health related fitness, is always placed at the fifth position. This talks about the relative percentage of fat in relation to the lean muscle in the body. Too much of fat in the body leads to obesity and other serious health problems. However, some amount of fat is required by the body to maintain good health.

It will not be a complete summary, if mention is not made of the various natural factors which affect health related fitness in various ways. These factors are heredity, age, sex, and race. Heredity, according to experts, has a lot of influence on cardiovascular endurance, flexibility, muscular strength and endurance.

Muscular strength and endurance, flexibility and cardiovascular endurance are also influenced by age. A person's sex has been found to have effect on flexibility, muscular strength, and muscular endurance. Race is identified to have influence on flexibility.

CHAPTER THREE

METHODOLOGY

The research was conducted to compare the health-related physical fitness levels of day and boarding senior High school girls in Cape Coast in Ghana. This chapter dealt with the steps that were followed and the procedures that were carried out to gather and analyze data pertinent to the study. Specific areas covered would be treated under the following headings;

1. Research Design
2. Population
3. Samples and Sampling Technique
4. Instrumentation
5. Validity and Reliability of Instrument
6. Data collection
7. Analysis of data

Research Design

Research design is the term used to describe a number of decisions which need to be taken regarding the collection of data before embarking upon data collection process (Nwana 1982). The design thus constitutes the blue print for collection, measurement and analysis of data. This study was designed to collect data to investigate the health-related physical fitness levels of Day and Boarding Senior High School Girls in Cape Coast.

The study was, therefore, structured within the framework of descriptive survey research. Descriptive survey research, according to Gay (1997), involves collecting data in order to test hypotheses or answer research questions concerning the current status of the subject of the study; in this case, the current status of the health-related physical fitness levels of day and boarding girls in senior High schools in Cape Coast. Creswell (2003) share these sentiments and elaborate that descriptive research is conveyed with prevailing conditions, such as determining the nature of prevailing conditions, practices and attitudes, opinions held, processes that are going on, or trends that are developed.

Population

The Population of a study refers to the group to whom the researcher would like to generalize the results of the study (Creswell, 2003; Frankell & Wallen, 2000). The target population for this study consisted of all student girls in the boarding and day senior high schools in Cape Coast. The 10 senior high schools in Cape Coast are made up of two girls' schools, three boys' schools and five mixed schools. The accessible population, however, was all day and boarding student girls in Ghana National College and Aggrey Memorial Zion Senior High

School in Cape Coast because these schools have day and boarding girls. Only girls were considered in the study, because the investigator's experience as a housemistress has shown that boarding girls form the majority of students who visit the hospital with physical fitness-related problems.

The population of students in Aggrey Memorial Zion Senior High School, according to the headmaster, is 2,100 of which 910 are boarding girls and 230 day girls. Ghana National College also has a population of 1,450 students of which 824 are boarding girls, 215 of the girls are day students, according to the assistant headmaster academic.

Day and Boarding Girls are student girls in SHS who live under two different environmental conditions which may have positive or negative effects on their health-related physical fitness levels. The day girls who stay with their parents are usually provided with care, accommodation, feeding and supervision. They are at times found helping in the kitchen, working on farms and running a lot of errands including selling. Those who stay in rented houses in nearby towns and villages face the problem of lack of parental care, and as adolescents, may fall into the hands of "sugar daddies" and boyfriends who take them out in the nights and also get them pregnant, resulting in abortion and teenage pregnancies.

All these problems go a long way to affect the health of the day girls in SHS. The boarding girls also face their own problems. Life in the boarding house, to any student is not palatable when feeding and lodging facilities are considered. Although there are facilities that should attract them to field to participate in physical activities, their interest is dampened by the other subjects teachers who organize their extra classes after classes hours to make money. They are told that

P. E. is non examinable and cannot take them anywhere. The stress and resulting problems for sitting for a long time also affect the health of some boarding girls negatively.

Sample and Sampling Technique

A total of 160 subjects were used for the study due to the fact that the two schools have large population of girls as compared to boys. 100 subjects were selected from Aggrey Memorial Zion Senior High School because their population was higher than that of Ghana National College whose subjects for the study were 60. The 100 student girls from Aggrey were made up of 80 boarding girls and 20 day girls, while the 60 students selected from Ghana National College were made up of 40 boarding girls and 20 day girls. This is so, because the population of Aggrey Memorial is higher than that of Ghana National College.

A sample frame, being the list of names of all the girls, was collected from the management of each of the schools involved. The day students were separated from the boarding students. A simple random sampling technique was used to select the number of the day and boarding student girls needed for the study. A simple random sampling is a sampling technique in which each element in the population has an equal probability of being chosen for the sample. Simple random sampling treats the target population as unitary whole (Monette, Sullivan & DeJong, 1994).

Numbers were assigned to the names of day and boarding girls in each of the school to develop a table of random sampling. Straight lines were ruled diagonally through the table of random sampling and the crossed numbers were picked as the samples subject. Eighty (80) boarding girls and Twenty (20) day

girls were selected from the sampling frame from Aggrey Memorial Zion Senior High School while the same method was used to select randomly 40 boarding girls and 20 day girls from Ghana National College

Instrumentation

The instrument for the study was the Prudential Fitnessgram (2002) which was designed by the Cooper Institute for Aerobic Research in Dallas in the United States of America (USA). The instrument has widely been used in The USA and Europe and has proved to be a reliable instrument in the evaluation of students' status relative to the different health-related fitness components.

The Prudential Fitnessgram (2002) is comprehensive fitness program 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. Fitness program measures the component of physical fitness which has 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. Fitnessgram is a more effective fitness test for three reasons.

First, it compares scores to carefully researched and developed health standards, rather than to national 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.

Secondly, it emphasizes measures of physical fitness instead of performance of physical or sports-related skills.

Thirdly, it goes beyond measuring fitness to recommend physical activity program option that will help students make it to the health fitness zone for those areas where they need improvement.

Fitnessgram was developed by the Cooper Institute for aerobic research, Texas-Dallas. It has been in use for the pass 10 years. Fitnessgram provides everything you need to accurately assess student's fitness levels and identify individualized approaches to improve physical fitness. Underlying the fitness standards and fitness zones is the premise that there is an association between good health and cardiovascular fitness, flexibility, muscular endurance, muscular strength and body fat may decrease the risk of some diseases. According to Payne and Hahn (1998) physical fitness is achieved when the various systems of the body are healthy and function effectively so as enable the fit person to engage in activities without unreasonable fatigue.

Studies such as those conducted by Bimah, (2001), Ankude, (2002), have also used this instrument in Ghana and it has measured up to expectation.

The components of the instrument include the following:-

1. 1 mile or 1600m run/ walk for cardiovascular endurance: It estimates the level of cardio respiratory fitness (maximal oxygen consumption) base on the amount of time it takes to complete one mile brisk walking and running.
2. Body Mass Index / Skin-fold measurement for body fat composition:

The body mass index (BMI) indicates the relationship of weight expressed in kilograms to height expressed in metres. The skinfold caliper is used to

measure the thickness of the layer of fat beneath the skin's surface, the subcutaneous fat layer.

3. Curl-ups for abdominal endurance: The subject lies on the floor with knees bent and the arms extended or crossed with palms on ears.
4. Modified push-ups for upper body strength: In a prone lying position on the knee with the hands just outside the shoulders with the back straight, the subject lowers the body until the upper arm is parallel to the floor or elbow is bent at 90 degrees. The rhythm should be approximately one push-up for one second.
5. Sit-and-reach for flexibility of lower back and hamstring muscle: It is an instrument used to test how flexible an individual can be. In this test, a student sit on the floor and remove her shoe, place the sole of the foot of the extended leg flat against a bench and place the head, back and hip against a wall. She places one hand over the other and slowly reaches forward as far as she can with arm fully extended, head and back remain in contact with the wall and partner slides the measuring stick on the bench until it touches the fingertips.
6. Standing height.
7. Resting heart rate: It is the taking of the subject's heart rate before the beginning of the one mile.
8. Heart rate immediately after the /mile run/walk: It is the taking of the subject's heart rate immediately after the subject has taken part in the one mile run/walk.

Validity and Reliability of the Instrument

Cureton et al (2002) have stated that the test instrument, Fitnessgram (6.0) battery of tests has been universally accepted to be a valid and reliable test for the assessment of health-related fitness of children and youth. The reliability and validity indexes for the health-related fitness components as noted by Welk, Morro.and Falls, (2002) are as follows;

- 1 Mile run/walk test for cardiovascular endurance
Reliability: $r \geq .80$
Validity: $60 \leq r \leq 80$
- 2 Curl-up assessment for abdominal muscle endurance
Reliability: $70 \leq r \leq 97$
Validity: no agreed absolute validity coefficient yet
- 3 Skin-fold assessment for % body fat, obtaining reliable and valid skin-fold was based on getting similar results with repeated measures. The mean skins-folds for 6-10 subjects should agree with 15% for each skin-fold site and no individual comparison should be larger than 20% (i.e. $15\% \leq r \leq .20\%$).
- 2 Ninety degrees push-up test for muscular strength
Reliability: $.64 \leq r \leq .99$
Validity: $.31 \leq r \leq .81$
- 3 Back- saver sit and reach assessment for flexibility
Reliability: $.93 \leq r \leq .99$
Validity: $.91 \leq r \leq .92$

Based on the above indexes, it seems to the investigator that the instrument was very reliable in the countries where it was used.

Data Collection

The researcher took an introductory letter from the Department of Health Physical Education and Recreation to the various schools in which the research was being done. (see Appendix D). The researcher then sought permission from the headmasters of the schools involved in the study. Both day and boarding subjects were tested without distinction to avoid a competitive situation.

The various tests were done on the schools fields and the assembly hall closer to the fields. Eight P. E. tutors who have knowledge in the collection of data assisted the researcher in the collection of the data. They were there researcher's course mates. The subjects were given the knowledge about the procedure, purpose and duration of what they were going to do. The three days for the collection of the data for each school was ideal because it did not bring fatigue, pressure or boredom to both teachers and subjects.

The recording of the results of the various data was compiled by the researcher to ensure accuracy, consistency and to make sure that the data was correct on each subject. Three days schedule was utilized to administer the fitness tests; this was how the tests were conducted each day.

Day 1

Sit and reach for flexibility, height, weight and skinfold measurement of calf muscles, abdominal, hamstring, and triceps were taken.

Day 2

Curl-up and modified push-up tests were administered after warm-up for muscular endurance and strength.

Day 3

One-Mile or 1600m run/walk was used to test the subjects for cardiovascular endurance. Resting heart rate was taken and recorded before the start and immediately after the race. P. E. tutors who already have knowledge of testing assisted in taking the measurements.

Day and Boarding subjects were tested together without distinction to avoid a competitive situation. The following were the purpose, facilities, equipment and procedures for the various tests:

Flexibility: Sit and Reach

To measure subjects' flexibility status at the lower back and posterior leg muscles.

Equipment: Acuflex ruler and mat

Procedure: Subjects sat on the mat; stretched one leg forward and placed the soles of both feet flat against the Acuflex and flexed the other leg fully. Subjects placed one hand on top of the other and bent forward with fully extended arms sliding down the meter rule to see how far forward they can reach. Subjects alternate the legs and repeat the same exercise.

Scoring: Distances covered by the subjects were recorded against their names.

Body Composition (% Body Fat)

Purpose: To measure the percentage body fat of subjects.

Equipment: Pre-calibrated Lange skinfold calipers.

Procedure: The fat on subjects' calf medialis, vastus lateralis and medialis were located and held between the thumb and the forefinger and measured with the Lange Skinfold Calipers.

Scoring: The thickness of the fat as shown on the caliper were recorded.

The sum of the medial calf medialis vastus lateralis gave each subject the fat level.

Body Weight

Purpose: To determine subjects' weight.

Equipment: Bathroom weighting scale.

Procedure: Subjects removed their sandals and wore their physical education uniforms before standing on the scale for their weights to be determined.

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

Subjects' Height Measurement

Purpose: To measure subjects' height

Equipment: Tailor's measuring tape

Procedure: The tape measure was used to record heights on the wall of the classroom, starting from 0 to 2 meters. All centimeters also marked. Subjects removed their shoes or sandals and stood with their back very close to the wall with feet flat on the ground. A ruler was placed on the top of student's head touching the wall. Subjects walked away from the wall for the reading to be taken.

Scoring: The height of each subject was recorded against her name in meters and centimeters.

Curl-Up: Muscular Endurance

Purpose: To measure abdominal muscular strength and endurance.

Facilities and Equipment: Mats and Curl-Up measurement strip, taped to the mat.

Procedure: Subject laid flat on the back with knees bent and feet on the floor. The hands by the side of the body. The subject then curled up sliding her fingers on the measurement strip. When the fingers traverse the strip, the student lowered her head and chest back to the starting position. The exercise was repeated as many times as possible until the students could no longer curl-up. There was no time limit.

Scoring: One point was scored for each correct curl-up.

Modified Push-up: For Muscular Strength

Purpose: To measure arm and shoulder strength.

Facilities and Equipment: A metal or wooden bar was placed horizontally on two wooden posts at a convenient height.

Procedure: The subjects used the overhand grasp technique to hang free off the ground. The subject then raised her body up until her chin went over the bar and then lowered her body down to the starting position with her arms fully extended. The subjects performed as many push-ups as possible. There was no time limit.

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

1-Mile Run/Walk for Cardiovascular Endurance

Purpose: To see how fast a subject covered a distance of 1-mile (1600m) in the shortest possible time to measure cardiovascular fitness.

Facilities and Equipment: A 400-meter athletic oval and stopwatches.

Procedure: Subjects were divided into 2 groups for testing purposes. Each partner worked with a partner. While one partner was running, the other was checking the number of laps and the time at the finish of the race over 4 laps.

Instructions: Subjects began to run on the signal “go” and stopped on completing the 4th lap.

Scoring: The time each subject used to complete the 4 laps was recorded against her name.

For accurate measurements of health-related physical fitness levels, the following tools were used;

1. Ten stopwatches (electronic) for timing the 1-mile run/walk.
2. Twenty pencils.
3. One hundred score sheets for recording.
4. Five tape measures for measuring distances.
5. Two whistles for starting and ending events.
6. Graduated wall for measuring heights.
7. Ten mattresses for performing floor activities.
8. One skinfold caliper for measuring body fat.
9. One bathroom scale for measuring weight.
10. One acuflex box for measuring flexibility.

Data Analysis

The scores on the various components of the health-related physical fitness were analyzed using the independent sample t-test. The scores of the cardiovascular endurance, muscular strength, muscular endurance, body

composition and flexibility of the day subjects were paired against the scores of the boarding subjects and the independent t-test used for the analysis. The Statistical Package for Social Sciences (SPSS) Windows 12.0 aided in the analysis. A decision rule as to whether there was a significant difference between the scores of the two groups was reached at 0.05- level. The results were then summarized under each sub-hypothesis.

Cardiovascular Endurance

The data or raw score in minutes and seconds collected after the one-mile (1,600m) run/walk test to test for cardiovascular endurance were converted to $VO_2\text{max}$. The $VO_2\text{max}$ was determined by converting the running time from minutes and seconds to a decimal figure. A time of 12 minutes 10 seconds became 12.6minutes. The running time (t) was inserted into an equation: $VO_2\text{max} = (483 / t) + 3.5$ (Fahey, Insel & Walton. 2002).

The answers, recorded in ml/kg/min., were fed into the computer program as data, distinguishing the scores of the day to that of the boarders. These data were then processed to get the group statistics and the independent sample t-test results. The $VO_2\text{max}$ values were put into their appropriate place in Prudential Fitnessgram cardio-vascular rating chart The HFZ percentage attainment by each of the participating groups were then ascertained for the analysis. Finally, both the independent samples t-test and the HFZ were used to assess the differences between the day and the boarding girls. For the independent samples t-test for all the variables tested, a probability level of alpha .05 was used as a decision point to indicate the degree of significance.

Muscular Endurance

The raw scores obtained after the curl-ups tests were fed into the computer program as data. The data were processed using the computer to obtain the statistics and the independent samples t-test results on the day and boarding girls. The raw scores were again put into the Prudential Fitnessgram (Fahey et al, 2002) rating scale individually, to ascertain the HFZ of participants. Percentage attainment rating for the day and boarding girls were then calculated from the rating of participants of the two groups.

The independent samples t-test and the HFZ percentage attainment results were finally used to ascertain if there were differences in the muscular endurance fitness levels of the day and boarding girls.

Muscular Strength

Just like the earlier variables, the raw scores obtained after the push-ups test were fed into the computer program as data, which was processed with another function of the program to obtain the group statistics and the independent samples t-test results.

To arrive at the HFZ percentage attainment results, the raw scores were rated using a Prudential Fitnessgram (2002) rating scale for push-ups.

Percentages were then calculated, based on the frequency of scores in a particular fitness zone. The results of the independent samples t-test and the HFZ were used to find out whether there were differences in the muscular strength levels of the day and boarding girls.

Flexibility

After the sit-and-reach test, the scores were fed into the computer as data. The data was then processed to get results for the independent samples t-test. The HFZ percentage attainment results was arrived at by using the Prudential Fitnessgram (2002) flexibility rating scale to group the raw scores of the day and boarding girls into zones of High Performance, Good, Fairly Good, and Need Improvement. The frequencies at each zone were then converted into percentages. The independent samples t-test results and the HFZ percentage attainment results were finally used to compare the flexibility fitness levels of the two groups.

Body Composition

The scores of the two different tests for body composition, being the BMI and the skinfold, were analyzed as follows. After taking the height and weight measurements, the BMI for each participant was calculated as follows; the recorded height was squared (expressed in metres), and then used to divide the weight (expressed in kilograms).

The answer, expressed in kilograms per meter squared (kg/m^2) was recorded as the BMI of the respective girls. The BMI of members of day and boarding girls were fed into the computer programme as data which were then processed to get results for the independent samples t-test.

The calculated BMI for each candidate was also referred to the Prudential Fitnessgram (2002) rating table for body composition classification. The frequency of the various body composition classifications were converted into percentages, used to ascertain the HFZ percentage attainment of each group. The independent samples t-test and the HFZ percentage attainment results were

used separately to compare the body composition fitness levels of the two independent groups.

For the skinfold, the three recorded skinfold measurements were added, and the sum was referred to on the appropriate table to find the corresponding percent body fat, which was used as the raw scores to feed the computer program as data. The same computer program was used to analyze the data of the two independent groups to get the independent samples t-test results to compare the body composition fitness levels of the girls.

The percent body fat, being the raw score, was also classified by referring to Prudential Fitnessgram (2002) percent body fat table. The frequency of raw scores of each group was converted into percentages to arrive at the HFZ percentage attainment results to again, compare the body composition fitness levels of the day and boarding girls.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter presents the general results and discussion of findings and test the hypotheses postulated for the research. The independent samples t-test was used to test for significant differences between the two groups in the five components of health-related physical fitness levels. The result is presented and the findings on each hypothesis stated.

Sub-Question 1: What is the Difference in Cardiovascular Endurance levels Between Girls of Day and Boarding SHS in Cape Coast?

Table 1 shows the descriptive statistics of the day and boarding girls. The mean score of the day girls is slightly higher than that of the boarding girls in terms of their cardio-vascular endurance performance.

The independent sample t-test showed that there was a significant difference between the cardiovascular endurance fitness levels between day and boarding girls in Cape Coast. The day girls were stronger and healthier in the cardio-vascular endurance fitness levels more than their boarding counterparts.

Sub-question 1 was also tested with the HFZ percentage analysis and the results are presented below in Table 2. The results in the table showed that the day girls were healthier and fitter than the boarding girls. From the table as high as 100% of the day girls that were selected for the study fell within high performance and good fitness zone without any falling within the marginal and Need Improvement zones, while 57.5% and 25.83% of the boarding girls fell within the high performance and good fitness zones, as much as 11.67% and 5% fell within the marginal and need improvement zones respectively. It showed that more boarding girls showed more weakness in cardiovascular endurance and needed to involve themselves in more physical activities to improve their cardiovascular endurance level. The HFZ percentage analysis of the 1,600metres run/walk test confirmed sub-hypothesis 1.

Table 1
Independent Samples t-test Result of Cardiovascular Endurance Fitness Levels for Day and Boarding girls.

Group	n	M	SD	SE	df	t	Sig.
Day	40	52.63	10.89	1.72	158	3.13	0.00(S)
Boarders	120	47.53	8.14	0.74			

P< .05 S = Significant

Table 2**HFZ Percentage Analysis of Fitnessgram Measurement of Cardiovascular Endurance.**

HFZ	DAY GIRLS		BOARDING GIRLS	
	n	%	n	%
High Performance	36	90	69	57
Good Fitness Zone	4	10	31	26
Marginal	0	0	14	12
Need Improvement	0	0	6	5
Total	40	100	120	100

The reason for the higher cardiovascular endurance level of the day girls may be due to the fact that the day girls engage in more physical activities than the boarding girls. They do more walking over distances to school and back, do more home chores like walking distances to fetch water, cook, wash, sweep and a whole lot of home chores which are good physical activities as compared to their boarding counterparts who have everything done for them by the pantry women. David (1986) states that in a study, a group of students walked on a treadmill for 40 minutes four times a week. At the end of 20 weeks, their VO₂max had increased by 28% and their heart rates during exercise had increased anywhere from 4 to 17 beats per minute. The walkers also showed improved lung capacity and a drop in body fat. In addition to its fitness benefits, walking is simple, safe and accessible to nearly everyone, all of which increase the chances of someone sticking with a regimen. Physical activity and health report of the American Surgeon General (2000) 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 physical activity increases muscle size, strength and power and develop endurance for sustaining work, and taxes the circulatory and respiratory systems. Vigorous daily activity positively develops cardiovascular fitness that produces the quality of physical reserve, power and stamina-endurance.

The higher VO₂max mean may also be as a result of a better engagement in vigorous physical activities like aerobics. This may fall in line with the findings of Laliberte (2001) which states that the better the running times, the better the aerobic capacity. The higher cardiovascular endurance could also be explained by the statistically significant difference in muscular endurance to the advantage of the day girls. According to experts, weight training for strength can stimulate the cardiovascular system (Lumpkin, 2002).

Inadequate physical activities in SHS campuses are putting the students in a sedentary way of life more especially in a situation where they engage in physical education once every week within 80 minute. It is not every girl that takes part in the physical education once a week. A sedentary lifestyle is one of the six major risk factors for cardiovascular endurance diseases (CVD). People who are sedentary have CVD death rate significantly higher than those of fit individuals. Cardiovascular disease usually begins to develop in childhood and adolescence; it progresses slowly over many years before producing any symptoms. Adopting healthy habit while young can help many people prevent or delay a heart attack or other serious forms of CVD (Insel and Roth, 2002). Blair, an epidemiologist for the Cooper Institute for Aerobics Research as cited in Robbins et al, (1997) as

said that sedentary lifestyle is as much a risk factor for disease as is high blood pressure and obesity.

Sedentary living, experts warn, leads to coronary artery disease and perhaps to some cancers, stroke, non-insulin dependent diabetes mellitus and other health problems. As the boarding girls do not engage in any physical and other related activities, their aerobics capacity which is considered to be the best indicator of cardiovascular fitness diminishes. This happens because aerobic physical activities are the only means to achieve it (Corbin et al, 2002).

Another contributing factor that will not motivate the boarding girls to engage in physical activities on campuses may be the heavy academic work load. They may feel they will be wasting their time on any physical activities that is not examinable at the end of the day, without thinking of the effect on their health.

Sub-hypothesis 2: What is the Difference in Muscular Endurance Fitness Levels between Day and Boarding Girls in Cape Coast.

The independent samples t-test revealed that there was a significant difference in muscular endurance levels of the day and boarding girls sampled for the study.

The finding therefore confirmed the sub-hypothesis 2 and also responded positively to research question 2.

The results presented in table 3 confirmed the assumed sub-hypothesis 2 which states that there is a significant difference between day and boarding girls in SHS in muscular endurance of which the day girls did better than the boarding girls. The difference is important due to the fact that the p-value which is the significant level is less than the alpha-level of 0.05. Table 4 also depicts the analysis on HFZ

of the curl-ups test results used to measure the muscular endurance levels of the students for the study.

Table 3

Independent Samples t-test Result of Muscular Endurance (Curl-ups). Test for Day and Boarding Girls.

Group	n	M	SD	SE	df	t	Sig
Day	40	25.75	3.65	0.58	158	2.70	0.01(S)
Boarding	120	23.77	4.14	0.38			

P < .05

S = Significant

The presentation in Table 4 indicates that there was a significant difference in the percentage attainment for High Performance and Good Fitness Zone for the day and boarding girls in respect of the curl-ups. The day girls as usual had percentages in both zones at 17% and 80%, higher than the boarding girls who had 11% and 70%, respectively. The differences in the percentages indicate that the day girls are still fitter when it comes to muscular endurance. In the Marginal zone, whilst the day girls had only 3% falling in the zone, the boarding girls had as high as 19%, showing that the day girls are fitter than the boarding girls. For the need improvement none of the day and boarding girls fell within.

The results show that although the day girls are healthier in terms of the muscular endurance, the boarding girls also showed some strength.

The findings on the muscular endurance proved that there was statistically significant difference between the day and the boarding girls.

Table 4**HFZ Performance Analysis of Fitnessgram Measurement of Muscular Endurance (Curl-ups) Test**

HFZ	Day Girls		Boarding Girls	
	n	%	n	%
High Performance	7	17	13	11
Good Fitness Zone	32	80	84	70
Marginal	1	3	23	19
Need Improvement	0	0	0	0
Total	40	100	120	100

The advantage of the day girls over the boarding girls in muscular endurance may be due to the home chores they engage in that have been mentioned earlier, like walking distances to school, walking distances to fetch water, sweeping, helping to cook at home, and washing the family's clothings at the weekend. A person with a moderate-to-high level of muscular endurance can perform everyday task imposed on him. This is what Fahey, Insel and Roth, (2002) has said. Most of the day girls do stay on their own and do stay in town as long as they can and are sometimes faced with challenges of running for their lives.

Again, most of the day girls are involved in the small basketball teams and soccer teams which are springing up all over in the Cape Coast vicinity which can also boast their endurance level. All these physical activities may be a contributing factor to the improved muscular endurance of the day girls. This may explain the significant difference of the muscular endurance between the day girls

over the boarding girls sampled for the study. Unlike the day girls who choose the food they eat and all other activities which can improve their muscular endurance level, every activity the boarding girls engage in is determined by the authorities of the schools which may not be physically oriented and can be the reason for poor muscular endurance level. The boarding girls do not engage in physical activities like walking distances to fetch water, washing of clothing, walking distances to school, weeding and other home chores that the day girls engage in. Sweeping and other physical works on campus are done by the form one students.

Sub-Question 3: What is the difference in Muscular Strength levels between day and boarding SHS girls in Cape Coast?

To test for the authenticity of sub-hypothesis three (3), again the t-statistics was employed, and the result is presented in Table 5.

From the table it is evident that the assertion stated in the hypothesis is true. Comparing the p-value of 0.02 and the alpha level of 0.05 a decision could be made that, 'since the p-value is less than the alpha level we reject the null hypothesis, in this context we accept the sub-question that 'there is a significant difference in muscular strength levels between day and boarding girls in Cape Coast Senior High Schools and that of day girls will be higher'.

Table 6 below depicts the data on the modified push-ups used as the basis to determine the muscular strength of the respondents. It is evident from the table that the day students are fitter in muscular strength than their boarding counterparts.

Table 5**Independent Samples t-test Result of Muscular Strength Test for Day and Boarding Girls**

Group	n	M	SD	SE	df	t	Sig
Day	40	25.95	2.57	0.41	158	2.33	0.02(S)
Boarding	120	24.72	3.00	0.27			

P < .05

S = Significant

The decision is buttressed by the percentage scores of the respondents as shown in Table 6.

Table 6**HFZ Performance Analysis of Fitnessgram Measurement of Muscular Strength (Modified Push-ups) Test**

HFZ	RANGE	Day Girls		Boarding Girls	
		n	%	n	%
High Performance	36-44	0	0	3	3
Good Fitness Zone	30-35	4	10	5	4
Marginal	23-24	32	80	82	68
Need Improvement	17-22	4	10	30	25
Total		40	100	120	100

Comparatively, about 90% of the day students are within the marginal zone and above, (that is, 36 out of 40 were able to do 23 and more of the push-ups), while only 75% of the boarders were successful.

Again, while about 25% of the boarders performed poorly and therefore needed improvement in muscular strength buildup, only 10% of their day colleagues were in need. This situation could be attributed to the fact that most of the day students are engaged in routine vigorous bulk of activities such as washing of their clothing and that of family relations, cooking, weeding, which are not allowed or performed in the boarding set up.

This goes to answer research question 3 and confirms and accept sub-hypothesis 3 that the day girls are stronger in muscular strength than their boarding counterparts. However, the high performance of the boarding girls at the marginal zone could be explained by the menial activities such as washing, lifting of trunks and other pieces of luggage, carrying of books while climbing and descending of the hills in the two schools.

In addition, good and variety of meals could contribute to the advantage that the day girls have over the boarders. While the boarders are restricted to pantry menus, day girls are exposed to a number of foods which they have the option to select from, according to their purchasing power. Some of the boarders, in an attempt to meet their hunger, after refusing the kitchen food, either due to monotonous or total dislike, will settle for gari, sugar, milo and water mixture, which is neither nutritious nor balanced. According to Ulrich (2006), proper nutrition is important to physical fitness, because energy expenditure depends on nutrition. If diet is inadequate, the fitness level will drop. Overweight, underweight and weak individuals will have below average strength fitness level.

Sub-question 4: What is the difference in Flexibility levels between day and boarding SHS girls in Cape Coast.

The ‘Sit-and Reach’ test was used to determine the flexibility of the respondents. Subjects were made to go through the process in turns and the results recorded as presented in Tables 7 and 8 below.

Table 7

Independent Samples t-test Result of Flexibility (sit-and-reach). Test for Day and Boarding Girls.

Group	n	M	SD	SE	df	t	Sig
Day	40	38.93	5.08	0.80	158	5.66	0.00(S)
Boarding	120	32.58	8.66	0.79			

P < .05

S = Significant

As the calculated t-statistics in Table 7 above depicts, it is clear that at 5% level of significance there is no evidence in these data to reject the alternative or sub-hypothesis 4. This is indicative of the fact that with t-statistic value of 5.66, the p-value (0.00) is less than the 0.05. Again, comparing the means throws more light on the conclusion reached. With 38.93 and 32.58 for day and boarding girls respectively, it is clear evidence that at 5% confidence level the day girls are more flexible than the boarders. This is further substantiated by the data in Table 8.

Table 8**HFZ Performance Analysis of Fitnessgram Measurement of Flexibility (Sit-and Reach) Test**

HFZ	RANGE	Day Girls		Boarding Girls	
		n	%	n	%
High Performance	38 above	24	60	39	33
Good Fitness Zone	34-37	14	35	35	29
Marginal	29-36	2	5	16	13
Need Improvement	below 28	0	0	30	25
Total		40	100	120	100

A cursory view of the data in Table 6 indicates that whilst as much as 95% of the day girls fell within the Good-Fitness-Zone and above, only 62% of the boarders challenged them. The situation became even clearer when 25% of the boarding girls were so rigid that they could not do more than 28 of the flexibility test repeatedly, as against the 0.0% of the day students. The differences could be explained by the vigorous daily activities that the day girls go through as routine at home. Activities such as sweeping, washing and cleaning of all types of things, walking briskly to and from school and involvement in indoor and outdoor games both in school and at home render the day girls more flexible than their boarding counterparts. The boarders on the other hand do not engage in any strenuous activity while on campus. Most of the vigorous activities are done by the first years. This result is supported by the previous findings of Miller (1994), that active people are more flexible than inactive individuals.

Sub-question 5: What is the difference in Body Composition Fitness levels between day and boarding SHS girls in Cape Coast.

To test for significant differences in the body composition of the two groups of subjects, the independent sample t-test statistic and the HFZ percentage attainment techniques were used and the results presented in Tables 9, 10, and 11 below.

Table 9

Independent Samples t-test Result on Day and Boarding Girls Body Composition (Skin fold).

Group	n	M	SD	SE	df	t	Sig
Day	40	36.45	5.25	0.83	158	-5.53	0.00(S)
Boarding	120	42.76	8.57	0.78			

P < .05 S = Significant

The results as presented in Table 9 indicate marginal but statistically significant differences in the body composition of the two groups. The means, that is, 36.45 and 42.76 for day and boarding girls respectively show a close body composition but health wise it is in favour of the day students. This is because a higher mean in this wise means a higher percentage of body fats deposits which is a warning or basis for the contraction of many diseases.

From Table 9 above, as the p-value is less than 0.05, we can statistically conclude that, at 5% level of significance there is enough evidence to accept sub-hypothesis 5 that, ‘there is a significant difference in body composition fitness levels between day and boarding girls in Cape Coast Senior High Schools.

Table 10**HFZ Performance Analysis of Fitnessgram Measurement of Body Fat (Skin Fold) of subjects**

HFZ	Day Girls		Boarding Girls	
	n	%	n	%
Low	0	0	0	0
Good Fitness Zone	36	90	94	78
Marginal	3	7	18	15
Obese	1	3	8	7
Total	40	100	120	100

Table 10 showing the HFZ performance analysis of measurement of body fat and BMI respectively further accentuate the results as depicted and discussed in respect of Table 9.

From Table 10 the majority of the girls in both groups were found in the Good Fitness Zone. The situation is however not the same at the bottom where as much as 26 (22%) of the boarders were either marginally or terminally obese as against only 4 (10%) of their day counterparts. This condition is not pleasant to the health of these young girls at all. The data in Table 11 below emphasizes this analysis very well.

As clearly shown in the table 10, about 75% of the day girls exhibited normal body condition as against the 68% of the boarders. These two figures indicate and confirm the good health condition that majority of the members of the two groups

had, though that of the day students were better. This condition could be attributed to some of the daily manual strenuous activities that these girls go through which burns out most of fats or whatever they consume. According to the United State of American’s Surgeon General’s Report (2000), strength training will increase your lean muscle mass, which results in an accelerated metabolism.

Again, a troubling high number of the boarding girls sampled (about 22%) were declared according to the research findings as either overweight or obese as against the 10% of the day students. This condition is very detrimental to the health of the girls at the boarding school.

Table 11

Independent Samples t-test Result of Body Composition (BMI) on Day and Boarding Girls.

Group	n	M	SD	SE	df	t	Sig
Day	40	34.46	5.25	0.84	158	-5.43	0.00(S)
Boarding	120	40.71	7.52	0.76			

P < .05 S = Significant

Table 11 above depicts the t-test result on the Body Composition (BMI) of the students. The evidence affirms the sub-hypothesis that the fitness level pertaining to the day students is higher than that of the boarders. With a comparatively lower mean level of 34.46 of the day students as against 40.71 of the boarders clearly indicate more of the latter are at risk health-wise. This conclusion is further

confirmed with the HFZ Performance Analysis of Fitnessgram Measurement of BMI of subjects in Table 12.

Table 12

HFZ Performance Analysis of Fitnessgram Measurement of BMI of Subjects

HFZ	RANGE	Day Girls		Boarding Girls	
		n	%	n	%
Underweight	below 18.9	5	13	12	10
Normal	19-24.9	30	75	82	68
Overweight	25-29.9	3	7	17	14
Obese	30-40	2	5	9	8
Total		40	100	120	100

The difference in body fat deposition could be a result of a number of factors but environment had not been identified as one. However, heredity, glandular disorders, ageing and basal metabolic rates (BMR) have been mentioned as contributing agents (Corbin et al, 2003).

The daily shuttling of the day girls between the school and the house, and other activities were active to burn most of the food or calories which might be stored as fats. According to Prentice (1999), numerous studies have shown that walking can be a very effective component of a weight loss program. It is beneficial and ranks high compared to other popular forms of exercises.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter seeks to summarize the entire research work and the conclusion of the study. It goes further to offer possible suggestions or recommendations which could be used to improve the health-related physical fitness levels of student girls in Cape Coast.

Summary

The broad goal of health service delivery is to improve the health of all people living in the country regardless of age, gender, ethnicity, religious conviction, political affiliation or socio-economic standing. This broad goal encompasses many specific objectives, among them, an increase in life expectancy, reduction in morbidity and fertility rates, and improvement in quality of life.

The problem of deteriorating health status of Ghanaians has raised a lot of concerns in recent times. The health sector is constantly plagued with cardiovascular related cases such as obesity, premature deaths and others are on the ascendancy.

Girls and for that matter the Ghanaian youth are admitted into second cycle institutions under the same broad computerized criteria or system which places students into their preferred schools so long as they qualify under the grading system. It follows that irrespective of one's educational, religious conviction, ethnicity, age, political affiliation, socio-economic standing, mental, or health-related physical fitness levels; these students are all admitted into the schools. Although, the Ghana Education Service, have as one of their functional pillars of responsibilities to ensure, promote and sustain through education the good health of all pupils or students in and out of the educational institutions in the country, this broad focus is far from being achieved because these institutions are situated and function under different administrative, operational and environmental conditions. The different conditions existing among the various schools could influence health-related physical fitness levels of the students.

The purpose of the study was to find out whether there would be significant differences in the health-related physical fitness levels between boarding school girls and their day counterparts using girls from Aggrey Memorial and Ghana National Senior High Schools. The descriptive survey design was employed and the girls were selected using the simple random technique. The Prudential Fitnessgram (2002) battery was used to evaluate the health-related physical fitness levels of the subjects. Data gathering took three days to complete and it was subjected to computerization using the SPSS Windows 12.0 engine for the analysis. Regarding the significant differences in the health-related fitness levels of the students and the test of the sub-hypotheses, the independent t-test statistic method was adopted.

Findings

The summary of findings of the study are presented in accordance to the five sub-hypotheses.

1. There was significant difference between the cardio-vascular endurance fitness levels of the day and boarding girls in SHS in Cape Coast. This reflected in the t-test values obtained and interpreted. The HFZ levels of the subjects also revealed that the day girls were fitter in cardiovascular endurance than their boarding counterparts.
2. There was significant difference between the muscular endurance fitness levels of the day and boarding girls in SHS in Cape Coast. The day subjects had statistical advantage over their boarding counterparts, in terms of their HFZ levels, however, more than half of both the day and boarding subjects fell within the good fitness zone.
3. There was significant difference between the day and boarding girls regarding their muscular strength fitness levels. Statistically, the day group was found to be muscularly stronger than the boarding girls. This finding rejected the null hypothesis to the acceptance of the assumed hypothesis number three. The HFZ percentage attainments also indicated that the day girls were stronger than the boarding girls.
4. There was significant difference between the flexibility fitness levels of the day and boarding girls. This was revealed by the t-test values obtained and interpreted. Statistically, the day group were also more flexible than the boarding group in terms of HFZ levels.

5 The independent samples t-test analysis revealed a significant difference between the body composition levels of the two groups. This finding was drawn from the statistical analyses of the two variables, namely, the BMI and the skinfold, which were used to test for the body composition levels of the two sampled groups. The mean scores compared revealed that, the day group were healthier in terms of their BMI and skin-fold measurements. For the HFZ, statistics again revealed that the day girls were healthier when their BMI and skin-fold measurements are considered.

Conclusions

From the HFZ values and the t-test statistical results, the boarding girls are weaker in respect of fitness in cardiovascular endurance, muscular endurance, muscular strength, flexibility and body composition. This condition is not at all healthy and needs an urgent, practical and comprehensive approach to solve it.

All the subjects were young and need not have had any marked difficulty in going through the test items used for the research. For example, at their ages they should not be incapable of stretching far enough forward due to the fact that they have soft tissues (ligaments, tendons) of the joints, as well as the muscles. The inability to stretch far forward indicates tightness in the low back and hamstrings due to inactivity (Lidell, 1997). Heidelberg (1996) also supports the fact that tight hamstrings limit lower back flexibility which results in back pain.

Recommendations

From the research findings and conclusions above the following recommendations were made:

1. There should be an outright comprehensive physical fitness program designed and approved under the G.E.S and Ministries of Education, Youth and Sports to keep students active all the time. Such physical fitness program should consider all the five health-related physical fitness components. This is because 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 one's lifestyle behaviours.
2. Permanent physical fitness facilities such as courts, fields and a gymnasium should be provided in all institutions or communities in order to help students cultivate the habits of self exercising, which will go a long way to reducing or preventing possible heart diseases threatening our youth.
3. Teachers, facilitators and Administrators should be educated and encouraged to appreciate the importance of sports and sporting activities to all and sundry irrespective of social position, gender or educational background. This will alleviate the problem where some teachers and administrators openly discourage students and their subordinates from engaging in sporting activities.
4. Recreational facilities and changing rooms should be provided in SHS to encourage student girls to participate in various recreational activities as well as physical education lessons with the assurance that they could wash themselves before returning to class for another lesson.

5. Management and parent teacher associations of schools should start awarding prizes, special awards as well as material and financial incentives to students who show interest in sports and other extra-curricular activities designed to promote the physical health of students .

Suggestions for Further Research

Future research work on health-related fitness levels in any educational institution should centre on the boys, either of different form levels or between day and boarding students.

REFERENCES

- Akorsah, B. (2006) *Talking Point*. Ghana Television
- Allen, P.E. & Harrison, I.M. (1995). *Philips Allen's total fitness for life*. Dubuque:WMC Brown Publishers.
- Armstrong, H. (1990). *Estimation of Coronary Risk Factors in British School Children*. British Journal of Sports Medicine.
- Anderson, D.F, Broom, E.F, Pooley, J.C, Schrod, B & Brown, E. (1995). *Foundations of Canadian Physical Education, Recreation and Sports Studies* (2nd Ed) Wm C. Brown Communication. Inc.
- Ankude, P.N. (2002). *Impact of Circuit Training on Health-Related Fitness Levels of pupils in Basic Schools in Ho Municipality of Ghana*
- Bimah, A. K. (2001). *Health-Related Fitness Levels of Day and Boarding Boys of Nsaban Presby High School in Ghana*.
- Boateng, K. F. (2006). *Rising Heart Diseases at Korle-Bu*, GTV Interview.
- Booher, J.M., & Inbodeau, G.A. (2000). *Athletic injury assessment* (4th Ed), New York:. McGraw-Hill Companies Inc.
- Bouchard, C., Shepherd, R. J. & Stephens, T. (1994) *Physical Activity. Fitness and Health*. Campaign: Human Kinetics.
- Bucher, C. A. & Prentice, W. (1985) *Fitness for College and life* St Louis
- Canadian Population Health Initiative (2002). *Canadian Population Health Initiative Brief to the Commission of the Future of Health Care in Canada* Retrieved February20, 2004, from http://secure.cihi.ca/cihiweb/en/downloads/cphi_policy_romanowbriefe.pdf
- Casperson, C.J., Nixon, P. & Durant, R. (1998) *Physical Activity Epidemiology Applied to Children and Adolescents*. Exercise and Sport Science Review C.VMosby Company.
- Corbin, C.B., Linsey, R., Welk, G.L. & Corbin, W.R (2002). *Concept of fitness and wellness*. (4th Ed). Chicago: McGraw-Hill Companies. Inc.
- Cozby, P. C. (2004) *Methods in Behavioral Research* (8th edition). New York. McGraw Hill Company:

- Creswell, John W. (2003). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (2nd Edition). London. SAGE
- David, N. (1986). *The Sports Medicine Fitness Course*: New York: Bull Pub. Co.
- Devries, H. & Housh, T.J. (1994). *Physiology of exercise for physical education, athletic and exercise science* (5th ed). Boston, WCB McGraw Hill.
- Fall, H.B., Baylor, A.M. & Dishman, R.K (1996). *Essential of Fitness with Laboratories*. Dubuque: Brown and Benchmark.
- Fahey, T.D., Insel, P.M., & Roth, W.T. (2002). *Fit and well. A edition.* (5th Ed). Dubuque: McGraw Hill.
- Frankel & Wallen (2000). *How to design and evaluate research in education*, (4th Edition) Boston, MA. McGraw Hill Company.
- Gallahue, D.L. (1993). *Developmental Physical Education for today's Elementary Children.* (2nd Ed) Melbourne, Australia Brown and Benchmark Publishers.
- Gay, L.R. (1997). *Educational Research: competencies for analysis and application.* Fourth Edition, Columbus: Charles E. Merrill Publishing Company.
- Getchell, B. (1993). *Physical fitness. A way of life* (3rd ed) New York: John Wiley and Sons.
- Gibson, J. (1992). *Human Biology, Elementary Anatomy and Physiology for Students and Nurses.* London: Faber to Faber.
- Goding, G. & Shepherd, R. (1990) *Psychological Factors Influencing Exercise of Young Students.* Research Quarterly for Exercises Sports, Vol. 37 Pages 4 - 52
- Goslin, R. & Burden S.B. (1986) *Physical Fitness of South African School Children.* Journal of Sports Medicine and Physical Fitness, Vol. 26 Pages 128 - 136

- Grundy, S.M., Blackburn, G., Higgins, M., Lauer, R., Perri, M.G. & Ryan, D. (1999). *Medicine and Science in Sports and Exercise*, 31 Suppl., S502-S508.
- Hahn D.B. & Payne, W.A. (2003). *Focus on health* (6th ed). New York: McGraw Hill.
- Heidelberg, A. (1996). *Guidelines for promoting physical activity among older persons*. (www.who.int/hpr/heidelberg_eng.pdf). Geneva, 25th, August 2007
- Hoegar, W.W.K. & Hoegar, S.A.(1992). *Lifetime Physical Fitness and Wellness*. (3rd Ed) Colorado: Morton Publishing Company.
- Insel P.M. & Roth W.T. (2002). *Fit and Well*. Alternate edition (4th Ed) Dubuque. McGraw Hill.
- Kirchner, G. & Fishburne, G. (1996). *Physical education for elementary School children* (9th Ed) Dubuque, Iowa: Brown and Benchmark Publishers.
- Laliberte, R. (2001). *Activity for Physical Fitness*, Retrieved, April 10, 2007 www.nutritionaustralia.org/FoodFacts/Facts/FAQ/PhysicalFitness.
- Lidell, L. (1997). *The Sensual Body*. New York, Simon and Schuster, Inc.
- Lindsey, R., Welk, G.I. & Corbin, C.B. (2000). *Concept of Physical Fitness*. Dubuque: Brown and Benchmark.
- Lindsey, D.T., Insel, P.M & Roth, W.T. (2002). *Core Concepts and Labs in Physical Fitness and Wellness*. Alternate Edition, Dubuque: Brown & Benchmark. McGraw Hill Higher Education.
- Livingstone, M.B.E., (1994) *Energy Expenditure and Physical Activity in Relation to Fitness in Children*. Nutrition Society.
- Lumpkin, A. (2002). *Introduction to physical education exercise science, and sport studies*. (5th ed) New York: McGraw-Hill Companies. Inc.
- Mackenbach, J. & Bakker, M. (Eds.) (2002). *Reducing Inequalities in Health: A European Perspective*. London UK: Routledge.

- Malina, R.M. (1996). *Physical Activity and Fitness of Youth*. Medicine Exercise, Nutrition and Health. Vol. 5 Pages 125 - 137
- Monette, D.R, Sullivan T.J & DeJong, C.R. (1994). *Applied Social Research Tool for the Human Service*. (3rd Ed), Harcourt Brace College Publishers.
- Miller, D. K. (1994). *Measurement by the Physical Educator*. Dubuque, C Brown Comm Inc.
- Mullen, K.D., Belcastro, P.A., Gold, R.S. & McDermott B. (1993). *Connections for Health*. Brown and Benchmark Publishers. (3rd Ed)
- Nelson, S. A. (1997). *Exercise and health*, (1st Ed). Dansoman, Accra: Holiano. Ghana Limited
- Nwana, O.C. (1982). *Introduction to education research*. Ibadan: Heinemann.
- Payne, W.A. & Hahn, D.B. (1998). *Understanding your health*. (5th Ed) Dubuque: McGraw-Hill Companies, Inc.
- Prentice, W.E., (1994). *Fitness for college and life*. (4th Ed) New York: Wm. C. Brown Publishers.
- Prentice, W. E. (1999), *Fitness and Wellness*. (6th Ed) Dubuque; WCB McGraw-Hill.
- Prudential Fitnessgram, (2002). *Prudential Fitnessgram*. The Institute for Aerobic Research in Dallas, U.S.A.
- Powers, S.K. & Howley, E.T. (1994). *Exercise physiology. Theory and application to fitness and performance* (2nd Ed).Dubuque: Wm. C. Brown Communications, Inc.
- Robbins, G., Powers, D. & Burgess, S. (1994). *A wellness way of life*.(2nd Ed) California: WCB Brown & Benchmark.
- Robbins, Powers, D. & Burgess, S. (1997). *A wellness way of life*. (3rd Ed) California. McGraw-Hill Companies. Inc.
- Ross, J.G. & Gilbert, G.G (1989). *The National Children and Youth Fitness Study* .A Summary of JOPERD. Vol 56 Pages 24 - 25

- Schrivers, A., Lawrence, T.G., Powers, M.D. & Vorhaus, J.L (1996). *Your Health and Safety in a changing Environment*. Boston: Harcourt Brace Jovanovic, Inc.
- Siedentop, D. (2001). *Introduction to physical education, fitness and sport* (4th Ed) New York: Mayfield Publishing Company.
- Ulrich, C. (2006). *Physical Fitness*. Retrieved, September 14, Microsoft Encarta Encyclopedia. 2006 version.
- United States of America's Surgeon General's Report (2000). *The physiological Benefits of Exercising Regularly*. Retrieved, November 10, 2005, [www.cyberparent.com/fitness/health fitness/defines/healthy1. htm](http://www.cyberparent.com/fitness/health_fitness/defines/healthy1.htm).
- Webster, T. (1991). *Issues on Health*. Retrieved 23rd March 2006.. www.heath\webster.
- WHO (2008). Regional Office for Europe. Retrieved May 14, 2008. (http://www.euro.who.int/hepa/20050708_5).
- World Health Organization, (Guidelines Series for Healthy living, No. 1, accessed 18 March 2002). Retrieved June 2007.
- Williams, M.H. (1997). *Nutrition for health, fitness and sport*. (5th Ed) Dubuque: McGraw-Hill Companies. Inc.
- Wuest, D.A. & Bucher, C.A. (1995). *Foundations of Physical Education and Sport*. (12th Ed). The McGraw Hill Companies.
- Wuest, D. & Lombardo, B. (1994). *Curriculum and instruction*. Chicago: Mosby-Year Book. Inc.

APPENDIX A

UNIVERSITY OF CAPE COAST

FACULTY OF EDUCATION

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

6th July 2006

Ghana National College
Cape Coast, Central Region

LETTER OF INTRODUCTION

The bearer of this letter, Miss Charity Nordzro, is an M.Phil student of the Department of Health, Physical Education and Recreation (H.P.E.R), University of Cape Coast.

She is conducting a research on Health-Related Physical Fitness Levels between day and boarding senior high school girls in your establishment.

I would be grateful if permission is granted to use your girls as subjects for the research. The study is targeted at Aggrey Memorial Senior High School and Ghana National College in Cape Coast.

Thank you.

Signed.

Dr. Boateng

APPENDIX B

UNIVERSITY OF CAPE COAST

FACULTY OF EDUCATION

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

6th July 2006

Aggrey Memorial Zion Senior High School

Cape Coast, Central Region

LETTER OF INTRODUCTION

The bearer of this letter , Miss Charity Nordzro, is an M.Phil student of the Department of Health, Physical Education and Recreation (H.P.E.R), University of Cape Coast.

She is conducting a research on Health-Related Physical Fitness Levels between day and boarding senior high school girls in your establishment.

I would be grateful if permission is granted to use your girls as subjects for the research. The study is targeted at Aggrey Memorial Senior High School and Ghana National College in Cape Coast.

Thank you.

Signed.

Dr. Boateng

APPENDIX C

Aggrey Memorial Zion Senior High School

P.O. Box 189

Cape Coast

RESEARCH

I, Appiah-Danquah Kwesi of Aggrey Memorial Zion Senior High School have agreed that Charity Nordzro, currently pursuing her M Phil in the Department of Health- Physical Education and Recreation (H.P.E.R), University of Cape Coast should use girls in my school as subjects for the study.

She is researching on the Health-related Physical Fitness Levels of S.H.S girls in Cape Coast.

I wish she will be given the necessary support and help.

APPIAH-DANQUAH KWESI
THE HEADMASTER
AGGREY MEM. ZION SEN HIGH SCH
CAPE COST

CC: DR B.L. BOATENG
DEPT. OF HP.E.R.
CAPE COAST

CHARITY NORDZRO
AGGREY MEM. ZION SEN HIGH SCH.
CAPE COAST

APPENDIX D

Our Ref:
GNC/ADM/IIMS/06/10

Ghana National College
P.O. Box 189
Cape Coast

RESEARCH

Charity Nordzro, a P.E Teacher currently pursuing her M Phil in the Department of Health- Physical Education and Recreation (H.P.E.R), University of Cape Coast. She is using girls in Ghana National College as subjects for the study.

She is conducting her research on the Health-related Physical Fitness Levels of S.H.S girls in Cape Coast.

I wish she will be given the necessary support and help.

ROBERT KOOMSON- BARNES
THE HEADMASTER
GHANA NATIONAL COLLGE
CAPE COST

CC: DR B.L. BOATENG
DEPT. OF H.P.E.R.
CAPE COAST

CHARITY NORDZRO
AGGREY MEM. ZION SEN HIGH SCH.
CAPE COAST

APPENDIX E

Group statistics

GROUP	N	MEAN	STD DEVIATION	STD ERROR MEAN
Cardiovascular day girls	40	52.63	10.89	1.72
Endurance boarding girls	120	47.55	8.14	0.74
Muscular day girls	40	25.95	2.57	0.41
Strength boarding girls	120	24.72	3.00	0.27
Muscular day girls	40	25.75	3.65	0.58
Endurance boarding girls	120	23.77	4.14	0.38
Flexibility day girls	40	38.93	5.03	0.80
Boarding girls	120	32.58	8.66	0.79
Body day girls	40	36.45	5.25	0.83
Composition boarding girls	120	42.76	8.57	0.78

APPENDIX F

Independent Samples t-Test

		t- test for Equality of Means				
		T	Df	Sig (2- tailed)	Mean Difference	Std Error Difference
Cardiovascular	Equal variances assumed	3.13	158	0.00	5.08	1.62
Endurance	Equal variances not assumed	3.13		0.00	5.08	1.62
Muscular	Equal variances assumed	2.33	158	0.02	1.23	0.53
strength	Equal variances not assumed	2.33		0.02	1.23	0.53
Muscular	Equal variances assumed	2.70	158	0.01	1.23	0.73
endurance	Equal variances not assumed	2.70		0.01	1.23	0.73
Flexibility	Equal variances assumed	5.66	158	0.00	6.35	1.12
	Equal variances not assumed	5.66		0.00	6.35	1.12
Body	Equal variances assumed	-5.53	158	0.00	-6.31	1.14
composition	Equal variances not assumed	-5.53		0.00	-6.31	1.14

APPENDIX G

The Prudential FITNESSGRAM

Test Items

AEROBIC CAPACITY

Teachers will select one of the following options:

The PACER Fat-recommended for the grades k-3 [multistage 20 metershuttle run] One Mile Walk/Run

BODY COMPOSITION

Teachers will select one of the following options:

Percent Fat –calculated from triceps and calf skinfolds

Body Mass Index from height and weight

MUSCLES STRENGTH, ENDURANCE AND FLEXIBILITY

Teachers will select as indicated:

Abdominal strength	Trunk extensor and Flexibility
Must select	Must select
Curl-up Test	Trunk Lift
Upper Body Strength	Flexibility
Must selected one	Must select one
Push-up	Back-Saver Sit-and-reach
Modified push-up	Shoulder stretch
Push-up	
Flexed Arm Hang	

APPENDIX H

THE PRUDENTIAL FITNESSGRAM

Table 2 The Prudential FITNESSGRAM

Standards for Healthy Fitness Zone*

GIRLS

	One Mile (min/sec)	Pacer (laps)	VO2 max (ml/kg/min)	PERCENT FAT	BODY MASS INDEX	CURL-UP *Completed
5	Completion of	Participate in		35 12	20 14.7	2 10
6	distance. Time	run. Lap count		35 12	20 14.8	2 10
7	standards not	standard not		35 12	22 15	4 10
8	recommended.	recommended.		35 12	23 16.6	6 12
9				35 12	24.5 17.5	9 15
10	12.30 10.00	26 60	45 55	40 12	25 18	9 18
11	12.00 9.30	30 64	45 55	40 12	26.6 18	9 20
12	11.30 9.00	33 66	45 55	40 12	27 18.5	12 20
13	11.30 9.00	40 70	45 55	40 12	28.5 18.5	18 24
14	11.00 8.30	41 80	45 55	42 12	28.5 20	20 30
15	11.00 8.30	43 85	45 55	42 12	40 20.5	20 30
16	10.00 8.00	43 85	45 55	45 12	42 22	20 30
17	10.00 8.00	43 85	45 55	45 12	45 22	20 30
17+	10.00 8.00	43 85	45 55	45 12	45 22	20 30

	Trunk Lift (inches)	Modified Push-up *(Completed)	Modified Pull-up *(Completed)	Pull-up *(Completed)	Flexed Arm Hang *(Completed)	Back Saver Sit-And-Reach (inches)
5	4 8	4 10	2 6	1 2	2 8	8
6	4 8	4 10	2 6	1 2	2 8	8
7	4 8	6 12	3 7	1 2	2 8	8
8	4 8	8 15	3 7	1 2	2 8	8
9	4 8	10 15	3 8	1 2	2 8	8
10	6 9	10 20	3 9	1 2	3 8	8
11	6 9	12 30	4 9	1 2	4 8	8
12	6 9	14 30	4 9	1 3	7 8	8
13	6 9	14 30	5 9	1 3	8 10	8
14	6 9	16 30	5 12	2 4	8 10	8
15	6 9	17 40	6 15	2 4	9 12	8
16	6 9	17 44	6 17	3 5	9 12	8
17	6 9	17 44	8 20	3 5	9 12	8
17+	6 9	17 44	9 22	3 5	9 12	8

Number on left is lower end of HFZ; number on right is upper end of HFZ

*Test scored pass/fail, must reach this distance to pass.