ASSESSMENT OF PHYSICAL FITNESS STATUS OF PUBLIC AND PRIVATE SECONDARY SCHOOL STUDENTS IN KATSINA STATE

BY

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DECLARATION

I declare that the work in the thesis entitled Assessment of Physical Fitness Status of Public and Private Secondary School Students in Katsina State has been undertaken by me in the Department of Physical and Health Education under the supervision of Professor F.R Haruna and Professor M.A Chado.

The information derived from the literature has duly acknowledged in the text and a list of references provided. No part of this thesis has been presented for another degree or diploma at any University.

Mohammed, Idris Abubakar _____ _____

Signature Date

CERTIFICATION

This thesis entitled "Assessment of Physical Fitness Status of Public and Private Secondary School Students in Katsina State" by Mohammed, Idris Abubakar meets the regulations governing the award of the Degree of Master of Science (MSC) in Exercise and Sports Science Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This work is dedicated to my wife and our children.

ACKNOWLEDGEMENT

The researcher wishes to express his thanks and gratitude to Allah (S.W.A) for seeing him through this work. The researcher also wishes to appreciate the effort of my two supervisors Professor F.R. Haruna and Professor M.A. Chado for their detailed suggestions, corrections, and constructive criticisms despite their tight schedule. May Allah in His infinite mercy reward you abundantly and bless your families, Ameen.

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ABSTRACT

The purpose of this study was to assess the physical fitness status of public and private junior secondary school students in Katsina State. An Ex-post facto research design was used for this study. Two hundred and forty (240) junior secondary school students were selected through random sampling by dip, pick, record and return method. The test items included push up, sit up, sit and reach, skin fold measurement and twelve minutes run/walk tests. These were used to determine muscular strength, muscular endurance, trunk flexibility, body fat percent, and cardio-respiratory endurance. The data collected were analyzed using statistical package for social sciences (SPSS) to test the hypotheses at 0.05 alpha levels The data of the study were subjected to descriptive statistic of Mean and Standard deviation then a further analysis using independent t-test was used to analyzed differences in treatment between public and private junior secondary school students and their physical fitness status. The result of the study indicated that students from the two types of secondary schools (public and private) did not differ significantly in their muscular endurance with the observed t-value of 1.058 and observed significant level of 0.291. It also revealed that students of public secondary schools were significantly higher in their muscular strength than students from private secondary schools involved in the study with observed t-value of 4.488 compared with 1.96 which stands for the critical value. Similarly it indicated that public secondary school students were significantly higher in their flexibility measured with sit and reach than students from private secondary schools the observed t-value (2.884) for the aggregate comparison between the private and public schools, obtained in the test is higher than the critical value of 1.96.The findings also revealed that students from public secondary schools have higher body fat percent than students from the private secondary schools. The result revealed that the two groups are significantly different in their body fat

percent. But among those of the public school no significance difference was observed. The aggregate means were however significantly different between the private and public schools. This is indicated by observed t-value of 2.292 compared to the critical value equivalent of 1.96. The difference is in favor of males against female students. Equally the result revealed that the two groups (private and public secondary school students) were significantly different in their cardio-respiratory endurance. The observed t-value 2.525 and critical value of 1.96. Thus it is recommended that government should reintroduce sport competitions in all secondary schools and participation made compulsory as this will improve the physical fitness status of the students and similar study should be carried out in senior secondary schools and other educational levels within the state and the country at large.

OPERATIONAL DEFINITIONS

Health Related Components: These are fitness components that are crucial in the development of better health.

Performance or Skill Related Components: These are primarily important to achieving success in athletics.

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CHAPTER ONE

INTRODUCTION

1.0 Background of the Study

Following man's great revolution to make better what nature has provided, and his quest for better living resulting from technological breakthrough, man has finally ended up losing his natural qualities to artificial living. Therefore, optimal health should not only be pursued but ought to be improved with exercise.

Globally, there has been a remarkable change in the lifestyle since the advent of the industrial revolution. Automobiles, aircrafts, the telephone, radios and several automatic machines have made life relatively easier, thereby relegating manual labour to the background. This brings about a decrease in physical fitness, and thus led to the endangerment of health and normal functioning of organs and systems (Hollmann and Hettinger, 2000). From time Nigerians have lived on farms or in villages and hamlets with agriculture as their main sources of livelihood, but with increased mechanization and its attendants rural urban migration, Nigeria once a society of physically active and hardworking people is being gradually transformed into a population of anxious city dwellers and sub-urbanities purely on sedentary existence due to lack of opportunity for physical activities (Sule, 2009).

The importance of physical fitness in the growth and development of a nation has been stressed by President J.F. Kennedy, (Pollock, Jack,and Samuel, 1984). In the light of the well documented health benefits of physical activity and with increase emphasis for active lifestyle for the health of individuals and Nations, majority of individuals in many developed and developing populations are not regularly active. According to

Heyward (1998), Niemen (1998), Manila (2001) U.S. Department of Health and Human Services stated that almost one – half of youth 12-21 years of age are not regularly active, 60% of adults are not regularly active and 25% of adult are not active at all. Nwegbu (1978) in Gajere (2005) has made similar observations about Nigerian youth and population that they are physically unfit.

Physical activity (PA) is an important part of healthy lifestyle and has been extensively documented and associated with health benefits (Welk, 2002; Department of Health, 2004). However, it is recommended that youth should undertake at least 60 minutes of moderate to vigorous physical fitness programs on most, if not all days of the week (National Association for Sports and Physical Education, 2004; Department of Health and Aging, 2004). There is evidence that adolescents do not engage in sufficient physical fitness programs to achieve these health benefits Katsina State adolescents inclusive (Van Mechelen, Twisk, Post, Suel, Kemper, 2000; Varo, Martinez-Gonzalez, Delrala-Estevez, Kearney, Gibney, Martinez, 2003). This situation underlines the need to dedicate more attention to the factors explaining the adoption of physical fitness, which may include past physical activity behaviour, intention to be physically active, perceived health benefit, motivation, self-efficacy, and support by significant others family influence, accessibility of sport facilities and attitude towards physical activity (Ries, Granados, Galarraga, 2009).

Studies have shown that physical fitness of children did improve as a result of some training programmes in running speed. Researchers like Shephard (1984), Nka (1999) have argued that the pre-adolescents growth period is a fruitful period to stimulate training responses because of hormonal activities. Kemper (1984) discovered that boys grow faster than girls at all ages with differences increasing with age.

According to Macauley (1999) there are sign of a serious decline in the level of physical activity among children and the pattern established in early life are maintained as these children get older. More alarming than the decline in physical activity is evidence of declining levels of physical fitness and the relationship between poor physical activity, fitness and cardio vascular risks factors. He went ahead to stressed that children are considerably less active than 10-20 years ago with correspondingly higher levels of obesity, lipids and hypertension. Macauley (1999) further reported that studies in Britain have shown that poor levels of aerobic fitness in children of all ages drop considerably after the age 14 years. In general boys were more active than girls at all ages, and after the age of 14 years activity levels among girls drop very low.

Other researchers are of the opinion that the children naturally sustain a high level of habitual physical activity and that the male child in particular would still make gains in different parameters of physical fitness training (Malina 1984).

Pollock, Jack and Samuel (1984) stated that developed Nations of the world like Germany, the United States of America, Britain and Japan have recognized fitness as a necessary factor in contributing to the economy and happiness of a nation. Such Nations have accordingly developed and implemented physical fitness programmes and assessed physical fitness status of their citizens including the youth and children.

In China for example more emphasis has been placed on physical fitness of citizens for economic purpose. According to Mao Tse-tung "for a nation to develop economically, the citizens must be healthy" and for workers to be highly productive, they need to be physically fit". He therefore, strongly recommended and encouraged participation in physical fitness programmes in the industries, factories, communities' schools and other organizations (Haruna, 2005).

Chado (1990) emphasized that during the pre-colonial days in Nigeria, different groups of people were actively involved predominantly in high energy expenditure physical activities such as farming, fishing, long distance walking, hunting, and many other strenuous activities that greatly contributed to their health. This way of life was observed throughout the African continent. Thus making the participants physically fit.

Nigeria as a developing Nation, realized the relevance of sports and physical education in building physical fitness as shown in the Federal Government of Nigeria (FGN,1981) that sports and physical education must be emphasized at all levels of our educational system. Moreover with the introduction of the 6-3-3-4 educational system in Nigeria, Katsina State specifically there has been an increased in students' enrolment, establishment of more public and private secondary schools with little or no sporting facilities and equipment. This makes participation in physical education and sports optional for the students. However, before this development boarding school system were practiced with enough sporting facilities and participation in physical education and sports by all students was compulsory. Thus participation in sports and physical activities in these days is voluntary and this has affected the physical fitness status of our students in both public and private secondary schools. Macauley (1999) pointed out that children are less fit today this is because more sedentary diversion such as television and video games, computer, takes them away from physical activity. Similarly Pollock et al (1984), Jackson, Marrow,Hill and Dishman (1999) maintained that children are not as active or fit than they were a quarter Century ago. This study was therefore designed to assess the physical fitness status of public and private junior secondary school students in Katsina State and ascertain whether one group has higher level of fitness than the other.

1.1 Statement of the Problem

Advances in modern technology have made life relatively easier for Nigeria citizen which has negative impact on their health. Enette, Robert, Mirko, David,(1994), Venkateswarlu (1996), Heyward (1998) stated that disease risk factors are increasing at an alarming rate, primarily due to modern lifestyle characterized by excess consumption of fat and lack of physical exercise among different population, irrespective of sex and age.

Heyward (1998), Jackson, Marrow, Hill and Dishman (1999) stated that most jobs that require hours of hard and vigorous work are now replaced by automation and make many people physically inactive.

In line with this Gajere (2005) stated that the awareness of these conditions that fosters poor fitness has prompted many Nations of the world to place more emphasis on physical exercise for their citizen and equally assess their physical fitness status more especially the health related components. Nigeria as a nation is not left out of this drive to keep her citizens physically fit. He further stated that secondary school children constitute one of the major groups of Nigeria population whose physical fitness status need to be looked into by government, since they are the future leaders and national defenders in many spheres of life example agriculture, education, economy, defense and many others.

Moreover research evidence has shown that there are sign of serious decline in the level of physical activity among children and the pattern established in early life are maintained as these children get older (Macauley 1999)..

Unfortunately, the National Policy on Education (FGN,2004) has neglected physical education to the background as it is grouped under group C of the upper basic education subjects together with religious knowledge and Arabic as an elective to pick at least one

from the group. More alarming than the decline in physical activity is evidence of declining levels of physical fitness and the relationship between poor physical activity, fitness and cardio vascular risks factors.

Moreover, physical activities like inter-class and inter-school competitions, traditional games like local wrestling and boxing which aimed at promoting physical fitness of the students are not only declining in our secondary schools today but are almost disappearing and this brought a serious concern on the state of physical education and that of physical fitness of our secondary school students in both public and private (Mainsa, 2008).

In line with the above observations, the researcher wishes assess the physical fitness status of public and private secondary school students in Katsina State with more emphasis to the health related components.

1.2 Purpose of the Study

The purpose of this study was to assess the health related fitness status of public and private junior secondary school students in Katsina State sand ascertain whether one group has higher level of physical fitness than the other.

1.3 Research Questions

The following research questions were raised in obtaining the data:

1. Do students of public and private junior secondary school differ in their physical fitness status?
2. Do students of public and private junior secondary school differ in their cardio respiratory endurance?

3. Do students of public and private junior secondary school differ in their muscular strength?
4. Do students of public and private junior secondary school differ in their muscular endurance?
5. Do students of public and private junior secondary school differ in their flexibility?
6. Do students of public and private junior secondary school differ in their body fat-percent?

1.4 Assumptions

On the basis of this research, the following assumptions are made:

- Physical fitness varies with age, sex, height, body weight and exposure to different sporting activities.
- Sedentary lifestyles or physical inactivity tends to lower physical fitness status.

1:5 Hypotheses

There are no significant differences between students of public and private junior secondary schools in their cardio respiratory endurance, muscular strength and endurance, flexibility and body fat-percent.

Sub-Hypotheses

i. There is no significant difference between the physical fitness status of public and private junior secondary school students in their cardio-respiratory endurance performance.

ii. There is no significant difference between the physical fitness status of public and private junior secondary school students in their muscular strength performance.

iii. There is no significant difference between the physical fitness status of public and private junior secondary school students in their muscular endurance.

iv. There is no significant difference between the physical fitness status of public and private junior secondary school students in their flexibility test performance.

v. There is no significant different between the physical fitness status of public and private junior secondary school students in their body composition measures.

1.6 Significance of the Study

Though there is no enough information on the student's health related fitness status in Katsina State, the findings of this study would be of benefit in the following ways:-

1. The study would benefit the parents, exercise and sport scientists, general public, and teachers to be able to identify the areas of strength and weakness of the students in terms of physical fitness.
2. The study would assist the students in both public and private secondary schools to develop skills and knowledge required to become intelligent physical fitness consumers.
3. This study will contribute significantly on the growing literature in the area of physical fitness and exercise science in general.

1.7 Delimitation of the Study

This study is delimitated to the following:

i. Health related fitness status of male and female students.

ii. Junior secondary school of public and private schools

1.8 Limitations

This study is limited by the inability of the researcher to make use of laboratory tests to measure the health related components of the subjects, scarcity of equipments and facilities and equally large number of the subjects taking part in the test. Thus, field test were used because of the large size of the subjects and the non-availability of equipments and facilities. Other factors include variations in daily activities of the subjects, nutritional mode, environmental, and socio-economic factors. Meanwhile no attempt has been made to control such factors and it is suspected that the daily activities are almost the same for all the subjects because they are from the same environment with similar socio-economic background.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

The purpose of this study was to assess the physical fitness status of public and private junior secondary school students in Katsina State. To achieve this purpose the researcher consulted different textbooks, dissertation abstracts, and journals in the related area for information. The literature was thus reviewed under the following sub-headings:

2.2 Concept of Physical Fitness

2.3 Components of physical fitness

i. Cardio-respiratory endurance

ii. Muscular strength

iii. Muscular endurance

iv. Flexibility

v. Body fat percent

2.4 Exercise and physical fitness

2.5 Physical fitness of active versus inactive persons

2.6 Summary

2.2 Concept of Physical Fitness

Physical fitness is difficult to define and even more difficult to measure and quantify. Physical fitness is a physical state of well being that allows people to perform daily

activities with rigor, reduce risk of health problems related to lack of exercise, and provide a fitness base for participation in a variety of physical activities (Musa, 1997).

Wuest and Bucher (2006) stated that physical fitness is the capacity of people to perform physical activities. It is a set of attributes that people have or achieve that allow them to carry out daily tasks without fatigue and enable them to have the energy to participate in a variety of physical activities. It is a state of well-being associated with low risk of health problems. Physical fitness can be described in relationship to health and skill or performance.

A physically fit person, according to Emiola (1982) is one who can efficiently handle his or her daily tasks without fatigue so as to have energy for family, hobbies, and leisure time activities and a physical reserve in case of emergencies.

The American Alliance for Heath, Physical Education and research AAHPERD (1987) defined physical fitness as the state, which characterized the degree to which an individual is able to function effectively. AAHPERD went further to state that physical fitness is an ability of an individual to live most effectively within his potentialities. Also, ability to function depends upon physical, mental, emotional, social, moral and spiritual components of fitness, all of which are related to each other and are mutually interdependent.

Corbin, Welk, Lindsey, Corbin (2004) opined that physical fitness is a multidimensional state of being. They added that it is the body's ability to function efficiently and effectively. It is a state of being that consists of at least five health-related and six skill related physical fitness components, each of which contributes to quality of life. Physical fitness is associated with a person's ability to work

effectively, enjoy leisure time, be healthy, resist hyporkinetic disease, and meet emergency situations. It is related to, but different from, health and wellness.

Hahn and Payne (2003) stressed that physical fitness is achieved when "the various systems of the body are healthy and function efficiently so as to enable the fit person to engage in activities of daily living, as well as in recreational pursuits and leisure activities, without unreasonable fatigue. Maud and Foster (1995) viewed physical fitness as "the ability to carry out daily tasks with alertness and vigor, without undue fatigue, and with enough reserve to meet emergencies or to enjoy leisure time pursuits".

On the other hand Heyward (1998) perceived physical fitness as the ability to perform occupational, recreational, and daily activities without becoming unduly fatigued. Saris (2003) look at it as the capacity to carry out reasonably vigorous physical activities, and include qualities important to the individuals' health and well being in general as opposed to those that relate to performance of specific motor skills.

Chado (1993) asserted that physical fitness relates to the capacity of the body to function at optimal level of efficiency in doing daily activities either in form of physical exercise or sport participation, planned or unplanned without undue fatigue.

Saris (2003) saw physical fitness as a substrate of performance, that is, muscular strength, motor task and physical capacities in energy production and work output. American Association of Physical Health Education Recreation and Dance (1985) look at physical fitness as a state in which an individual possesses qualities of strength, power, agility, flexibility, endurance, balance, speed and general coordination to the extent that he is able to meet his everyday needs and emergency situations adequately. Physical fitness is relative and it is better defined with due

considerations for the general health, occupation, vocational activities, interest, needs and capabilities of the individual. This submission was in line with that of Emiola (1982) who stated that physical fitness is the ability of the individual to endure exertion and stressful physical activity beyond his moral daily occupational requirements. This definition agrees with the views of Dikki (1994), physical fitness is a concept that has varied definition depending on the perspective from which one is defining it. It is generally conceptualized as that level of fitness that enables the individual to have enough competence to meet daily responsibility with reserve energy to meet eventualities. This type of fitness is important for very individual irrespective of occupation because it promotes general good health.

Thus it can be understood that physical fitness has no universally accepted definition, but has been viewed according to individual understanding and needs. It can therefore be defined as the ability of an individual to perform his daily task without stress and still have extra energy to enjoy other social activities.

2.3 Components of Physical Fitness

Wuest and Bucher (2006) viewed physical fitness as a quality of life comprising eleven different components, each with specific requirements for its development and maintenance. The eleven components are sub-divided into two groups namely:-

i. Health related components and

ii. Performance related or skilled-related components.

The health related components according to them are:

1. Body composition
2. Cardio respiratory endurance

3. Flexibility
4. Muscular strength
5. Muscular endurance

While the performance related or skill-related components include;

1. Power
2. Agility
3. Balance
4. Recreation time

Heyward (1998) enumerated components of physical fitness as: Cardio-respiratory endurance, musculoskeletal fitness, body weight and body composition, flexibility and neuro-muscular relaxation. Hoeger (1988) categorized physical fitness into two groups: the health related components and the skill related components. The health-related components include: Cardiovascular endurance, muscular strength and endurance; muscular flexibility, and body composition while the skill-related components include among others: agility, balance, coordination, power, reaction time and speed. Corbin et al (2004) stated the components of physical fitness as; body composition, cardiovascular fitness, flexibility, muscular endurance and strength others are agility, balance, coordination, power, reaction time and speed.

Hoeger (1988) identified cardiovascular endurance, muscular strength and endurance, muscular flexibility and body composition as the health related components of physical fitness while the skill related components include among others agility, balance, coordination, power, reaction time and speed. Mainsa (2008) dichotomized physical fitness into two components. These are health related components and performance related components. The basic components of health related fitness include: cardio respiratory endurance, muscular endurance, muscular strength,

flexibility, body composition, and muscular power. The performance related components include speed, agility, coordination, and balance. Many authors example Mathews and Fox (1981), However, Ogundari (1984) stated the components of physical fitness as strength, muscular endurance, flexibility, cardio-vascular endurance which according to him, is referred to as the dynamic components of physical fitness. American Association of Physical, Health Education, Recreation and Dance (1985) considered the basic components of physical fitness to be strength, power, agility, and flexibility, muscular and cardio-respiratory endurance. Others are balance, speed and general coordination. More attention was focused on the health related components of physical fitness throughout the conduct of the study.

i. Cardio respiratory endurance:

Cardio respiratory fitness is a component of fitness which is regarded as the basis of entire fitness. This is because of the various health advantages associated with the development of high levels of cardio respiratory endurances some of the benefits according to Hockey (1981), Wilmore and Costill (1999), Brown et'al (2002), Sharkey (1984) and Billman (2002) include increased efficiency in supplying oxygen, increased fat tolerance, increased coronary supply and capillary development, increased collateral circulation, reduction of obesity and overweight, reduced risks of heart diseases, strengthen bones, ligaments and tendons, reduced tension and stress, improved vitality, reduced fatigue, improved fat metabolism, enhanced self confidence and body image and emotional stability.

The cardio respiratory systems are solely responsible for supplying oxygen (O_2) to the tissues and keep them from carbon dioxide (CO_2) and other waste products. Therefore, cardio respiratory endurance and fitness is essential to prolonged vigorous

activity. Having good cardio respiratory endurance is exemplified by such characteristics as the ability to run, cycle or swim for prolonged period of time, because of the importance of cardio respiratory fitness the ACSM (1995) in Heyward (1998) recommended that every physical fitness evaluation should include the assessment of cardio respiratory function during exercise and at rest.

Studies on cardio respiratory fitness have been carried out by various researchers and findings reveal that several variables are responsible for the differences in the cardio respiratory fitness of individuals.

Musa (1986), in his comparative study on cardio vascular fitness of day and boarding students showed that males have superior aerobic capacity compared to their female counterparts. Gwani (1986) also found both height and sex of the subject have significant relationship with aerobic performance.

However, Wilmore and Costill (1999) affirmed that healthy untrained girls and women have much lower VO_2Max (20-25%) lower than healthy untrained boys and men. This finding corresponds with the finding of Gwani (1986) and Musa (1986).

Nieman (1998) stated that female have higher heart rate and low VO_2Max when compared with their male counterparts. He cited example of the world marathon record for men just under 2.07 and for women 2.21 minutes and 11 percent difference. He further confirmed that elite female endurance athlete VO_2Max values are 15 to 30 percent lower than male athlete. This finding is in consonance with McArdle (1991) where he stated that boys show better VO_2Max than girls. Moreover, he stated that girls VO_2Max peak at above 14 years and decline thereafter. This indicated that genetically male are better than female in endurance activities (Nieman, 1998).

McArdle (1991) reported that VO_2Max decline with increases in age. This submission was supported by Nieman (1998) in which he reported that VO_2Max normally declines 8-10 percent per decade after 25 years of age, and this may be as a result of the tendency of people to exercise less as age increases. Moreover, at any given age, individuals who exercise vigorously can be fitter than their sedentary counterpart. Thus, active people have higher VO_2Max than the less active ones.

Cardio respiratory fitness can be measured and the measurement of maximal oxygen consumption (VO_2Max) was found to be the best measure of an individual's cardio respiratory fitness (Maud and Foster 1995, Malina 2001 in Gajere, 2005). The best method to determine an individual's VO_2Max is to use a direct method test in a laboratory setting with a bicycle ergo meter and treadmill. The inspired and expired air is collected and analyzed to determine the amount of oxygen consumption. Physiologists considered directly measured VO_2Max or peak VO_2 to be the valid measurement of functional capacity of cardio respiratory function (Heyward, 1998). This measurement requires expensive equipment expert and it is vigorous and time consuming and cannot accommodate a large pollution. This makes this measuring technique not practicable in many schools and colleges. Attempts have therefore been made to devise other methods found also reliable and valid ways of estimating VO_2Max and could be administering to a large group of subjects with minimum cost in time and money.

Indirect or field tests have been used by many researchers and proved to be successful when estimating individuals' VO_2Max. Example of such tests are 1.5 mile run test, Harvard step test, Cooper's 12-minutes run test, 9-minutes test, etc. The field test has served as an alternative to direct method and provides very high correlation with laboratory test. These submissions revealed that reliable estimate of VO_2Max may be

obtained from performance during the Cooper's 12-minutes run test, findings of this test correlate very highly (r. 090) with laboratory VO_2Max (Heyward 1998, Maud and Faster 1995, Jackson et al 1999 and Wilmore and Costill 1999).

Chado (1991) stressed that the 12-minutes run test suggested by Cooper (1968) has since gained world-wide recognition. It is used to measure the extent of individual's ability to respond adequately and safely to endurance related work. It also shows the functions of the heart, blood, and oxygen consumption of an individual. Moreover, previous research finding elaborated the administrative feasibility and reliability as well as suitability of the 12-minutes run test for young adolescent boys and girls (Gwani 1986, Igbanugo and Fatokun 1995).

Gwani (1986) conducted a research with 60 under graduate male and female students from Ahmadu Bello University (ABU) Zaria with mean age of 28.4 years and discovered that there is correlation of 0.778 between modified 6-minutes run test and Cooper's 12-minutes run test as a measure of cardio vascular fitness. This result is in agreement with Tukur (1995) who reported a high correlation with predicted VO_2Max of running performance among college women. Subsequently, it was agreed that the 6-minutes run test can be used instead of the 12-minutes run test more especially among untrained persons. In this study, the researcher decided to use Cooper's 12-minutes run test to estimate the subject VO_2Max.

To administer the Cooper's 12-minutes run test, a 400-meter track field was used and where there is none, subjects were taken to nearby school with standard track. The subjects run round the 400 meter track or measured course for 12-minutes and the number of laps cover in 12-minutes is multiplied by 400-meters and change to kilo-meters and recorded for each subject.

ii. Muscular Strength

Muscular strength is regarded as the symbol of fitness and the possession of superior muscular strength enable the person to carry out tasks involving these muscles without difficulties. However, the measurement of total body strength and endurance is very difficult since there are many muscle groups which need to be measured Gajere, (2005), Tukur (1995, Maud and Foster (1995), Jackson et'al (1999) Heyward (1998) stated that strength is measured correctly by determining the maximal force that a muscles or muscle groups can exert in a single effort once and only, or a number of repetitions within a specific period of time. To evaluate total body strength or endurance many tests must be conducted. This is because; there is no single test to evaluate total body muscle strength or endurance, because strength is not a general components but specific. Heyward (1998) suggested that the strength test battery should include a measure of abdominal, lower extremity strength.

According to Maud and Foster (1995), Heyward (1998), Pollock et'al (1984), McArdle et'al (1991) muscular strength can be measured by the following methods:-

a. Dynamometer
b. Tensiometer
c. One-repetition maximum
d. Constant resistant
e. Variable resistant
f. Free weight (barbells and dumbbells)

Strength is measured in units, pound or kilograms using handgrip dynamometer or cable tensiometer (Tukur 1995, Wilmore and Costill 1999, Heyward 1998, Maud and Foster

1995). They indicated that sometimes strength is also measured as a maximal amount of weight that can be lifted once by a muscle group throughout the range of motion.

According to Heyward (1998) grip strength is the commonly used measurement of muscular strength. This involves the subject squeezing the hand dynamometer and exerting a maximal force once and only once as the musculature contracts forcefully. The force exerted is recorded on the dial. Reliability coefficient had been reported in the 0.90s (Johnson and Nelson 1979, Tukur 1995). Nieman (1998) maintained that the tests developed to measure muscular strength and endurance use very sophisticated equipment and are costly. However, good result can be obtained with the use of common test such as push-ups, flexed arm hang, hand grip test and one repetition bench press test. The above finding is in consonance with Malina (2001) where he stated that correlations for indicators of functional strength (flexed arm hang, pull-ups, sit-ups leg lifts) are generally similar to those for static dynamometric and cable tensiometric measures. Nelson (1982) reported similar findings of superior performance of boys over girls in modified sit up over the age 6-17 years. He noticed that boys continue to improve through 17 years while girls level up and decrease performance after the age of 15 years.

Falk, Cotton, Lustig, Lauder, Yaaron and Ayalon (2001) in their findings pointed out that tracking the physical fitness components in boys and girls from the second to six grade uses the standing long jump and reported that it reflects explosive muscular strength. Falk et'al (2001) reported a correlation of 0.54-0.74 standing long jump has been used by many researchers to test explosive muscular strength of the lower extremities. Therefore, the researcher decided to use standing long jump in this study which test explosive muscular strength of the individual. Secondary school students need the local explosive muscular strength of the lower extremities to enable them

perform their daily physical activities like trekking to school, shooting football, jumping high jumping and many other physical activities.

To perform the standing long jump the subject stands at the take-off with feet parallel and behind the starting mark, bend the knees and swing the arms and jump with both feet forward as far as possible and land with both feet. Three trials are permitted and the best distance between the starting mark and the nearest heel upon landing is recorded in meters and score for the subject.

iii. Muscular Endurance

Devries (1980) is of the opinion that muscular endurance is probably the most important component of physical fitness in that it reflects the state of some of the physiological systems that are vital to the general health of an individual. He asserted that it is a major factor in most sports and in human performance.

Since muscular endurance is vital during participation, they need to be developed through rigorous physical activities. Muscular endurance is needed to maintain posture throughout the day. Foss and Keteyian (1998) defined muscular endurance as the ability or capacity of a muscle group to perform repeated contractions (isotonic, isokinetic, or eccentric) for an extended period of time. In another way round they viewed muscular endurance as the opposite of muscular fatigue (i.e., a muscle that fatigues rapidly has a low endurance capacity and vice versa). Thus among the factors that contribute to muscular fatigue, is the influence of type I and type II fiber distribution. Bucher and Wuest (2006) defined muscular endurance as the ability of a muscle or muscle group to exert force repeatedly. In other words it refers to the capacity of a muscle or muscle group to sustain a contractive state over a period of time.

Muscular strength and endurance are specific to each muscle or muscle group. That is, different muscles in the body can have different levels of strength and endurance. Moreover, muscles used more frequently are stronger and have greater endurance than muscles used less frequently. Somerville (2006) defined muscular endurance as the ability of a muscle or muscle group to perform repeated movements within a sub-maximal force for extended periods of time.

The importance of muscular strength and endurance in physical fitness cannot be overemphasized. Thus muscles contribute to strong bones, increased stamina, improved heart function, better sleep, increased metabolism, better posture and decreased risk of injury. Both muscular strength and endurance contribute to overall health. Improving strength and endurance contribute to a higher metabolism and decreased risk of injury as well as toned and firm muscles. This in turn increases your caloric burn both while at work and rest. Muscular endurance helps to maintain proper posture all day long (Rossi, 2011).

Moreover, Gardner (2008) stated that an individual with a moderate-to-high level of muscular strength and endurance will be able to perform everyday tasks such as lifting objects, carrying books and climbing stairs with ease. Muscular strength and endurance are extremely beneficial when participation in recreational activities. Individuals with poor fitness levels tend to tire more easily and are less effective in activities like hiking, running and playing tennis. Therefore, increasing your muscular strength and endurance will enhance your enjoyment of recreational sports by allowing you to achieve high levels of performance and to handle advanced techniques.

Increased muscular strength and endurance provides protection against injury as they help to promote and maintain good posture and appropriate body mechanizes when carrying out everyday activities like working, lifting, and carrying objects. Strengthening the muscles of the abdomen, hips, lower back and legs will help to support the back in prone and help prevent lower back pain (Rossi, 2011).

Developing muscular strength and endurance contributes to improved body composition and metabolic functioning. Strength training improves body composition by increasing muscles mass, thereby slanting the body composition ratio towards fat-free mass and away from fat. Building muscles through strength training also allows you to lose fat as metabolic rate is related to muscle mass (Gardner, 2008).

The more muscle mass you have, the higher your metabolic rate will be. A high metabolic rate means that a nutritionally sound diet combined with regular exercise will not lead to an increase in body fat and thus improve the level of one's physical fitness (ACSM, 2011). Muscular endurance and muscular strength and power are closely associated. It is also associated with the number of active capillaries within the working muscles. Some physiologists have classified muscular endurance, strength components as components of motor fitness (Wilmore and Costill 1999).

Muscular endurance is the ability of a muscle to repeat identical movement or certain pressures, or to maintain a certain degree of tension over a period of time Pollock et'al (1984), Devries (1980), Jackson et'al (1999). Devries (1980) further stated that muscular endurance reflects the condition of some physiological systems that are most important to the general health of the individual. This is supported by strong men having endurance than less strong.

Heyward (1998), Tukur (1995) stated that muscular endurance is the ability of a muscle or muscle groups to exert or maintain sub maximal force levels for extended period. They stressed that it is the repetition of sub maximal contraction or sub maximal holding time. This is the capacity to sustain repeated muscle actions, such as when performing sit-ups or push-ups or sustained fixed or static muscle action for an extended period of time such as in flexed arm hang. Muscular endurance is achieved by repetitive contractions of the muscle fibres involved. It is also determined by both muscular fitness and cardio-respiratory fitness.

This repetitive contraction needs a continuous supply of substrates (O_2, food nutrients) to produce energy, and muscle fibres with aerobic capacities are ideally suited for the job. The slow-twitch fibres and fast-twitch fibres have greater capacity for aerobic activity have more mitochondria and higher oxidative enzymes needed for the continuous supply of Adenosine triphostate (ATP) for extended period of effort. It is believed that the more slow-twitch fibres in the muscles, the greater the muscles oxidative capacity (Heyward 1998, Wilmore and Costill 1999). The longer a muscle can contract without fatigue and the greater the number of repetition by the muscle before fatigue, the higher the muscular endurance.

American College of Sports Medicine (ACSM) and other international organizations have established guidelines for comprehensive exercise programmes composed of aerobic, flexibility and resistance-exercise training. However, Hass, Mathew, Bary (2001) maintained and increasing lean body mass and improving muscular strength and endurance. They also believe that daily physical exertion and participation in exercise programmes incorporating endurance exercise and resistance training help to reduce the risk of several chronic diseases (e.g coronary heart disease, diabetes mellitus and osteoporosis).

Muscular endurance is specific to each muscle group (Maud and Foster 1995), therefore, suggested the use of many test if a complete evaluation of endurance as a components of health related physical fitness is to be made. There are three types of muscular endurance test (Maud and Foster 1995, Heyward 1998). Skinner, Baldini, Gardener (1990) indicated that each of these tests may be expressed in absolute (lifting the same load) and relative (lifting the same percent maximal voluntary contraction) terms. They added that absolute values correlate closely with strength, but relative values do not. The assessment of relative endurance can be made in isometric contraction.

In agreement with the types of muscular endurance test Johnson and Gajere (2005) suggested the use of relative endurance test which is based upon a proportional amount of the body weight since maximum strength is known to fluctuate and to be dependent upon many variables, but body weight is more constant. The three identified muscular endurance test are as follows:

i. Dynamic test of muscular endurance: - in this type of muscular endurance test the performer executes identical repetition of a movement through a designated distance and over an unlimited amount of time. The test is scored in terms of the number of correct executions completed. Examples of such test items include push-ups, sit-ups and barbell exercises with sub maximal loads.
ii. Repetition static test of muscular endurance: - the performer executes repetitions of force against a static measuring device, and the test is scored in terms of the number of times the performer registers a force equal to a certain percent either the maximum strength of the muscles involved or of body weight. An example would be the number of times the performer or

subject can squeeze hundred pounds or more on a hand grip dynamometer. The test is stopped when the performer or subject either fails to squeeze the prescribed load or when he fails behind the desire cadence.

iii. Time static test of local muscular endurance: the subject maintains one continues muscle contraction rather than a series of repetitive bouts and the test is scored in terms of the amount of time the weight was held. Example would be the flexed-arm hang test for girls (Maud and Foster 1995 in Gajere, 2005).

Tests of muscular endurance are practical for most schools and have been widely use in physical fitness testing programmes. Such test, however, differ from muscular strength test in that the scores were based on the number of repetition correctly executed or the length of time a set tension was maintained and not on the maximum amount of force exerted or weight lifted. Otinwa and Ogundare (1995), Tukur (1995), Owolabi (1993), Nwanko and Salawu (1995), Falk et'al (2001) uses different tests for muscular endurance and muscular strength.

Studies of muscular endurance have been reported. Seliger in Anderson (1978) in his studies of athletically trained youngersters aged fifteen years rural and urban children found that urban children show a superior physical fitness level than rural children.

Nelson (1982) pointed out the function of age, gender and body size characteristics on physical fitness performance discovered that boys show a better performance than girls, in sit-ups test. This finding is supported by Malina (2001), Otinwa and Ogundare (1995).

Research evidence has shown that boys performed better than their counterparts in muscular endurance test as stated by Maud and Foster (1995). They affirmed that

female fatigue was less with relative loads while boys fatigue with absolute loads. This assertion is supported with a similar research conducted by Nelson (1982) in which he stated that the function of gender, body size, age characteristics on physical fitness performance revealed that boys show better performance than girls in sit up test.

The above findings are in disagreement with the finding of Malina (2001) who discovered inconsistence sex differences in muscular endurance test. He also observed that childhood to adolescent muscular endurance ranges from low to moderately high.

Heyward (1998) stated that dynamic muscular endurance may be assessed by measuring the maximum number of repetition for each type callisthenic type of exercise (e.g. pull-ups, sit-ups and dips). Gajere (2005) reported reliability as high as 0.94. AAHPERD also reported a test retest reliability coefficient which range from 0.68 to 0.94. This suggests that the sit-ups test is an indicator of muscular endurance. Therefore, the bent-knee sit-up would be used for this study. The subjects will perform in pairs. Each member of the pair will perform after the other.

The performing subject will be told to lie on his back (supine lying) with fingers interlocked behind the head. The supported partner kneels beside the performer, holding his performance ankles to keep the feet in contact with the mat. The stopwatch will be started as the performing subject sits-up to touch his knee, with the elbow and back to the lying position. One point will be given each time the execution is property done or executed. The numbers of good performance in one minute will be recorded for each performer.

iv. FLEXIBILITY

The ability to move a body part around a joint is one of the most critical elements in keeping people moving independently. As implied earlier, one of the main benefits of flexibility is it improves movement proficiency. In addition, flexibility means increased range of motion, reduced muscle soreness, improved posture, reduced musculoskeletal injuries, increased relaxation, reduced neuromuscular tension and controlled spasticity. Being able to tie one's own shoes, reach a plate on a shelf over-head or bend down to pick up a dropped spoon means so much to the independence of every one of us (Idris, 2011).

Flexibility is considered as one of the necessities in physical fitness. Hayward (1998) stressed that it is the ability to move a joint or series of joints fluidly through the complete range of motion. Flexibility is limited by factors such as bonny structure of the joint and the size and strength of muscles, ligaments, and other connective tissues. Daily stretching exercises can greatly improve flexibility.

Hockey (1977) defined flexibility as the functional capacity of the joints to move through a full range of movement. Flexibility as a component of physical fitness is the ability of an individual to move the body and its parts through as wide a range of motion as possible without undue strain to the articulations and muscle attachment. Exercising for flexibility is an imperative component of any exercise program, especially for those whose disabilities are severe. Joints that do not move, including those in the spine, eventually become rigid and inflexible and the quality of life diminishes measurably.

Flexibility is an important area that needs to be developed because as a person ages, the muscles and tendons tend to shorten and the ligaments tend to become less resilient (Haruna, 2001). This situation according to him can lead to increased

stiffening and increase chances of muscular injury. It is not uncommon to hear people complaining of low back pain especially among adults. He further recommends that for the development and maintenance of fitness components calisthenics exercises involving static slow and steady movements, using the body's weight and force of gravity should be done.

Flexibility could be developed through calisthenics type of exercise like forward bend, alternate toe touch retching exercise. Klafs and Arnheim (1981) agreed that the following principles should be considered while training for flexibility:

i. Exercise programme should begin with adequate warm up activities.

ii. Exercise should be performed by moving through the full range of motion.

iii. Each exercise should be repeated, five times per training session.

iv. Each position should be held six to ten seconds.

v. Several graduals stretching exercise should be directed to all muscles and joints of the body.

An adequate amount of flexibility is necessary in all major joint of the body to avoid unwanted muscles pulls and strains; hence it should be developed in all individuals. Lack-of flexibility results in restricted joint movement, pain and increase potential for injury. Without sufficient degree of flexibility, the range of movement is limited. This may be disadvantageous when an activity requires a wide range of movement. Lack of flexibility in the back area and in the hamstrings is causes of low back pain, (Dikki, 1997).

In line with this statement, a programme of training like jogging does not only develop and maintain cardio-respiratory fitness with improvement in body

composition but also have an effect on other fitness components like flexibility, muscular strength and endurance to some extent (Haruna, 2001).

According to AAHPERD (1984) sit and reach test has been recommended over so many type of flexibility tests this is because the coefficient obtained in the test has general range between 0.80 and 0.90. It went further and stated that the measure has a logical validity in that one needs to have better extensibility in his low back, hip and posterior thigh in order to have better score in such test. The sit and reach test has a reliability of 0.70 and above.

Recent study carried out by Jackson and Baker (1986) as cited by Gajere (2005) have indicated that the sit and reach test seems to be invalid measure of flexibility in the hamstring, it is not necessary a valid measure of low back flexibility. In a similar vein Dikki (1992) affirmed a correlation coefficient of 0.77 in a vertical toe sit and reach test of lumber flexibility. Maud and Foster (1995) stated that the sit and reach test is extensively used in the assessment of flexibility of both adult and children population and extensive norms have been developed.

Heyward (1998), Maud and Foster (1995) identified two methods of assessing flexibility which include direct method and indirect methods. The direct methods include Leighton Flexometer, Standard Goniometer, the Inclinometer, Still Photograph and Radiograph. The indirect methods include Standard sit-and-reach test, Modified sit-and-reach test and modified schober test.

Indirect methods are appropriate for large scale screening or for documentation of change resulting from specific flexibility exercise training programmes. Indirect methods have the advantage of ease and speed of measurement and low cost of equipment. Many indirect methods test has been used to assess flexibility in various

joints. The most commonly used flexibility test according to Nieman (1998), Maud and Foster (1995) is the sit-and-reach test that is used to evaluate hamstring and low back flexibility. Lack of flexibility in these areas alone when accompanied by relative weakness in the abdominal muscles has frequently been cited as possible cause of low back pain.

AAHPERD (1994) stated that sit-and-reach test has been validated against several other types of flexibility test. The coefficient obtained has general range between 0.80 and 0.90. Also, the measure has a logical validity in that one most have good extensibility in the low back, hip and posterior thigh in order to achieved good score on the test item. It has a test reliability ranging from above 0.70 (AAHPERD 1984).

Heyward (1998) recommended using the standard sit-and-reach test to evaluate low back and hip flexibility. Although most exercise specialist assume that standard sit-and-reach test to be valid measurement of low back and hip flexibility. Recent studies conducted by Jackson and Baker (1986) in Jackson, Marrow, Hill and Dishman (1999), Heyward (1998), Maud and Foster (1995). However, have found that although the sit-and-reach test appeared to be invalid measure of flexibility in the hamstring area, it was not necessary a valid measure of low back flexibility. Maud and Foster (1995) stated that for both young and adult females, the sit-and-reach test correlated moderately well with passive hamstring flexibility, r=0.64 and r=0.70 respectively, but poorly with low back flexibility, r=0.28 and r=0.12. On the other hand for adult males, the sit-and-reach test correlation was r=0.89 for hamstring and r=0.59 for low back flexibility.

In another study conducted by Maud and Foster (1995), they used the standing toe-touch-test and find out that the test was positively related to trunk and hip flexion, it

correlated very poorly with vertebral flexion in males. The above findings correspond with Dikki (1992), in which he affirmed a correlation coefficient of 0.77 in the vertical to sit-and-reach test of Lumbar flexibility. The consistency of the instrument within individual rater was also reported by Dikki (1994) and by different raters Dikki et'al (2002) did not find significant difference between different ratings on the vertical to sit-and-reach test by the same rater. According to him, the rating positively correlated with each other and with the reference mea sure, also correlation coefficient ranging from 0.62 to 0.67 was reported by Verducci (1980).

Moreover, Maud and Foster (1995) confirmed that a more valid description of the sit-and-reach test would be that it assesses the flexibility of the posterior muscles, the hamstring and the lower middle and upper Para spinals and calf muscles. They further stated that tightness in any of these muscles can limit the subject's ability to reach forward. However, the tightness may be compensated for by one or more of the other muscles being tested, thereby resulting in a "normal" sit-and-reach test score. They also observed that factors such as limb and torso lengths have effects on the indirect measurement of flexibility. Anthropometric variables such as long trunk and arm measurement but short legs were at an advantage where as those with short trunk and arm measurement and long legs were at a disadvantage Maud and Foster (1995) also found that variation in head position has significant effect on sit-and-reach test. Although these effects are small, they emphasized the importance of exact test description and adherence to protocol.

Despite these problems, the sit-and-reach test is extensively utilizing in the assessment of flexibility in both adult and children populations, and extensive norms have been developed (Maud and Foster, 1995).

According to Heyward (1998) standard and modified sit-and-reach test scores indicated the individuals with proportionally longer arms than legs (lower finger to box distance) had significantly better scores on the standard sit-and-reach test than those with moderate or high finger-to-box distances, whereas the modified sit-and-reach test scores did not differ significantly among the three groups. He further stated that the modified sit-and-reach test was moderately related to criterion measures of hamstring flexibility and poorly related to low back flexibility. It appears that neither the standard nor modified sit-and-reach tests are very good for assessing low back flexibility.

Joint flexibility ranges dramatically from one person to another and from one joint to another, these differences can be attributed to factors that can be changed such as physical activity. Pattern and factors that cannot be changed such as genetic predisposition gender and age (Devries 1980, Nieman 1998, Heyward 1998, and Jackson et'al, 1999). But some researchers are of the opinion that habitual movement pattern and physical activity levels apparently are more important determinants of flexibility than age, gender and body type (Gajere, 2005).

Lack of physical activity is a major cause of inflexibility. It is well documented that inactive persons tend to be less flexible than active persons and that physical exercises and active lifestyle increases flexibility (Heyward 1998, Wilmore and Costill 1999, Powers and Howley 1997). Wilmore and Costill (1999) are of the view that flexibility is quickly lost during inactivity and it can be regained within a short period of time. Disuse due to lack of physical activity or immobilization, produces contracture and shortening of the tissues which in turn restrict joint mobility. In a contradictory result, Malina (2001) shows that active and inactive boys do not differ in sit-and-reach from 13-18 years of age. But other researchers such as Devries (1980), Nieman (1998) and

many other researchers maintained that flexibility can be improved through stretching physical activity. Powers and Howley (1997) identified two general techniques in use today for the improvement of flexibility. These are (1) static stretching (referred to as ballistic stretching if movement are not controlled). Although the two techniques result in an improvement in flexibility, static stretching is considered to be better or superior over dynamic stretching. Nieman (1998) recommended a minimum of three sessions a week in stretched position held for ten-thirty seconds, three to five times for each major joint. In another study, Powers and Hawley (1997) pointed out that thirty minutes of static stretching exercises performed twice per week will improve flexibility within five weeks.

It is also recommended that flexibility exercises should start with warm up activities. It is believed that as a matter of safety and effectiveness, an active aerobic warm-up should precede vigorous stretching session. Muscles that are warm from jogging, cycling, or other aerobic exercises fan stretch further and more safely thereby improve range of motion. Heyward (1998) reported that warming the joint (113^{o}f) produces 20% increase in range of motion, whereas cooling the joint (65^{o}f) result in a 10 to 20% decreases in flexibility.

It is a known fact that flexibility progressively decreases with aging because of the changes in the elasticity of the soft tissue and decrease in the physical activity level. Gajere (2005) stated that for the most part of humans becomes progressively more flexible from childhood to adolescence and then become progressively less flexible with aging. This assertion was supported by Heyward (1998) and Nieman (1998). In another contrasting result of inter-age correlation for flexibility of the lower back (sit-and-reach) are low to moderate between childhood and mid-adolescence ranging from 0.26 to 0.52 (Branta et'al 1984 in Malina 2001). Short-term tracking from 9-12 years

was a bit higher, 0.67 and 0.72 in boys and girls respectively (Marshall et'al 1998 in Malina 2001). A similar correlation also indicated for boys over the interval of 12-17 years 0.57 (Malina 2001).

After studying boys and girls of comparable ages, a number of investigators have concluded that females generally are more flexible than males (Nelson 1982, Pizzaro 1982, Otinwa and Ogundare 1995, Heyward 1998, Jackson et'al 1999 and Wilmore and Costill 1999). Heyward (1998) further explains that the greater flexibility in females is usually attributed to gender differences in pelvic structure and to hormones that affects the laxity of connective tissues. However, the effects of gender on range of motion appear to be joint-and motion specific. Females tend to have more hip flexion and spinal lateral flexion compared to males of the same age. On the other hand, males have greater range of motion in hip extension and spinal flexion and extension in the thoracic lumber region (Heyward 1998).

Flexibility is a specific characteristic and not a general characteristic. Many devices for direct assessment of flexibility have been used, including sophisticated devices which cost a lot of money and difficult to operate by an average person. The use of these sophisticated devices like electrogoniometers and radiogoniometers provide the best method for determining joint flexibility.

However, ACSM (1995) recommended the sit-and-reach test which is widely used as field tests and serves as good indicator of flexibility. The researcher decided to use sit-and-reach test for this study. This test measures muscles length of both the leg and back. Tukur (1995) stressed that since these are the muscle groups in which the average person is most likely to experience pain and which are most often used in work and recreational activities, this test has relevance to many people. To perform

sit-and-reach test, the sit and reach box is required. After a warm-up, the subject seat on the floor with feet against the foot print, with knees kept straight, the subject reaches as far as possible with two hands overlapped. The most distance reach is recorded in centimeters is recorded as the measured of flexibility (Dikki 1992 and Heyward 1998).

Flexibility tests are tests used in physical fitness as means of determining potentials in certain sports, determining achievement and skills, to diagnose the extent of injury sustained, or cause of poor posture.

v. Body Fat Percent or Body Compositions

In physical fitness, body composition is defined as the percentage of fat, muscle, and bone in the body. Usually it's expressed as a ratio of lean mass to fatty mass. Lean mass includes muscle, bone, skin, internal organs and body water. Fatty mass is mostly composed of body fat as well as internal essential fat surrounding organs. Body composition will typically be displayed as either a percentage of fat (body fat percentage or % fat) or as a percentage of lean body mass (Matt, 2009).

There are several different procedures whereby body composition can be determined. The most common techniques according to Hoeger (1988) are;

i. Hydrostatic or underwater weighing.
ii. Electrical impedance;
iii. Skin fold thickness; and
iv. Girth Measurement

He further added that hydrostatic weighing is the most accurate technique available to assess body composition, but it also requires a considerable amount of time, skill, space, equipment and complex procedures.

Body weight is the part of our general physical condition that received particular interest in research over the last ten years. Over the years, the amount of body fat, extend of muscular development and dimension of body structures are factors used in evaluating physique and body type. Body composition is often referred to as the lean muscle and the fat weight, which all together equal to the body weight (Mainsa, 2008). Edgerton (1976) is the opinion that body composition is largely dependent on dietary and exercise build, sex and genetic background to determine the distribution of fat deposit in the body. He stressed that male and female humans do not deposit fat in the position at the same percentage. He further indicated that exercise is an important means of controlling body fat and the overall body builds. This however, shows that exercise could redistribute the body weight by making the muscles stronger.

Excessive fatness develops gradually during adulthood. Scientific information so far available, especially from the Western world reveals that the average 35 years old male gains between 0.2 and 0.8kg of fat each year until the sixth decade of life in spite of decreased food intake, (Haruna, 1994). This means that body fat should be maintained at a reasonable and acceptance level so as to avoid coronary heart diseases or deficiencies of fat-soluble vitamins. A nation that has a high level of sedentary life and a high level of caloric foods may likely have a large percentage of adults and children with too much fat, and many are over fat to such an extent that they may be classified as obese. Fox and Mathews (1981) stated that active people possess considerably less total body fat and are less prone to cardio-vascular diseases than

their less active counterparts because the world is becoming more and more obese by body image, created by undesirable body weight, and it becomes necessary to provide scientific explanations in respect to body composition.

Venkateswarlu (1987) is of the opinion that obesity begins/starts early in childhood; and if this happens, the chances for adult obesity will be three times greater than children of normal body weight. Meanwhile, research evidence suggests that overfeeding early in life, more especially during infancy causes the generation of abnormally large number adipose tissue cells, which may likely persist throughout life. Strauss (1984) revealed that body fat is stored around the main organs of the body and within muscles, but half is stored in the layer first below the skin, making over fatness a visible phenomenon.

Measurement of body composition is very important this is because obesity has become a worldwide problem. Obesity is associated with impairment of cardiac function due to an increase in heart's mechanical work, left ventricular dysfunction, hypertension, diabetes, renal diseases, gall bladder diseases, and pulmonary respiratory disease could also serve as predisposing factors (Haruna, 1994). Wilmore (1977) asserted that life insurance statistics tells us that an individual with $15^{1/2}$ under weight has the best chance of surviving a heart attack.

McArdle, Katch and Katch (1981) stated that the evaluation of body composition permits quantification of the major structural components of the body such as muscle, bone and fat. They further asserted the general procedure for the evaluation of body composition as:

- Direct method- This entails the chemical analysis of the animal carcass and human cadaver and

- Indirect method- This denotes hydrostatic weight, skin folds and air circumference measurement.
- Skin fold measurement: Skin fold measurement was done on the right side of the body to the nearest centimeter (cm) using the Lange skin fold caliper with an inter-jaw pressure of 10g/mm2 over the full range of opening. For the purpose of this study, five skin fold measurement sites were taken (triceps, sub scapular, suprailiac, thigh and abdomen). The measurements were done according to the prescription of Heywood and Stalarczyk (1996). Two measurements were taken at each site and the average recorded. The skin of subject was cleaned to avoid any measurement error. The caliper is to be held at 90 degrees to the surface of the skin fold site and allowed to stabilize for few seconds after which the reading will be taken.
- Triceps: The midpoint between the acromion and olecromion process on surface of the arm was measured and marked. With the subjects' arm relaxed, the skin fold about 1cm above the midpoint was grasped taking care to exclude muscle from the grasp. The skin fold caliper was applied to measure the thickness of the skin fold unit of measurement.
- Sub scapular: The site is inferior to the inferior angle of the scapula. The subject stands comfortably erect, with the upper extremities relaxed at the sides of the body. To locate the site the investigator will palpate the scapular, running the fingers inferiorly and laterally along the vertebral boarder until the inferior angle is identified. The calipers jaw is now raising the fold, and the thickness is recorded to the nearest 0.1cm.
- Suprailiac: The suprailiac skin fold was measured on the mid-auxiliary line immediately superior to the iliac crest. The subject stands with feet together

and in an erect position arm hanging by the sides. An oblique skin fold is grasped just posterior to the mid-auxiliary line following the natural cleavage line of the skin. The caliper jaws were applied about 1cm from fingers holding the skin fold and the thickness was recorded to the nearest 0.1cm.

- Thigh: The thigh skin fold site is located in the middle line of the anterior aspect of the thigh, midway between the inguinal crease and the proximal boarder of the patella. The subject flexes the hip to assist location of the inguinal crease. The thickness of a vertical fold is measured while the subject stands. The body weight is shifted to the other foot while on the leg on the side of the measurement is relaxed with the knee slightly flexed and feet flat on the floor. The caliper jaws are applied about 1cm distal to the fingers holding the fold the thickness of the fold is recorded to the nearest 0.1cm.
- Abdomen: The subjects stand erect, relaxes the abdominal wall musculature as much as possible. Body should be distributed on both feet. Select a site 3cm lateral to the midpoint of the limbilicus and 1cm inferior of umbilicus. Raise a horizontal skin fold with the left hand and measured the thickness to the nearest 0.1cm.

The average values was recorded and used for regression equations of Jackson and Pollock (1978) and was used to compute the body densities for the adolescents. The equation of Siri, and Heyward, (2002) was used to estimate the percent body fat from their body densities. Body Mass Index (BMI) derived as ratio of subject's body mass (in kilograms to stature (in meters squared).

In many instances, a change in body weight is a simple increase or decrease in body fitness. However, this is accepted only when the change is measured over a period of

time and then only if there has not been any case of illness, for example dehydration or changes in muscle mass as a result of training or detraining programme. Physically active people possess less total body fat than less active people. Differences in performance do exist between males and females, this according to Wilmore and Costill (1999), can be due to greater percentage of fat contained in the female body. Heyward (1998) stated that healthy adult body fat percentages fall under 15 percent for male and 23 percent for female. Although large quantities of body fat are undesirable for good health and fitness, there is not an optimum level of body fat or body weight for a particular individual. Optimum level varies from person to person and is greatly influenced by a variety of genetic factors (McArdle et'al 1991 in Gajere, 2005). It is of paramount importance to determining the percent body fat of the individual by identifying cases of obesity, or underweight which can be disadvantage to the students health related fitness performance.

The skin fold is based on the assumption that 50% of the body fat is subcutaneous (Skinner et'al 1990) they indicated that correlation coefficient of 0.70 to 0.84 had been reported between Skin fold, and hydrostatic weighing in different populations. In a similar vein McArdle (1991) stated that for young adults approximately one-half of the body's fat is subcutaneous fat and the reminder internal organ fat. Thus, the subcutaneous skin fat fold scores reflect a greater total percent body fat.

The above result corresponds with Willett et' al (1999) who reported that measurement of skin fold thickness can provide a reasonable assessment of body fat, especially if taken at multiple sites. They supplied additional information on the location of the fat; they recommend skin fold fat measurement to be useful to specialist in body composition and for research purposes. The sum of measurement from three or four skin fold sites are recommended by Heyward (1998), Maud and

Foster (1995) and Jackson et' al (1999), the measurement is to be taken from chest abdomen and thigh for men and triceps, thigh and supraillias for women. AAHPERD (1984), used two skin fold sites (Triceps and subscapular) to evaluate the fatness level of school boys and girls and concluded that they are highly related to total percent body fat.

Gwani (1996) reported in his study that skin fold measurement and underwater weight of boys and girls aged 9-16 years using just two skin folds (Triceps and subscapular). He reported a co-relation coeffeicient between hydrostatic weighing and the skin fold measurement to be from 0.81 to 0.95.

Studies suggesting the relationship between physical activity and percent body fat or skin fold thickness and body weight are numerous. Kaidal (1989), McArdle (1991), Haruna (1994), Heyward (1998); and Jackson et' al (1999) reported findings in which percent body fat were found to decrease significantly with various training programmes of different duration and instances. However, in a contrasting report Malina (2001) discovered that no difference in four skin fold between active and inactive boys aged 13-18 years.

In a related studies Shifan et' al (2002) in a Longitudinal Analysis of changes in indices of obesity from age 8-18 years, measure six skin fold sites observed that mean percent body fat decreased with age in males, increase with age in females and was constantly greater in females than males, the sex differences widen with age. According to Bedogni, Iugeitti, Ferrari, Malvotti, Poli, Bernasconi and Battistini (2003) the age, weight, height, and body mass index of children were similar in males and females. However, 4 skin fold weight was higher and fat free mass lower in females than males. They suggested that the use of 4 skin fold may increase the

sensitivity of a screening procedure for excess adiposity in children. Malina (2001) also reported an increase of body fatness as age increases. However, the skin fold measurement would be used for this study to estimate fat content.

Gwani (1996) and Tukur (1995) reported procedures which could be used on subjects of both sexes and all ages but different equations were used for computation of body density for men, women, boys, and girls. Skin folds have measured on four sites triceps, biceps, sub-scapular and supra-cliac.

The conversion of the skin folds measurement to an estimate of body density was arrived at by adding all the four skin folds and substituted in one of the following equations:

1. Boys: body density = 1.1533-0.0643 $\log_{10}$ (total skin folds).
2. Girls: body density = 1.1369-0.598 $\log_{10}$ (total skin fold) (Gwani 1996).

The body density is then converted to estimate of percentage fat. The equation used in Heyward (1998) and is the same for all types of subjects. Percentage fat = 4.5 Regression equation used for determining percent body fat although population specific provide a good correlation as compared with other method or percent body fat estimate.

Therefore, because of cost, time, and complexity of test procedures, the researcher prefer the use of anthropometric measurement techniques that correlate quite well with hydrostatic weighing. These techniques, primarily skin fold thickness and girth measurements, provide a quick, simple and inexpensive estimate of body composition.

2.4 Exercises and Physical Fitness

When one exercise vigorously, some of the most noticeable changes are deep breathing, profuse sweating, and throbbing sensation in your head and of course, a heavy pounding in your chest. Other changes such as increased rate of metabolism and increased size of the capillaries are not so obvious. All these adjustment are called immediate or acute effect of exercise (Folaloiyo, (1989).

Exercise can simply be defined as exertion of muscles for the purpose of total investigation of the body system to keep fit. Baba (2000) viewed exercise as the use of any part of the body or mind so as to strengthen and improve it.

The level of physical fitness can be influenced by regular, systematic exercise. Moderate activity will maintain the individual at a level that is usually adequate to handle ordinary stress. If the fitness level is to be improved, however, it is necessary to participate in more intensive exercise that overload the physiological systems and thus promote change. Idris (2003) defined exercise as an activity that results in contraction of muscle. The term is usually used in reference to any activity that promotes physical fitness. Although muscle contraction is the common element of all forms of many other organs and systems are affected, for example, the heart and lungs. Many people also find that regular exercise enhances their sense of mental well- being along with their general physical health and increase skill or endurance in sport or to restore muscle heath after illness, injury or birth defect.

Toriola and Adedoja (1983) viewed physical activity as an integral component of normal development of children that affect motor performance. Many people are becoming aware and appreciating the benefits of exercises for example. Venkateswarlu, Gamba (1997) asserted that exercise improved and strengthened the

Cardio-Vascular system, maintain better muscle tone, maintain body weight, improved posture promoted sleep and relaxation, increased longevity, slowed down ageing process and improve general quality of life. Chado (1991) on the other hand was with the opinion that as physical exercise is being executed, muscle volume increases, heart rate is stepped up, the tracing recorded by electro cardiograph alters, and the speed and volume of respiration changes. He concluded that physical exercise produced noticeable effects on the system and practically everything else in the human body. Therefore, participation in regular physical exercise and sports lead to good physical fitness.

Karpovich and Sinning (1971) found children to be more active than adults because they need exercise for their proper development. The Michigan State of Medical Society indicated that the so-called stigmata of aging might be postponed for a number of years by the institution of planned physical education and exercise, Eta (1999) said that Hippocrates, the Farther of Medicine was credited with the statement that exercise strengthens, while inactivity wastes.

In the light of this, Udoh (1982) drew the following conclusions:-

i. Regular Physical exercise played a significant role in the prevention of obesity.
ii. Physical exercise improved muscle tone, helped the body to respond to the demand of living and preserve a more desirable appearance. In other words, regular exercise helped in the preservation of the physical characteristics of youth and delay of the onset of the stigmata of aging. Exercise generally influences lifespan.

iii. Regular exercise appeared to be an important factor, which provides some degree of resistance to the vascular degenerative characterize of coronary heart among heart diseases.

iv. Regular exercise conditions the body and keeps the individual in peak form to be able to combat the emergencies of daily living more effectively. It is an important factor in the preservation of health and in the avoidance of disability and perhaps even premature death.

Andrew (1998) contended that a continuation in physical activity throughout adult life is able to offer positive protective function in loading off the degenerative illness of cardiovascular, alimentary, respiratory and muscular system, which is prevalent in modern society.

People have common misconception that hardening of the arteries (atherosclerosis), which causes heart attack, started at about the age of 40 years. Thus, this is not always true Strong (1999) stated that many people believe so but the truth is atherosclerosis starts as early childhood, and is already evident by the time a person reaches the age of 20 years". Fatty streaks can be demonstrated in teenagers (AHA, 1997). This process of atherosclerosis begins in most people during childhood and the teenage years, and worsens, as they get older. It is expected, and it has been confirmed, that age has a strong and consistent association with atherosclerotic lesions (Samaila, 2008). A recent study looking at the adolescents and young adults found that in 2876 autopsies of accident victim's age 15-34 years fatty streaks were seen in the aorta in 99.93%, and atherosclerosis was already evident in the heart arteries in 50% of the teenagers 15-19 years old.

Montoye (1986) is of the opinion that; in the coronary arteries, fatty streaks are rare before age 10 years but are frequent thereafter. Some studies have confirmed that

teenagers can have the beginning of CHD (Baker & Christenbury, 2003 in Samaila 2008).

Risk factors in children are more prevalent in countries which incidence of CHD in adult so high. Even within a single country the presence of risk factors is correlated with the CHD mortality rate of different region. In general, risk factors in children are high if their parents' risk factors are also high or if a parent died from CHD at a young age (Farquhar, 2000).

Wilmore et al., (1982) found out from their study on the prevalence of CHD risk factors in 13-15 years, old boys that prevalence of elevated serum cholesterol was low (7.1%), (14.6%) had low levels of HDL cholesterol, 13.3% had elevated triglyceride levels 13.0% and 4.9% had either or both systolic and diastolic hypertension, respectively, and 14.9% were obese, 1.3% were diabetic, 6.5% had deviations from normal in their ECG, and 18.8% had low VO_2max values 35% of the population exhibited 2,3,and 4 risk factors respectively. Only 29.9% of the population was free from CHD risk factors. The fit group had lower cholesterol and relative body fat levels than did the less ft group. Wilmore et al., (1982), concluded that from their findings those CHD risk factors can be identified in a relatively young population.

Cardiovascular risk factors, i.e. high plasma LDL-/HDL-cholesterol ratio, hypertension, smoking abdominal obesity, physical inactivity and high fat intake will not have the same on the morbidity, mortality of children and youth as in adults. However, the presence of these risk factors, especially when clustered as in obese child could lead, over a period of many years to the development of CHD. Such concern would appear especially relevant if CHD risk factors track reasonably well during childhood and adolescence (Samaila, 2008).

Since clustering of factors is evident in childhood and persists into adulthood, the presence of multiple risk factors could indicate the acceleration of atherosclerosis in young people (Berenson et al., 1998 in Samaila 2008). The risk factors of coronary heart diseases (CHD) usually found in children or adolescence include; Blood Pressure, Hypertension, High Blood Cholesterol, (Hypercholesterolemia), Obesity/Overweight, Hyperlipidemia, Physical Inactivity, Family History and Diabetes.

2.5 Physical fitness of active versus inactive persons

A physically fit person, according to Emiola (1982) is one who can efficiently handle his or her daily tasks without fatigue so as to have energy for family, hobbies, and leisure time activities and a physical reserve in case of emergencies. According to Mainsa (2008), the physically active person shows better adaptability to stress, less neuro-muscular tension, and less fatigability. Active individuals do not tend to become absolute and relatively over weight, have lower blood pressure, are stronger and more flexible, and have greater breathing capacity and lower pulse rate. Meanwhile it has been observed that physically active lifestyle tend to improve the function of an individual and makes him a functional member in the society

Physically active people possess less total body fat than less active people. Differences in performance do exist between males and females, this according to Wilmore and Costill (1999), can be due to greater percentage of fat contained in the female body. Heyward (1998) stated that healthy adult body fat percentages fall under 15 percent for male and 23 percent for female. Although large quantities of body fat are undesirable for good health and fitness, there is not an optimum level of body fat or body weight for a particular individual. Optimum level varies from person to

person and is greatly influenced by a variety of genetic factors (McArdle et'al 1991). It is of paramount importance to determining the percent body fat of the individual by identifying cases of obesity, or underweight which can be disadvantage to the students health related fitness performance.

2.6 Summary

Physical fitness was conceptualized as the ability of an individual to have enough competence to meet daily responsibilities and still have reserve energy to meet other eventualities of the day without undue fatigue. It is also referred to as a quality of life comprises two different components these are performance related components or skill-related components, and health related components which is the main focus of this study.

The health related components of physical fitness consists of elements like body composition, cardio respiratory endurance, flexibility, muscular strength and muscular endurance.

Meanwhile it has been observed that physically active lifestyle tend to improve the function of an individual and makes him a functional member in the society. Physical fitness can only be developed and maintained through physical exercises. Equally it protects against hypokenetic diseases associated with sedentary lifestyle resulted from advances in modern technology. It has been noted that the level of physical fitness can be influenced by regular, systematic exercise, and moderate physical exercises will maintain the individual at a level that is usually adequate to handle ordinary stress.

Similar researches has been conducted in different organizations like schools, military etc to assess the physical fitness status of their members and it has been observed that there is no single test batteries designed mainly for these components.

CHAPTER THRE

RESEARCH METHODOLOGY

3.1 Introduction

The purpose o this study was to assess the physical fitness status of public and private junior secondary school students in Katsina State. This chapter presents the method used in carrying out the research. Moreover, it is organized to cover the following:

Population, research design, study conditions, testing procedures, selection of test items and justification, sampling and sampling techniques, research assistants and statistical techniques.

3.2 Research Design

In order to carry out this study on the assessment of physical fitness status of public and private junior secondary school students in Katsina State, the Ex-Post-Facto research design was used. This is non experimental research using conditions in which no independent variable was manipulated. It was used to find out the relationship that exists, effects that are evident, opinions that are held and trends that are developing on a group of people under study by collecting and analyzing data from a sample considered to be representatives of the entire group (Sambo, 2005; Ali, 2006). The information required for the study already exists with the respondents and was readily available through the use of comparative assessment of students' fitness status.

3.3 Population

The population of this study consisted of all Junior Secondary school Students (JSS) of both public and private secondary schools in Katsina State.

The total number of public Junior Secondary Schools as at the time of this study was Two Hundred and Eighty Five (285).There are One hundred and twenty Seven Thousand and Sixty Three (127,063) JSS students in public schools while Thirty nine thousand and Eighty Seven (39,087) JSS students in private secondary schools, and this makes up a total number of One Hundred and Sixty Six thousand, One Hundred and Fifty (166,150) JSS students in both public and private secondary schools in Katsina State (Katsina State Ministry of Education, 2010) This is as shown in Table 3:1

TABLE 3:1 Enrolment of Students of Public and Private Junior Secondary Schools According to Educational Zones.

EDUCATIONAL ZONES	PUBLIC SHOOLS	PRIVATE SCHOOLS
Dutsin-Ma	17,165	4816
Kankia	13,024	2895
Daura	16,249	5025
Mani	10,189	2632
Katsina	34,833	15576
Funtua	20,245	4637
Malumfashi	15,358	3506

TOTAL	**127,063**	**39,087**

3.4 Sampling and Sampling Technique

A total sample of two hundred and forty (240) junior secondary school students across the seven (7) educational zones of Katsina State Ministry of Education were selected for the study through random sampling by dip, pick, record and return method. The school names of each educational zone were written on a paper differently and dropped in a container and one picked at a time and recorded. The paper was refolded and returned to the container, each occasion a school was picked until two schools required for each educational zone were recorded, and this is to keep the number the same for all the selections and to ensure equal opportunity for all the schools in each educational zone (Sambo, 2005).

From this number one hundred and twenty (120) were selected from public schools and the same number one hundred and twenty (120) from private schools. Out of each one hundred and twenty (120) subjects sixty (60) were males and the other sixty (60) were females. This selection was done through random sampling procedure in which two schools were randomly selected in each educational zone. This type of selection is supported by Ndagi (1999), Sedhu (2002), Nwana (2005) and Sambo (2008) in which they stated that in random sampling, every element in the population has an equal probability of being selected. This implies that no element of the population has been omitted deliberately except by chance.

Katsina State has seven (7) educational zones. The zones are Katsina, Daura, Mani, Kankia, Dutsin-Ma, Malumfashi and Funtua educational zones. Four educational

zones were randomly selected for the study and it is in accordance with Sambo (2008), Nwana (2005) and Ndagi (1999) who both stated that "a sample is a random sample if all the elements of the population from which the sample is drawn have an equal likely chance of being included in the sample".

The sample students used for schools were one hundred and twenty (120) students. The samples were selected through simple random sampling procedure in which the students were arranged according to their level, i.e. JSS I, II and III while in each level ten (10) students were selected. In JSS I ten (10) students were selected out of which five (5) are males and five (5) are females. In JSS II ten (10) students were selected out of which five (5) were males and five (5) were females while in JSS III a total number of ten (10) students were selected out of which five (5) were males and five (5) were females Ndagi (1999) stated that stratified random sampling is the process of dividing a population into strata or sub- populations. After the population has been divided into strata, samples are selected randomly but independently from each stratum, and an estimate of the parameter is computed over all strata. Stratification allows variability of elements selected within each group stratum to be more homogeneous than is the variability of elements between strata.

3.5 Testing Procedures

The subjects selected for the study were assumed to be healthy**,** before the commencement of the test also informed consent form was given to the students which was filled and returned to the researcher. The researcher explained in detail and demonstrated each test item to the students before the commencement of the activity.

The researcher allowed only three test items for each student per day for three days in a week i.e. (Monday, Wednesday and Friday) Wilmore (1983) stated that American

college of sports medicine recommended at least, three sessions of training per week. The timing of the exercise session was necessary to ensure students adherence to the programme. Each session was preceded by a 10-15 minutes warm-up exercise and lasted for thirty minutes.

The following sections also give description of the instrument and techniques to be used in obtaining the data.

3.5.1 Instrument and Techniques Used to Obtain Data

The American Alliance for Health, Physical Education, Recreation and Dance AAHPERD (1985) stated that physical fitness test battery can be administered to ascertain the physical fitness level of the students. The test items consisted of

- Flexed knee sit up- To assess abdominal muscle endurance.
- Coopers 12 minutes run/walk- To test cardio-respiratory endurance.
- Sit and reach- To test trunk flexibility.
- Standing Broad jump- To measure explosive power of the leg.
- Push- ups- To measure muscular strength of the arms.
- Body Fat %- To estimate different components of the body fat compositions.

1 Height

Instrument: Height scale marked against classroom wall and graduated to the nearest 0.5cm and a ruler.

Technique: Subjects stood backing the marked wall bare footed with feet together and buttocks touching the wall. The arm and shoulder kept relaxed. The subjects head was

held in such a way that lower border of the orbit will fall horizontal at a certain point on the scale. The ruler was slide to contact the head and the point on the scale measurement was taken to the nearest centimeter.

2. The age of the subjects were obtained from their birth certificate in their school files.

3 Body Weight: Hanson's weighing scale was used to take the body weight of the subjects.

Instrument: Bathroom scale (Hana Model)

Technique: Subjects stood on the weighing scale bare footed and with minimal clothing (underwear). The subject stood erect, with the feet together and arms dropped by the side in a relaxed manner, measurement was taken and recorded to the nearest kilogram.

4 Flexed knee sit-up (To assess Abdominal Muscle Endurance).

Instruments: - Stopwatch (Quartz), mats, and supporters.

Technique:-The subjects will perform in pairs. Each member of the pair will perform after the other. The performing subject will be told to lie on his back (supine lying) with fingers interlocked behind the head. The supported partner kneels beside the performer, holding his performance ankles to keep the feet in contact with the mat. The stopwatch will be started as the performing subject sits-up to touch his knee, with the elbow and back to the lying position. One point will be given each time the execution is property done or executed. The numbers of good performance in one minute will be recorded for each performer.

5 .**Coopers 12 Minutes Run/Walk (To Test Cardio Respiratory Endurance).**

Materials: Stopwatch (Quartz) and running tracks.

Techniques A 400 meter standard tracks will be used for this test. Before starting the race, subjects will be informed that they could either run or walk. Subjects stood behind

the starting line of 400m. At the signal "go" the stopwatch will be started as they began to run/walk. The subjects will run in groups of 5 according to year group and sex in order to avoid confusions. When the l2minutes expire, the whistle will be blown and everyone stop where they are. The number of times the subjects run around the track will be counted at the end of the 12 minutes. The distance covered by each subject will then be converted to kilometers and recorded against his or her name.

In order to have hitch-free test the researcher made use of all undergraduates students of Federal College of Education, Katsina, two lecturers from the department of physical and health education, teachers of the selected secondary schools. These will serve as research assistants and each one is assigned to take care of a particular group and record the number of rounds he/she covered.

6 **Sit and Reach** (To Test the Trunk Flexibility) this test will be used to measure the flexibility of the lower back and upper leg area. The test is important in minimizing lower back problems. The score is the distance in inches, reached on a yardstick (Winnick and Short, 1986).

Equipment: A specially designed box with a grid (calibrated in centimeters) to measure the length of one's reach was used. The grid ranges from o to 40 centimeters with the 23-centimeters line at the edge of the box (the point at which the participant's feet contact the apparatus) (Winnick and Short, 1986).

Technique: The sit and reach box was placed against a wall. Subject assumes a sitting position and places soles of the feet flat against the side of the box. Subject's legs were fully extended and one hand placed on top of the other. The subject was then asked to place the hands on top of the box (palm down) and slowly reach as far as they can along the grid as possible. A partner was asked to make sure the subjects legs remained straight throughout the test by lightly holding down the subject's knees. The tester makes sure

that the maximum reach was held for a second before recording. Each subject was given three trials on the site and reach test and the average of two trials was used as a criterion score.

7. Standing Broad Jump (To Measure Explosive Power of the Leg).

Materials: Floor Space and measuring-tape.

Technique: Subjects were asked to stand behind a restraining line, feet apart to get ready to jump; the examinee swings the arms backward and bends the knees to enable proper take-off. Measurement was taken from the back of the heel at landing with the zero end of the tape to take-off mark where the reading was done. Three trials will be allowed for each subject. The distance to the best trial was recorded to the nearest one metre.

8. **Push-ups** (To Measure Muscular Strength)

Materials: Floor

Technique: The subjects will be asked to lie down flat on the floor facing down, the hands should be just outside the shoulders, the back and legs straight, and the toes tucked under. Then lower the body until the upper arm is parallel to the floor or the elbow is bent at 90 degrees. The rhythm should be approximately one push-up every three seconds. A push-up is scored each time the body is lowered to the floor and pushed up. The score is the correct numbers of push-ups a subject perform within one minute.

9. **Skinfold Measurement** (To Estimates Different Components of the Body Fat Composition).

Material: A skin fold calipers (Lange Skin fold caliper by Cambridge Scientific Industries. Cambridge, Maryland).

Technique: The sites of the measurement involved the thigh skin folds and scapular skin folds. The skin folds in these sites was held with the thumb and index finger and also held with the jaws of the caliper approximately about 1cm from the thumb and finger. The total value derived from the caliper was then recorded in millimeters (mm). The right side of the body was used for the measurement (Hoeger, 1988).

3.6 Research Assistants

A total of fifteen (15) research assistants were used for this study and they consist of five physical and health education teachers of Federal College of Education (FCE) Katsina and ten Undergraduate students who are currently undergoing their degree programme in the department of physical and health education.

An interaction session was held with the research assistants to familiarize them about the test procedures which include how to keep the time of the subjects and other test procedures. They were placed in positions where they can see the subjects very well and record their performances accurately. Thus, the team competed the testing in one time block and uniform testing procedure was adopted.

3.7 Study Conditions

The tests were conducted on the field of the same measurement so as to ensure equal study conditions among the subjects; also the researcher advised the subjects to take their meals an hour or two before the commencement of the tests.

i. The subjects were informed about the purpose and reasons for each test items before the real commencement of the test.
ii. 4pm-6pm was earmarked for the tests; this is because it was assumed that this time range was more convenient for physical activities.

iii. To ensure a hitch-free test, subjects were asked to put on their sport outfit.

The researcher addressed the subjects selected for the test and a consent form was given to the parents through their respective children in different schools which were returned to the researcher.

3.8 Selection of Test Items and Justification

The study was conducted to use flexed knee sit-up for muscle endurance, Cooper's 12 minutes run/walk test for cardio-respiratory endurance, sit and reach for trunk flexibility, standing broad jump to measure explosive power of the legs , push ups for muscular strength of the arms, skin fold measurement for body composition or percent body fat. The test items were selected because of their ease in administration, cost, and time and also ease in assessing individual health related fitness status (Gajere, 2005).

The flexed knee sit-up was used to determine muscle endurance as used by many researchers like Johnson and Nelson (1979) who reported a reliability of 0.94 as cited by Gajere (2005). Gwani (1986) stated that Cooper's 12 minutes run/walk test has been used as an indicator of cardio respiratory fitness. He asserted the validity of some selected laboratory test and reported that 12 minutes run/walk test correlate as high as 0.91.This indicates that the 12 minutes run/walk test is a good measure of cardio respiratory fitness.

Sit and reach has been used as an indicator of flexibility as reported by many researchers, like Jonson and Nelson (1979) who reported a reliability of 0.94 and an objectivity score of 0.99 when using sit and reach test for measuring flexibility as cited by (Gajere, 2005)

Standing broad jump was used to determine explosive power of the legs while jumping forward. This assertion was supported by Falk, Cotton, Lusting, Lauder, Yaaron, and

Ayalon (2001) who reported a correlation coefficient of 0.54 to 0.74. This showed that standing broad jump is a good measure of explosive power of the legs.

Skin fold measurement were used to determine body composition or percent body fat. This statement is in line with Gwani (1996). The skin fold caliper was used to measure subcutaneous and adipose fat tissues. An equation for determining body density was used and the Siri fat percent formula was also used to estimate the percent body fat. Hydrostatic weighing method is the most widely used laboratory procedure for measuring body density and often serves as a criterion method for another indirect technique (Wilmore, 1977) and Chado (1991) confirmed that skin fold measurement is always used as a substitute. Many researchers reported a correlation coefficient between hydrostatic weighing and skin fold πmeasurement example Gwani (1996) reported a correlation coefficient of 0.81 to 0.95 while Skinner, Baldini and Gardener (1990) reported a correlation coefficient of 0.7 to 0.8.

3.9 Statistical Techniques

The results of this study were subjected to descriptive statistic of Mean and standard deviation (SD). A further analysis using independent t-test was used to analyze differences in treatment between public and private junior secondary school students and their physical fitness status. The level of significance for all analysis was 0.05 at alpha levels.

CHAPTER FOUR

RESULT AND DISCUSSIONS

4.1 Introduction

In chapter three the methodology used in the selection of the subjects for the comparative assessment of physical fitness status of public and private secondary school students in Katsina state were discussed. In this Chapter, the researcher presents the statistical analyses and interpretations of the results of the data collected from the subjects in public and private schools. The chapter is structured along the research hypotheses that were formulated for the investigation. The discussion of the findings from the tests of the hypotheses is presented at the end of the chapter.

4.2 Results

The summary of the selected variables for the male and female subjects in the private and public schools involved in the study is presented in two tables below. Table 4.1.1 presents the personal variables of the subjects while Table 4.1.2 presents the variables subjected to examination in the experiment..

Table 4.1.1: Summary of Variables for the Male and Female Subjects Selected in the Private and Public Schools.

		Private school			Public School		
Variables	**Sex**	**Mean**	**S. D**	**S. E**	**Mean**	**S. D**	**S. E**
Age (yrs)	Male	12.34	1.263	0.158	12.62	1.209	0.156
	Female	12.52	1.236	0.165	12.38	0.993	0.128
Height (m)	Male	1.36	0.178	0.022	1.37	0.110	0.014
	Female	1.39	0.080	0.010	1.41	0.090	0.012

Weight (kg)	Male	34.34	2.880	0.360	34.17	2.701	0.349
	Female	34.46	4.917	0.657	33.93	2.616	0.338

There was no major variability in the selected personal variables of the subjects in the private and public schools with private school and public school age of 12.34 and 12.62 respectively for male while that of female reads 12.52 in private school and 12.38 in public school as shown in the table. The table also indicated insignificant difference in the male height of the two group of students with the mean of 1.36 for public schools and 1.37 for private schools and that of female is 1.39 for private schools while 1.41 for public schools respectively. The mean weight of male is 34.34 for private schools and 34.17 for public schools and that of female is 34.46 and 33.93. This implies that the subjects are of the same age, height and weight before they were subjected to the experiment. The measured variables of the subjects by sex and type of school (Private and Public) are shown in Table 4.1.2.

Table 4.1.2: Summary of Variables for the Male and Female Subjects Selected in the Private and Public Schools.

		Private school			**Public School**		
Variables	**Sex**	**Mean**	**S. D**	**S. E**	**Mean**	**S. D**	**S. E**
Push ups (mnt)	Male	14.81	3.075	0.384	17.25	3.620	0.467
	Female	15.34	3.123	0.417	16.75	3.568	0.461
Sit ups (mnt)	Male	14.30	2.810	0.351	13.88	2.865	0.370
	Female	15.00	2.615	0.349	14.57	3.336	0.431
Sit reach (aver)	Male	14.14	2.372	0.296	15.21	1.482	0.191

	Female	14.70	2.001	0.267	15.07	1.957	0.253
Body Fat % (mm)	Male	11.24	1.160	0.145	11.42	1.068	0.138
	Female	9.87	3.589	0.480	11.12	2.357	0.304
12 Minute run (m)	Male	1.72	.2548	0.032	1.75	0.283	0.037
	Female	1.68	.2748	0.037	1.84	0.313	0.040

The table showed major variability in some of the means between the male and female subjects and between the schools. Variables mostly affected in this major difference between the schools and the sex of the subjects were push-up, Sit ups, and Sit reach. However, the test of significance of the variability was conducted in all the stated hypotheses of the study.

4.3 Test of hypotheses

One major hypothesis was formulated but was broken down into sub-hypotheses to test the differences between the two groups in the selected fitness variables. The hypotheses of the study were as follows.

Major Hypothesis: There is no significant difference between male and female students of

public and private junior secondary schools in their cardio respiratory endurance, muscular strength and endurance, flexibility and body Fat-percent.

Table 4.2.1 presents the summary of the test of difference between the two groups for the total selected variables.

Table 4.2.1: Independent t-test on Mean Physical Fitness between Male and Female

Students of the Selected Schools.

Variables	Sex	N	Mean	S.D	S.E	t-value	DF	P
Push Ups	Male	120	15.99	3.553	0.319	0.171	238	0.064
	Female	120	16.07	3.420	0.318			
Sit up	Male	120	14.10	2.833	0.254	1.802	238	0.073
	Female	120	14.78	3.005	0.279			
Sit & Reach	Male	120	14.66	2.056	0.185	0.895	238	0.372
	Female	120	14.89	1.978	0.184			
Broad Jump	Male	120	1.49	0.257	0.023	1.008	238	0.314
	Female	120	1.52	0.236	0.022			
Body Fat %	Male	120	11.68	1.116	0.100	2.750	238	0.044
	Female	120	9.52	3.067	0.285			
12Mins Run	Male	120	1.74	0.268	0.024	0.742	238	0.059
	Female	120	1.76	0.304	0.028			

(t-critical = 1.96)

Table 4.2.1 indicates the Means and S.Ds of male and female students of both public and private secondary schools in push-ups as 15.99, 16.07 and 3.55, 3.42 respectively. To test the null-hypothesis, t-test statistic was used. The t-value (0.171) was not significant at α=0.05. Similarly, the P value (0.064) > 0.05, therefore, the null-

hypothesis is rejected and it is concluded that there was no significant difference in the mean push-ups of male and female students.

Table 4.2.1 also revealed the Means and S.Ds of the two groups of students in sit-ups to be 14.10, 14.78 and 2.83, 3.00 respectively. To test the null-hypothesis, t-test statistic was used. The t-value (1.82) was not significant at α=0.05. Meanwhile, the P value (0.073) > 0.05, the null-hypothesis is therefore, rejected and it is concluded that there was no significant difference in the mean sit ups of male and female students of public and private secondary schools.

Again, from table 4.2.1 the Means and S.Ds of students in sit and reach was shown as 14.66, 14.89 and 2.06, 1.98 respectively. To test the null-hypothesis, t-test statistic was used. The t-value (0.895) was not significant at α=0.05. Similarly the P value (0.372) > 0.05. the null-hypothesis is therefore, rejected and it is concluded that there was no significant difference in the mean sit and reach of both male and female students.

Similarly, table 4.2.1 indicated the Means and S.Ds of the two groups of students in public and private secondary schools in body fat percent to be 11.63, 9.52 and 1.12, 3.07 respectively. To test the null-hypothesis t- test statistic was used, the t-value (2.750) was significant at α=0.05. Similarly, the P value (0.044) > 0.05 therefore, the null-hypothesis is accepted and it is concluded that there was significant difference in the mean body fat percent of the two groups of students in public and private secondary schools. The difference is in favor of males against female students.

On the 12 minutes run/walk test the table 4.2.1 indicated the Means and S.Ds of both public and private secondary school students as 1.74, 1.76 and 0.268, 0.304 respectively. To test the null-hypothesis t-test statistic was used. The t-value (0.742)

was not significant at α=0.05, also the P value (0.059) > 0.05. The null-hypothesis is rejected and it is concluded that there was no significant difference in the mean 12 minutes run/walk of male and female students.

The major hypothesis was structured into sub-hypotheses for the different variables for the two groups respectively as follows:

Sub-hypotheses I: There is no significant difference between the physical fitness status of public and private junior secondary school students in their muscular endurance.

Test of muscular endurance was measured by the flexed knee sit up. The male and female subjects in the school types were compared before the aggregate of both male and female subjects was compared by the types of schools. The tests were conducted with the mean sit up of the two groups. The t-test procedure was used to compare the scores for the two groups as summarized in 'Table 4.2.3.

Table 4.2.3: Independent t-test on Muscular Endurance by Public and Private School Students in Katsina State Junior Secondary Schools

Variable	**Sex**	**N**	**Mean**	**S.D**	**S.E**	**t-value**	**DF**	**P**
Private	Male	60	14.30	2.810	.351	1.412	118	.160
	Female	60	15.00	2.615	.349			
Public	Male	60	13.88	2.865	.370	1.204	118	.231
	Female	60	14.57	3.336	.431			
Aggregate	**Type**	**N**	**Mean**	**S.D**	**S.E**	**t-value**	**DF**	**P**
	Private	120	14.63	2.732	0.249	1.058	238	0.291

Public	120	14.23	3.115	0.284	

(t-critical = 1.96, P>0.05)

The students from the two types of secondary schools (public and private) did not differ significantly in their muscular endurance. This observation is deduced from the observed t-value of 1.058 and observed significant level of 0.291 for the test. The critical value often for the test is higher than the observed t-value of 1.058 and the observed level of significant is higher than the fixed probability level of significance (P>0.05). This means that the null hypothesis that there is no significant difference between the physical fitness status of public and private junior secondary school students in their muscular endurance is therefore accepted.

Sub-hypotheses II: There is no significant difference between the physical fitness status of public and private junior secondary school students in their muscular strength.

Test of muscular strength for the two groups was measured by their push up. The hypothesis was tested by comparing the push up of the private and public junior secondary school students with the aid of the two sample t-test procedure. The male and female in the individual type of schools (Private and Public) were compared before their aggregate were compared. A summary of the result is presented in Table 4.2.4.

Table 4.2.4: Independent t-test on Muscular Strength by Public and Private School Students in Katsina State Junior Secondary Schools

Variables	**Sex**	**N**	**Mean**	**S. D**	**S. E**	**t-cal.**	**DF**	**P**

Private	Male	60	14.81	3.075	0.384	0.929	118	0.355
	Female	60	15.34	3.123	.417			
Public	Male	60	17.25	3.620	.467	0.762	118	.448
	Female	60	16.75	3.568	.461			
Aggregate	**Type**	**N**	**Mean**	**S. D**	**S. E**	**t-calc.**	**DF**	**P**
	Private	120	15.06	3.096	0.283	4.488	238	0.000
	Public	120	17.00	3.588	0.328			

(t-critical = 1.96, P<0.05)

Students from public secondary schools were significantly higher in their muscular strength than students from private secondary schools involved in the study. This observation is obtained from an observed t-value of 4.488 compared with 1.96 which stands for the critical value often indicated at the bottom of the table. The observed level of significant for the test is 0.000 (P>0.05). By these observations, the null hypothesis that there is no significant difference between the physical fitness status of public and private junior secondary school students in their muscular strength is therefore rejected.

Sub-hypotheses III: There is no significant difference between the physical fitness status of public and private junior secondary school students in their flexibility.

To test this hypothesis, the scores for the two groups (private and public junior secondary school students) on sit and reach were compared to establish significance differences between the two groups. The two sample t-test was used in the test because of' the two independent groups (private and public secondary school in the independent variable. A summary of the result is presented in Table 4.2.5.

Table 4.2.5: Independent t-test on Flexibility by Public and Private School Students in

Katsina State Junior Secondary Schools

Variables	**Sex**	**N**	**Mean**	**S. D**	**S. E**	**t-calc.**	**DF**	**P**
Private	Male	60	14.14	2.37	.297	1.387	118	.168
	Female	60	14.70	2.001	.267			
Public	Male	60	15.21	1.482	.191	0.444	118	.658
	Female	60	15.07	1.957	.253			
Aggregate	**Type**	**N**	**Mean**	**S.D**	**S.E**	**t-value**	**DF**	**P**
	Private	120	14.40	2.216	0.202	2.884	238	0.004
	Public	120	15.14	1.730	0.158			

(t-critical = 1.96, P<0.05)

The test revealed that public secondary school students were significantly higher in their flexibility measured with sit and reach than students from private secondary schools. But there was no significant difference between male and female students in the private schools and the male and female students in the public schools were also not significantly different in their flexibility. The observed t-value (2.884) for the aggregate comparison between the private and public schools, obtained in the test is higher than the critical value of 1.96. The observed significant level (0.004) for the test is lower than the fixed probability level of significance ($P < 0.05$). Therefore the null hypothesis that there is no significant difference between the physical fitness status of public and private junior secondary school students in their flexibility is thus rejected.

Sub-hypotheses IV: There is no significant different between the physical fitness status of public and private junior secondary school students in their body composition.

Body composition of the students was measured by body fat percent as described in chapter three. To test this hypothesis, the body fat percent for the two groups (private and public secondary school students) were compared using the two sample t-test procedure. The test was carried out by first comparing the male and female in each of the school types. A summary of the result is presented in Table 4.2.6.

Table 4.2.6: Independent t-test on Body Fat Percent by Public and Private School Students in Katsina State Junior Secondary Schools

Variables	**Sex**	**N**	**Mean**	**S. D**	**S. E**	**t-calc.**	**DF**	**P**
Private	Male	60	11.24	1.160	.145	2.885	118	.005
	Female	60	9.87	3.589	.480			
Public	Male	60	11.42	1.068	.138	0.895	118	.373
	Female	60	11.12	2.357	.304			
Aggregate	**Type**	**N**	**Mean**	**S.D**	**S.E**	**t-value**	**DF**	**P**
	Private	120	10.60	2.671	0.244	2.292	238	0.023
	Public	120	11.27	1.828	0.167			

(t-critical = 1.96, P<0.05)

From the result in the table, students from public secondary schools have higher body fat percent than students from the private secondary schools. The result revealed that the two groups are significantly different in their body fat percent. This observation was obtained for male and female in the private schools. But among those of the public school no significance difference was observed. The aggregate means were

however significantly different between the private and public schools. This is indicated by observed t-value of 2.292 compared to the critical value equivalent of 1.96. The observed significant level (0.023) for the test is lower than the fixed probability level of significance ($P < 0.05$). This means that the null hypothesis that there is no significant difference between the physical fitness status of public and private junior secondary school students in their body composition is therefore rejected.

Sub-hypotheses V: There is no significant difference between the physical fitness status of public and private junior secondary school students in their cardio-respiratory endurance.

The cardio-respiratory endurance of the students was measured with the 12 minute run. In the test of this hypothesis, the 12 minute run of the two groups were compared using the two sample t-test procedure as summarized in Table 4.2.7. The male and female students in the private and public schools were compared independently for each of the school type before the test of significant difference between the private and public school was conducted. A summary of the tests is presented in along with the aggregate in the table.

Variables	**Sex**	**N**	**Mean**	**S.D**	**S.E**	**t-value**	**DF**	**P**
Private	Male	60	1.72	.255	.032	0.803	118	.424
	Female	60	1.68	.274	.037			
Public	Male	60	1.75	.283	.036	1.600	118	.112
	Female	60	1.84	.313	.040			
Aggregate	**Type**	**N**	**Mean**	**S.D**	**S.E**	**t-value**	**DF**	**P**

	Private	120	1.70	0.263	0.024	2.525	238	0.023
	Public	120	1.80	0.300	0.027			

Table 4.2.7: Independent t-test on Cardio-respiratory Endurance by Public and Private School Students in Katsina State Junior Secondary Schools

(t-critical = 1.96, P<0.05)

The result revealed that the two groups (private and public secondary' school students) were significantly' different in their cardio-respiratory endurance. The observed t-value (2.525) obtained in the test is higher than the critical value of 1.96. The observed significant level (0.012) for the test is lower than the fixed probability level of significance (P <0.05). The individual test between male and female students in the public and private schools did not differ significantly. From the observation of the aggregate difference between the private and public school, the null hypothesis that there is no significant difference between the physical fitness status of public and private junior secondary school students in their cardio-respiratory endurance is therefore rejected.

4.4 Discussion

The study was conducted to compare and assess the physical fitness status of public and private junior secondary school students in Katsina State. To achieve this one major hypotheses was formulated which was broken down into five sub- hypotheses. The five sub-hypotheses include the following:

The hypotheses set to test for muscular endurance revealed that students from the two types of secondary schools (public and private) did not differ significantly in their muscular endurance. This finding is in contrast with the finding of Maud and Foster

(1995) who stated that boys performed better than their counterparts in muscular endurance test. They affirmed that female fatigue was less with relative loads while boys fatigue with absolute loads. The possible reason for the insignificance in the test may be due to differences in the age, sex and environmental factors where the study was conducted. The finding is also in line to that of Gajere (2005) who reported in his study that no significant difference existed among the sample groups in their muscular endurance test in all males and females of age groups 12, 13, 14, 16 and 17 years, but significant difference existed among females aged 15 year. The possible reason for non significant difference in muscular strength and endurance in some age groups may be that the natural rural life is fast fading away where most of the social amenities enjoy by urban settlers today are also available in rural areas.

The hypotheses set to test for muscular strength showed that students from public secondary schools were significantly higher in their muscular strength than students from private secondary schools involved in the study. This finding agrees with that of Toriola and Adedoja (1983) where physical activity is described as an integral component of normal development of children which affect motor performance. This is generally explained by health experts and sociologist to be caused by the fact that most students from public schools go on errands, carrying objects for quite a long distance, assist their parents in farm work or involve in life sustaining and stressful activities than their counterparts in private schools who ran a sedentary life playing with computers or watching television after school hours.

These findings disagree with Musaiger (2011) who opined that children from private schools are better fed with good food, live in a healthy environment and are engaged in program of physical exercise in clubs, games, exercise machines and thus have better muscular strength than those from public schools that lack such facilities. This

disagreement may be due to the location and environment in which the research was conducted, while this present study was conducted in Nigeria, Musaiger conducted his research in Australia.

The hypotheses set to test for body composition indicated that students from public secondary schools have higher body fat percent than students from the private secondary schools. The result revealed that the two groups are significantly different in their body fat percent. This observation was obtained for male and female in the private schools. But among those of the public school no significance difference was observed. The aggregate means were however significantly different between the private and public schools.This observation is in agreement with Akodu, Ibeabuchi, Oluwakemi, and Akinbo (2012) in a comparative study of the effect of recreational physical activities on body composition among pupils of public and private primary schools in Surulere local government in Lagos State, where they stated that there were significant difference in body composition indices among pupils of public and private primary schools in favour of public schools.

In a similar vein, the finding is in consonance with Adeniyi and Abdullahi (2007) in which they reported that there is significant difference in body composition indices of pupils in public and private primary schools. 66.7% of the public schools had open fields with no Recreational Physical Activities (RPA) facilities. The difference in the body composition may be attributed to the fact that they conducted their study with primary school pupils and the present study was conducted in junior secondary schools.

The hypotheses set to test for cardio respiratory endurance revealed that the two groups (private and public secondary school students) were significantly different in their cardio-respiratory endurance. This finding is in line with Mainsa (2009) in which

he found significant difference in cardio-respiratory endurance between public and private secondary school students in Zaria. He based his argument on the reasons that; Most public secondary school students in Zaria trek a long distance to and from their respective schools in which public schools in Katsina State are not exempted. Most of the public school students more especially boys go to schools on bicycles which is a great deal of exercise and most private school students go to schools in cars, commercial buses or commercial motorcycles (okada). These means of transportation make private secondary school students more sedentary.

The last hypotheses set to test for flexibility revealed that public secondary school students were significantly higher in their flexibility measured with sit and reach than students from private secondary schools. But there was no significant difference between male and female students in the private schools and the male and female students in the public schools were also not significantly different in their flexibility. The finding is in line with Chado (1992) in his study, where he expressed the fear that many Nigerian students have become physically unfit because they prepare to be spectators rather than participants. The finding is also in agreement with Shu'aibu (2000) which complements the work of Chado, in his study on male athlete and non athlete and physical education students.

The finding is in contrary with that of Gajere (2005) in a comparative study of physical fitness status of students in rural and urban secondary schools in Kaduna State where he indicated no significant difference existed between rural males and urban males at all sample aged groups. The result of the study also showed that rural females performed better than their urban peers. Jackson et al (1999) Heyward (1998) supported the assertion that physical activity pattern are responsible for these differences in which active individuals tend to be more flexible than inactive ones. In

a similar finding Wilmore and Costill (1999) stated that females tend to have more hip flexion and spinal lateral flexion while compared with males of the same age. The finding is also in line with Ogundare and Otinwa (1995) in which they stated that females from all angles performed better than their males counter parts in flexibility test This assertion may be as a result of the fact that girls shy away from sporting activities as age increases and the appearance of sexual secondary characteristics.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

In this chapter, the summary of the assessment of physical fitness status of public and private junior secondary school students in Katsina state was presented along with the major findings from the test of the related hypotheses. The chapter presents the conclusion and recommendations on the subjects.

5.2 Summary

The purpose of this study was to assess the physical fitness status of public and private junior secondary school students in Katsina State.

To achieve this purpose a total sample of two hundred and forty (240) junior secondary school students across the seven (7) educational zones of Katsina State Ministry of Education were selected for the study through random sampling by dip, pick, record and return method.

From this number one hundred and twenty (120) were selected from public schools and the same number one hundred and twenty (120) from private secondary schools. Out of each one hundred and twenty subjects sixty (60) were males and sixty (60) were females. Physical fitness variables of the subjects selected for the test were Push Ups, Sit Up, Sit Reach, Body Fat percent, and 12 minutes Run/Walk. The data collected were tested for possible differences between the two schools. One major null hypothesis was formulated and was further structured into six null sub-hypothesis.

The Ex-Post-Facto research design was used. This is non experimental research using conditions in which no independent variable was manipulated and informed consent form was given to the subjects whom they filled in and returned to the researcher. 4pm-6pm was earmarked for the tests. The researcher allowed only three test items for each student per day for three days in a week i.e. Monday, Wednesday, and Friday, the test was conducted for over three weeks.

The data collected were analyzed using independent t-test to ascertain the physical fitness status of public and private secondary school students. All statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 17. The hypotheses were tested at 0.05 level of significance using relevant degree of freedom.

The result of the study indicated that there was significant difference in the mean body fat percent of the two groups of students in public and private secondary schools. The difference is in favor of male against female students. Furthermore, the result revealed that public secondary school students were significantly higher in their flexibility measured with sit and reach than students from private secondary schools. But there was no significant difference between male and female students in the private schools and the male and female students in the public schools were also not significantly different in their flexibility test.

5.3 Summary of major findings

The major findings from the analysis of the data and test of the study's hypothesis are summarized below:

i. The students from public secondary schools involved in the study were generally more physically fit than students from private secondary schools selected for the study.

ii. The two groups were significantly better in their flexibility measured with their sit and reach with the public school students having higher scores.

iii. There was significant difference between the two groups in their cardio respiratory endurance as measured by their 12 minute run. The students from the public schools had a higher score.

5.4 Conclusion

Based on the findings and in view of the limitations of this study the following conclusions were made.

- Students from the two types of secondary schools (public and private) did not differ significantly in their muscular endurance
- Furthermore, the result revealed that public secondary school students were significantly higher in their flexibility measured with sit and reach than students from private secondary schools. But there was no significant difference between male and female students in the private schools and the male and female students in the public schools were also not significantly different in their flexibility test.
- The result of the study indicated that students from public secondary schools have higher body fat percent than students from the private secondary schools. The result revealed that the two groups are significantly different in their body fat percent
- The study revealed that the two groups (private and public secondary school students) were significantly different in their cardio-respiratory endurance.

- The result of this study showed that students from public secondary schools were significantly higher in their muscular strength than students from private secondary schools involved in the study.

5.5 Recommendations

Based on the findings from the analyzed data, the following recommendations are made:

1. Government should reintroduce sport competitions in public and private secondary schools and participation should be made compulsory as this will improve the physical fitness status of the students.

2. Similar study should be carried out in senior secondary schools and other educational levels within the state and the country at large.

3. Availability of play facilities like athletic field and such other facilities should be prerequisites for allowing the establishment of private secondary schools in the state.

5.6 Recommendations for further studies

This study assessed students of junior secondary schools. It is suggested that, similar research be conducted to senior secondary schools and to some other tertiary institutions in the state and country at large.

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DEPARTMENT OF PHYSICAL AND HEALTH EDUCATION

AHMADU BELLO UNIVERSITY, ZARIA - NIGERIA

(OFFICE OF THE HEAD OF DEPARTMENT)

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Head of Department: PROFESSOR C. E. DIKKI, *NCE, B.Sc.Ed., M.Ed., Ph.D. (ABU)*

9th February, 2012

Our Ref: _____ Date: _____

Your Ref: _____

_____

_____

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Dear Sir,

INTRODUCTION OF COLLECTION OF DATA –

ABUBAKAR MOHAMMED IDRIS (M.SC/EDUC/18961/2007-2008

The bearer is an M.Sc student of this Department; he required to conduct a research on the **"Assessment of Physical Fitness Status of Public and Private Secondary School Students of Katsina State"** in which your school is one of his selected samples.

In this regard, I wish to request for your permission and support to use your College Athletic Track and also your students to collect data for his M.Sc Thesis.

Please assist him.

Thanking you.

Prof. M.A. Chado

Supervisor

STUDENT'S CONSENT FORM

I _____of _____ Secondary School agree to voluntary take part in this test.

That I understand that if on the process of conducting the test I cannot meet up with the training or there is a problem along the line I am free opt out from the field.

Student Signature:_____

Address: _____

_____

_____

Date:_____

Parents Name:_____

Signature: _____

Address: _____

Date:_____