COMPARATIVE STUDY OF THE PHYSICAL FITNESS OF NIGERIAN ARMED FORCES PERSONNEL

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DECLARATION

I declare that the research work in this thesis titled "**Comparative Study of the Physical Fitness of Nigerian Armed Forces Personnel",** is written by me and that this thesis has not been written or submitted for the award of any degree to the best of my knowledge. All sources of publications and related literature cited in this research are duly acknowledged by means of references.

_____ _____

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CERTIFICATION

This thesis titled **Comparative Study of the Physical Fitness of Nigerian Armed Forces Personnel**, by OlatoyeUthmanOlasunkanmi meets the regulations governing the award of the Degree of Master of Science (M.Sc) in Exercise and Sport Science of the Department of Physical and Health Education, Ahmadu Bello University, Zaria, Nigeria, and is approved for its contribution to knowledge and literary presentation

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DEDICATION

The researcher wishes to dedicate this research to the Glory of the Almighty God

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Thanks be to Almighty God for his protection throughout the period of the research study. The researcher wishes to express his profound gratitude to the major supervisor of the research work, Professor C.E Dikki, for his efforts at scrutinizing this research work. Prof. Dikki's assistance, guidance and positive criticism contributed immensely to the production of this thesis. The researcher's profound gratitude also goes to the minor supervisor, Professor KankanalaVenkateswarlu, for his painstaking perusals and correction of this research work.

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ABSTRACT

The study was on the physical fitness of Nigerian Armed Forces personnel. The motivation for the research was kindled by the observed variations in the results of physically demanding tasks performed by personnel of the three Armed Services in joint military operations. The study was to assess the physical fitness of Nigerian Armed Forces personnel towards ensuring the proper assignment of physically demanding tasks to the Nigerian Armed Forces personnel during joint military operations in order to enhance operational efficiency.The research methodology applied in the study was basically descriptive. Data were collected using field method and document analysis. In achieving the purpose of the study, 35 male and 20 female Nigerian Army personnel, 30 male and 13 female Nigerian Air Force personnel and 25 male and 10 female Nigerian Navy personnel were randomly selected to serve as participants in this study. The 3.2km run/walk test for cardio-respiratory endurance, sit-up test for muscular endurance, push-up test for muscular strength and BMI computation for body composition were conducted on the participants. The data thus collected were statistically analyzed. The findings of this study revealed that the Nigerian Army personnel had significantly better cardio-respiratory endurance than their counterparts from the Nigerian Air Force and Nigerian Navy. Nigerian Army personnel also had significantly greater muscular strength and muscular endurance. Furthermore, the Nigerian Army personnel had significantly more favourable body composition. The performances of the participants in the tests were measured against the physical fitness standards established for the Nigerian Armed Forces. On the basisof the findings of this study, it was recommended that during joint military operations, the highest volume of physically demanding tasks should be assigned to the Nigerian Army personnel, followed by the Nigerian Navy and then the Nigerian Air Force. In addition, it was recommended that the three Armed Services should strengthen the physical training programmes of their female personnel. Furthermore, it was also recommended that the three Armed Services should embark on weight control programmes for their personnel.

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CHAPTER ONE

INTRODUCTION

1.0 BACKGROUND TO THE STUDY

The promotion of physical fitness through physical activity among children, adolescents and adults has become a public health objective. In recent years around the world, there has been serious concern over declining physical activity levels among these segments of the population as a result of more time spent on less vigorous recreational activities, such as Video Games and Watching Television (Dinubile, 1993).

Research evidence has shown that vast technological progress made in modern times has markedly affected lifestyle of many societies and has crept into developing countries at a fast rate, thus changing the whole pattern of our lifestyle, rendering the whole generation inactive, declining their day to day performance at work and during physical activity (Chado, 1992; Montoye, 1985).

Physical fitness is an essential requirement not only for optimal health, but also for better performance and quality of life (Hayward; 1998; Venkateswarlu; 2009, 2010). It is of particular importance to Armed Forces all over the world, not only because of its benefits, but also because it makes the soldiers battle ready. A soldier's level of physical fitness has direct impact on combat readiness. The many battles in which American troops have fought underscores the important role physical fitness plays on the battle field. The role of regular participation in a sound physical fitness programme and maintenance of healthy weight is to enhance a person's quality of life, improve productivity and bring about positive physical and mental changes (United States Presidents Council on Physical Fitness and Sport: USPCPFS, 2005).

Nigerian Armed Forces personnel are required to be physically fit to meet certain military operational requirements. These include ability to perform under a wide range of geographical and environmental conditions as well as coping with the stress of sustained operations. Thus, physical fitness training forms an important part of the Nigerian Armed Forcesphysical education programme.

The concept of Joint Military Operations requires the personnel of the three Armed Services (Nigerian Army, Nigerian Navy and Nigerian Air Force) to function as a unit in the theatre of operation. The achievement of results in physically demanding tasks assigned to the personnelhasthus, made it imperative for the Nigerian Armed Forces to have a well-developed physical fitness training programme. This physical fitness programme is developed to cater for cardio-respiratory endurance, muscular strength, muscular endurance and body composition. However, the physical fitness of the personnel from the three Armed Services which is measured against the Nigerian Armed Forces Standard Physical Fitness Chart at Appendix II,has been questioned owing to the observevariations in the resultsof physically demanding tasks they perform. These variations paint an unclear picture of the personnel levelsof physical fitness and thus, have negative effects on the operational efficiency of the Nigerian Armed Forces.

The foregoing, calls for the need to compare the physical fitness of Nigerian Armed Forces Personnel. The purpose of this study is to assess the physical fitness of Nigerian Armed Forces personnel towards ensuring the proper assignment of physically demanding tasks to the personnel for the enhancement of the Nigerian Armed Forces' operational efficiency. This study is therefore motivated by the need to appropriately assign physically demanding tasks to the personnel of the three Armed Services towards enhancing the operational efficiency of the NigerianArmed Forces.

1.1 Statement of the Problem

The Nigerian Armed Forces policy on physical training isa course of action crafted to enhance the performance of its personnel for the effective and efficient attainment of operational objectives. Basically, this revolves around enhancing the quality of the personnel and prepares them effectively for combat roles.

The ability of the Nigerian Armed Forces to tackle security threats thus, requires having personnel that are physically fit. However, the physical fitness of the personnel from the three Armed Serviceswhich is measured against the Nigerian Armed Forces Standard Physical Fitness Chart at Appendix II, has been questioned owing to the observed variations in the results of physically demanding tasks they perform. These variations paint an unclear picture of the personnel levels of physical fitness and thus, have negative effect on the operational efficiency of the Nigerian Armed Forces.

From the foregoing, if the observed variations are not catered for, it would remain difficult to properly assign physically demanding tasks to the personnel of the three Armed Services towards enhancing the operational efficiency of the Nigerian Armed Forces.

1.2 Research Questions

This study was conducted to answer the following specific research questions:

1. Do the Personnel of the Nigerian Armed Forces differ in their cardio-respiratory fitness?
2. Do the Personnel of the Nigerian Armed Forces differ in their muscular strength?

3. Do the Personnel of the Nigerian Armed Forces differ in their muscular endurance?
4. Do the Personnel of the Nigerian Armed Forces differ in their body composition?

1.3 Basic Assumptions

On the basis of available research evidence, the following basic assumptions were made for the purpose of this study.

i. Cardio-respiratory fitness, muscular strength and endurance, flexibility and body composition change with age and lifestyle.
ii. Response to training programme is highly related to age, sex,physical activity and lifestyle patterns of participants.
iii. These characteristics can be objectively measured and quantified.

1.4 Hypothesis

Based on the research questions and basic assumptions of this study, the following hypotheses were made.

Major Hypothesis

There are no significant differences in cardio – respiratory endurance, muscular strength, muscular endurance and body composition among Nigerian Armed Forces Personnel.

1.4.1 Sub – Hypothesis

1. There is no significant difference between the Nigerian Army, Nigerian Navy and Nigerian Air Force personnel in cardio- respiratory endurance.
2. There is no significant difference between the Nigerian Army, Nigerian Navy and Nigerian Air Force personnel in muscular strength.
3. There is no significant difference between the Nigerian Army, Nigerian Navy and Nigerian Air Force personnel in muscular endurance.
4. There is no significant difference between Nigerian Army, Nigerian Navy and Nigerian Air Force personnel in body composition.

1.5 Significance of the Study

This research is justified based on the following:

The physical fitness components for most Armed Forces all over the world include cardio-respiratory endurance, muscular strength, muscular endurance and body composition. The results of the study would indicate the differences in the physical fitness of the personnel of the three Armed Services. This will in turn ensure the proper assignment of physically demanding tasks to the personnel for the enhancement of the operational efficiency of the Nigerian Armed Forces.

Research evidence has clearly shown significant differences between male and female adults. Such differences appear to affect the standards in different components of physical fitness, which has implications for designing appropriate training programs for male and female

adults. The results of this study will show the difference, if any, between male and female Armed Forces Personnel in different components of physical fitness which will have implications for designing their fitness programs.

This study may bring to light new areas for further research relating to different aspects of physical fitness of Nigerian Armed Forces Personnel.

1.6 Delimitations

This study was delimited to the following:

i. This study was conducted only on 90 male and 43 female personnel of the Nigeria Armed Forces Selected from the 900 male and 430 female Service Personnel resident in Mogadishu Cantonment, Asokoro, Abuja.

ii. The components of physical fitness measuredin the study wasdelimited to cardio-respiratory endurance, muscular strength, muscular endurance and body composition of the Nigerian Armed Forces Personnel.

1.7 Limitations

This study had the following limitations that would be considered during interpretation of the results:

i. Body composition is better assessed by laboratory methods using sensitive instruments like computer tomography, hydrostatic weighing, bioelectric impedance and dual-energy X-Ray absorptiometry. However, because of the non-availability of the instruments; body composition was estimated by computing body mass index.

ii. Cardio – respiratory endurance was not tested by laboratory experiment because of lack of equipment. It was estimated by the 3.2km run test.

1.8 Operational Definition of Terms

The following are the operational definitions of terms used in the study:

Armed Forces Personnel: Refers to an individual serving in the Armed Forces who is between 20-45 years for male and 20-35 for female.

Body Composition: Body composition refers to the fat and non-fat components of the human body. It is important in assessing recommended body weight.

Body Mass Index: Body mass index is the most common technique used to determine thinness and excessive fatness in the body. It incorporates height and weight to estimate critical fat values at which the risk for diseases increases.

Cardio-respiratory Endurance: Cardio-respiratory Endurance is the ability of the lung. Heart and blood vessels to deliver adequate amount of oxygen to the cells to meet the demands of prolong physical activity.

Muscular Endurance: Muscular endurance is the ability of a muscle to exert sub-maximal force repeatedly overtime.

Muscular Strength: Muscular strength is the ability of a muscle to exert maximum force against resistance.

Physical Fitness: It is the ability to perform daily tasks, vigorously and alertly, with energy left over for enjoying leisure time activities and meeting emergency physical activity demands.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 INTRODUCTION

The purpose of the study was to find out and compare the physical fitness levels of Nigerian Armed Forces Personnel (male and female). To achieve this purpose, available related literature was critically reviewed and presented in this chapter under the following sub titles.

a. Components of physical fitness.

b. Importance of physical fitness

c. Health related physical fitness

d. Physical fitness requirements in the Nigerian Armed Forces and other World Militaries.

2.1 Components of Physical Fitness

Physical Fitness is to the human body what fine-tuning is to an engine. It enables us to perform up to our potential. Fitness can be described as a condition that helps us look, feel and do our best. More specifically, it is "the ability to perform daily tasks vigorously and alertly, with energy left over for enjoying leisure-time activities and meeting emergency demands. It is the ability to endure, to bear up, to withstand stress, to carry on in circumstances where an unfit person could not continue, and is a major basis for good health and well-being (President's Council on Physical Fitness and Sports, 2005).

Physical fitness involves the performance of the heart lungs, andthe muscles of the body. And since what we do with our body also affects what we can do with our

minds. Fitness influences, to some degree, qualities such as mental alertness and emotional stability (President's Council on Physical Fitness and Sports, 2005). Fitness is an individual quality that varies from person to person. It is influenced by age, sex, heredity, personal habits, exercise and eating habits. You cannot do anything about the first three factors. However, it is within your power to change and improve the others where needed (President's Council on Physical Fitness and Sports, 2005).

Physical fitness is all encompassing. It is a state that characterizes the degree to which the individual is able to live most and to serve best. The ability to function emotionally, socially and spiritually determines fitness. All these components are related to each other and mutually dependent (AAPHERD, 1989).

In the above definition of fitness, the reference is to "total fitness". Physical fitness is thus seen as just a part of total fitness. However, physical fitness is basic to other forms of fitness. It is a very significant aspect, and a highly desirable means to total fitness. It is not an easy term to specifically define. It is perhaps one of the most controversial terms inphysical and health education. This is probably the case since the need to fitness varies from oneindividual to another. Therefore, a concise definition that will be applicable to all situations becomes very difficult.

Historically, physical fitness was conceived in simple terms as consisting of strength, endurance, speed, agility, coordination and balance. National youth fitness testing was started in 1950s around the world on a limited scale, which has become much more complex in 1980s. For example, in the United States, the Kraus-Weber Test (Kraus et al; 1961), administered in the 1950s, was a health-related fitness test, developed to assess minimum levels of strength, endurance, and flexibility. This test stimulated the American Association of Health, Physical Education and Recreation (AAHPER) to develop a battery of tests (AAI-IPER, 1989).

The present concept of physical fitness emphasizes two broad areas of fitness, which include health-related fitness and skill or performance-related fitness. Health-related fitness comprises of cardiorespiratory endurance, muscular endurance, muscular strength, body composition and flexibility. Skill or performance-related fitness includes agility, balance, coordination, speed, power and reaction time (AAHPER, 1989).

According to Nieman, (1998), physical fitness is a positive quality that is related to the prevention of most of the diseases. Physical fitness emphasizes on having vigor and energy to perform physical work and exercise.

Physical fitness can be objectively measured by determining how much energy one has for doing what is enjoyable in life for experiencing all the natural adventures possible and engaging in activities from snow skiing to mountain climbing, cycling, to weekend backpacking. Those who are physically fit have the energy and zest to maximize the enjoyment of the natural resources available to them. Goran et al (1995) explained that the confusion regarding the definition of physical fitness stems from an understandable desire by most authors to make a definition apply to everything under the sun: health, economic success and happiness. He however defines physical fitness as "the individual's ability for physical exertion and stressful physical activity beyond that is required by his/her normal day-to-day occupation". This definition agrees with the view of Getchell (1980), who saw physical fitness as the ability to meet certain physical requirements which may be "structural" anatomical, "physiological", function or both.

Physical fitness is not easily understood by examining its components, or "parts". There is widespread agreement that the four components that are basic are cardiorespiratory endurance, muscular strength and endurance, flexibility and body composition.

Cardiorespiratory endurance is the ability to deliver oxygen and nutrients to tissues, and to remove waste products over sustained period of time. Long runs and swims are among the methods employed in measuring this component (President's Council on Physical Fitness and Sports, 2005).

Muscular strength is the ability of a muscle to exert force for a brief period of time. Upper body strength, for example, can be measured by various weight-lifting exercises (President's Council on Physical Fitness arid Sports, 2005).

Muscular endurance is the ability of a muscle, or a group of muscles to sustain repeated contractions or to continue applying force against a fixed object. Push-ups are often used to test endurance of arm and shoulder muscles (President's Council on Physical Fitness and Sports, 2005).

Body composition is often considered as a component of fitness. It refers to the makeup of the body in terms of lean mass (Muscle, bone, vital tissues and organs) and fat mass. An optimal ratio of fat to lean mass is an indication of fitness, and the right types of exercise will help you decrease body fat and increase or maintain muscle mass. (President's Council on Physical Fitness and Sports, 2005).

The AAHPER committee adopted the position that physical fitness testing and programmes for development of fitness should emphasize the relationship between health and physical activity. Physical fitness is a multifaceted continuum extending from birth to death affected by physical activity. It ranges from optimal abilities in all aspects of life through high and low levels of different kinds of physical fitness, to severely limiting disease and dysfunction. Since physical fitness can be operationally defined by the test items used for its evaluation, specific criteria were needed for choosing the test items. The criteria selected are as follows:

- A physical fitness test should measure a range which extends from severely limiting dysfunction to high levels of functional capacity;
- should measure capacities that can be improved with appropriate physical activity; and
- It should accurately reflect an individual's physical fitness status as well as changes in functional capacity by corresponding test scores and changes in these scores (President's Council on Physical Fitness and Sports, 2005).

The following areas of physiological function are related to positive health, which are national concern, and appear to meet the above criteria:

- Cardiorespiratory function
- Body composition (leanness/fatness), and
- Abdominal and hamstring musculoskeletal function (President's Council on Physical Fitness and Sports, 2005).

Since the concern for positive health extends to all ages, it is recommended that all persons be tested periodically on health related fitness components. Periodic testing emphasizes the importance of an active lifestyle to achieve and maintain low amount of fat, high levels of cardiorespiratory function, and sufficient muscular strength and endurance, and flexibility in the lower trunk posterior thigh areas for health and low back function (President's Council on Physical Fitness and Sports, 2005). As additional research data and other information become available on the relationship of physical performance to health and on the validity of tests for specific components, additional items may be added to the test. Upper body strength and endurance, and perhaps other items, may well be included in future revisions of this test battery.

Additionally, athletic participation is an integral part of physical education programmes. Helping all students identify and develop their individual potential in motor

performance is one of the major purposes of physical education and athletics. Speed, power, strength, endurance, and agility are important abilities needed to participate successfully in athletics. Test items designed to measure some of these traits are available with national norms in the AAHPER Youth Fitness Test Battery (AAHPER, 1976).Scient ific research has shown that the test items in the manual do not measure the same components of physical fitness as those in the original AAHPER test.

The classification of physical fitness by the American Association for Health, physical Education, Recreation and Dance APHERD (1980) has become the mostwidely accepted. It states that physical fitness is an expression of physical development in a number of discrete areas that can be classified into two major categories, namely: the health related physical fitness and the performance related physical fitness, each with its own specific components as listed below:

1. Health related physical fitness

- Cardiorespiratory endurance
- Muscular strength and endurance
- Body composition
- Flexibility

2. Performance related physical fitness

- Balance
- Agility
- Power
- Speed
- Reaction time
- Coordination

Walking to school fell from 71-62%,while percentage traveling by car rose from 15 - 28%. Similarly, United States Presidents Council on Physical Fitness and Sports, (2005) reported that between 1984 and 1990, the percentage of U.S. high school students participating in 20 minutes or more of vigorous physical activity, three or more times a week, declined from 62% to 37%. Given the consistency of declines in the performance and physical fitness in children, it appears that both school based physical education and government intervention strategies are not highlighting the pressing need for new approaches.

Physical fitness is a multifactorial concept comprising a set of more or less independent attributes which are related to the ability to perform physical activities. Some of these components are closely related to health, while others are related to performance. Gutin et al;1998 and Pate et al; 1995 suggest that total energy expenditure is the key factor in fitness and health status, no matter what type of physical activity is performed. Because changing technology has a large impact on energy expenditure during work, the latter can vary considerably among individuals. Consequently, it could be expected that higher physical activity during work can improve some physical fitness components. But a number of studies have shown a stronger relationship between heavy leisure time physical activities and fitness measures, including cardio respiratory fitness (Kemper et al; 2001).

The Lifestyle of children, adolescents and adults has no carryover effects of youth fitness to adult fitness. It is recommended that physical activity programs should contain a variety of enjoyable moderate to vigorous physical activities that have carry over value to adulthood (Venkateswarlu, 1990). Individuals should engage in leisure time physical activities from where they will derive both enjoyment and health benefits.

There is stronger evidence relating to increasing inactivity in children, adolescents and adults (Montoye, 1985). Some studies on the association between television watching and levels of obesity have found that, as the hours of television watched increase, physical activity levels decrease and obesity in children, adolescents and adults increases.

To examine the influence of daily physical activity on the relationship between physical fitness and physical activity for each fitness item, a comparison was made between the regression coefficients with and without correction of body weight and height. When physical activity was added to the regression equation, the magnitude of the regression coefficient was about the same as without correction for physical activity. This means that physical activity has no influence on the relationship between physical activity and fatness (AAHPERD, 1980).

Research has shown that adults who exercise regularly believe that it makes them feel better in general and perhaps relieve tension (Venkateswarlu, 1969; Harris, 1979; Corbin, 1987 all in Venkateswarlu, 1990). Any physical activity is better for health than none at all; some is better than a little, and more is better than a little, and more is better than some. (Jackson et al; 1999).

According to ACSM (1998), adults should be moderately physically active for at least 30 minutes on most and preferably all-days of the week. Moderate physical activity utilizes 150 kilo-calories of energy per day or 1000 kilocalories of energy per week. The ACSM recommends that one should exercise five days a week doing moderate activity or three days a week for vigorous activity. Adults should take part in moderate physical activity for at least 30 minutes daily. Despite interest in and knowledge about adolescent and adult physical activity and disease risk factors, very little is known about children's participation in physical activity and about the relationship between physical activity, physical fitness and health among children (Harris, 1979; Corbin, 1987).

2.2 Importance of Physical Fitness

Physical fitness is not just for Olympic hopefuls or super models. In fact, you are never too unfit, too young or too old to get started. Regardless of your age, gender or role in life, you can benefit from regular physical activities, if you are committed. Physical activities, in combination with a sensible diet, can help provide an overall sense of well being and can even help prevent chronic illness, disability and premature death. (President's Council on Physical Fitness and Sports, 2005). Some of the benefits of improved physical fitness are:

Improved Health

Increased efficiency of heart and lungs

Reduced cholesterol levels

Increased muscle strength

Reduced blood pressure

Reduced risk of major illnesses such as diabetes

Weight loss

Improved Sense of Well-being

More energy

Less stress

Improved ability to cope with stress

Increased mental acuity

Improved Appearance

Toned muscles

Improved posture

Enhanced Social Life

Improved self-image

Increased opportunities to make new friends

Increased opportunities to share activities with others

Increased Stamina

Increased productivity

Increased physical capabilities

Less frequent injuries

Improved immunity to minor illnesses

(President's Council on Physical Fitness and Sports. 2005).

According to Kraus and Raab (1961), the physically active person shows better adaptability to stress, less neuromuscular tension, and less fatigability. Active individuals age later, do not tend to become absolute and relative overweight, have lower blood pressure, are stronger and more flexible, and have greater breathing capacity and lower pulse rate (Venkateswarlu, 1969, 1971).

The joint Committee of the American Medical Association and the American Association for Health, Physical Education and Recreation (AMA and AAHPER) in 1989, stated that, "the benefits of physical exercise are more clearly observed in their relation to certain organic diseases. Regular exercise is now considered to help retard the onset or further progress of diabetes, for example, and man's most common threat to health "artheosclerosis".

2.3 Health Related Physical Fitness Components

2.3.1 Cardio-respiratory Endurance

This refers to the heart and blood vessels and the efficiency by which oxygen (0_2) is taken into the lungs and into the bloodstream and carried to the various parts of the body where it is needed. It is the ability of the circulatory system to keep the muscles supplied with oxygen and nutrients and to keep the muscles free of waste products during heavy exercise. The individual, who has difficulty in climbing stairs, demonstrates a lack of cardiovascular endurance.

Bray et al (1980) defined cardio-respiratory endurance in terms of the "ability of the circulatory and the respiratory systems to adjust to vigorous exercise and to recover from the effect of exercise". Cardiorespiratory endurance is a means of determining a person's maximal oxygen consumption ($V0_2$ max) (Mathews and Fox, 1981). Maximum oxygen uptake according to Verducci, (1983), indicates how well various physiological functions can be adjusted to increasing metabolic demands of work. Over the years, various tests were developed to measure $V0_2$ max but most of these tests require laboratory tests. Such tests include treadmill running/walking, cycle ergometer pedaling and stepping tests. Again, most of these tests cannot be used on large populations at the same time, because of cost of equipment, time consumption, and their technical complexity. Thus, to overcome these limitations, varied field tests were developed as alternatives to the more complex laboratory tests. These tests are not only reliable, having been compared with the laboratory tests, but found to be more convenient when large samples are involved.

Some of these field tests include the 6-minutes, 9-minute, 12 -minute, and the 3.2km run tests. Cooper (1968) designed at 12-minute run/walk test, which was not only considered suitable for large sample, but also found reliable when compared with

laboratory tests. Burke (1976) reported that the 12-minute run test correlated as high as .91 with selected laboratory tests.

Pollock et al (1984) stated that the widely used field tests for measuring VO_2 max are the 12-minute and the 3.2km run tests. This, according to them, is because both tests have very high inter-correlation. Both tests have a moderate to high relationship with the laboratory max.0_2 uptake test. They however warned that these field tests should not be used as diagnostic tool. Gwani (1986) reported that the 6-minute run and the Cooper's 12-minute run tests are correlated as high as .778. This suggests that the two tests are reliable measures of cardio-respiratory fitness. McArdle et al (1981) stated that prediction of maximum aerobic capacity should be approached with caution when using running performance factors, such as the pacing of inexperienced subjects, body weight and body fitness, running efficiency and the percentage of one's aerobic capacity that can be sustained without lactic acid build-up, all contribute significantly to successful running.

Cardiorespiratory endurance is one of the health-related components of fitness which Malina et al; (2000) defined as the ability of the circulatory and respiratory systems to adjust to vigorous exercise and to recover from the effect of that exercise with more energy still spared for other daily routine activities (Lohman, 1989; Oja and Tuorth;1995).

Factors determining cardiorespiratory endurance: Optimal level of the cardiorespiratory function has generally been accepted as the most important index of physical fitness capacity (Billat etal;2004). Laboratory determination of the function has also been found to produce the most accurate result (Astrand, 1996). However, due to some technical and administrative difficulties field test batteries have been developed to undertake the same evaluative processes in determining the cardiorespiratory fitness.

Maximum oxygen uptake is often referred to as maximal aerobic power. This is the highest rate of oxygen consumed by the body in a given period of time during exercise involving a significant portion of a muscle mass (Falk et al; 2001; Kim et al; 2000). It provides a great measure of the state of the gas transport system and reflects pulmonary capacity. The cardiovascular fitness is the ability of the heart, lungs and blood vessels and working muscle cells to work effectively and efficiently. Similarly, William et al; (1986) and Ekblom et al (1968) were of the view that maximum oxygen consumption is a significant factor in determining cardiorespiratory endurance. Their evidence is that trained individuals have a lower rise in lactic acid than the untrained individuals working at the same workload. They contended that better oxygen transport in the trained individual than in the untrained is due to better condition of the heart, blood vessels and the lungs that determine oxygen carrying capacity.

(Sharkey, 1984; Dorocciak& Nelson, 1983) were of the view that VO_2Max is regarded as a good determinant of cardiorespiratory endurance. This claim is supported by the fact that a habitually trained individual has a much lower rate of rise in lactic acid than in untrained counterpart working at the same workload. This, according to them, is due to high level of maximum capacity to transport oxygen Cardiorespiratory endurance is determined by factors such as 0_2 consumption (heart rate, cardiac output, stroke volume in pre-school children, as in older age groups).

When an increase in overload fails to elicit a significant increase in oxygen consumption, the highest value attained represents the VO_2Max. More importantly is the finding that 0_2 consumption linearly increased with exercise intensity (Astrand, 1996).

Jackson and Pollock, (1999) sought to validate distance run-tests for elementary school children, consisted of 866 boys and 903 girls. Test items included 50 yards dash and Time runs of 5-6-9 and 12 minutes durations. In the factor analysis, the 9 -and 12 -

minute run - tests and VO_2max from the laboratory performance of a sub sample of 22 boys and 25 girls revealed a validity of .82 and .71 respectively. Both 9 and 12 minute runs did not have a higher validity over the 6 minute run, as such the latter was recommended for elementary school children.

Using 6- 9 and 12 minute run tests on 40 college females, Custer and Chaloupka (1977) found a significant relationship between predicted $V0_2$ Max and performance in all the three runs. The investigator therefore felt that since the differences between correlation of 6 minute (r=.45) and 12 minute runs was not significant, the 6 minute run could be used, instead of the longer 12 minute run.

The study of Gwani (1986) to find the relationship between 6- and 12 minute runs, involving 60 male and female students of Ahmadu Bello University, Zaria, revealed a significant correlation ($P<0.05$) between the two runs ($r=0.778$) and on the basis of this finding, he recommended that 6 minute run-test can be used as 12 minute test to measure cardiorespiratory fitness.

It can clearly be understood that distance run-tests of 12 minute duration and above are suitable tests for cardio-respiratory fitness; longer distance run- tests are more valid than the shorter ones though there are hardly any significant differences between the two. In the present study, the 3.2km run test will be used for the research.

2.3.2 Muscular Strength

Muscular strength refers to the capacity of a muscle to develop activity tension, irrespective of the specific conditions under which tension is measured (Simonen et al; 2003). Strength is the ability of the body to apply force, it refers to the amount of force a muscle or group of muscles can exert. Nelson and Jensen, (1972) defined strength as "the ability of a body or a segment of it to apply force, one effort that can be exerted against a

resistance while Johnson and Nelson (1979) defined strength as the muscular force exerted against moveable and immoveable objects. Muscular strength can quickly be built up through static (isometric) exercises, and through dynamic (isotonic) exercises. The static exercises are carried out by exercising against an unyielding resistance. Static strength training is the preferred method of the so-called body builders, It can be measured by different kinds of dynamometers, while the dynamic strength exercises are carried out against a moveable resistance. Dynamic strength training is much more advantageous in physical conditioning (Jensen and Fisher, 1979).

Vigorous activities depend on the application of great force. Increased strength often contributes to better performance. In certain cases, improved strength can be the most important single contributor to better performance (Nelson and Jensen, 1972).

Strength building stimuli may be provided by:

a. Application of muscle tension against a fixed object
b. Specific exercises against body weight as in pull-ups or dips. (Additional weight may be added to the body weight).
c. Exercises against external movable resistance, such as weight training equipment and wall pulleys.
d. Hired manual labour or vigorous athletic performance.

All human movement depends upon a minimum level of strength. The importance of strength came to light mostly during the 2nd World Warwhen strength training was used for rehabilitation of hospital patients(Pollock et al, 1990). After the successful use of strength for rehabilitative purposes, other disciplines, including physical education, became interested in the use of strength to achieve a lot of specific objectives. Subsequently, much research was done to determine the effectiveness of strength training for improving athletic performances.

Massironi and Denolin(1985)reported that Delorrne and Wi1kins (1948) were instrumental to the acceptance of weight training as a modality for improving strength, especially for rehabilitative purposes. They further showed that increased strength was highly beneficial to certain athletic performances, and that heavy resistance exercise was the most expedient method of increasing strength.

Pollock et al (1990) is of the opinion that strength requirements differ for each sport or activity, and even by position within each sport but that specific standards for each sport have yet to be developed. Chado (1987) in his study of the difference between pull-ups and push-ups as a measure of dynamic strength and endurance of upper limb muscle groups showed that pull-ups are a good exercise for developing strength of the upper limb muscle groups. Massironi and Denolin(1985),stated that, in men, strength is considerably higher than in women, because in men the inherent capacity to increase muscle mass is much higher in men than in women. In this connection, the ambit action of testosterone plays a great role. They however stated further that a sex difference is strength increase in valid only for the muscles of the limbs, while strength increase and capacity for training of the muscles of the trunk are not so significantly different between sexes. Tinkle and Montoye (1961), Wessel and Nelson (1961), observed that there is decrease in the strength of muscle group when the contralateral limb is concurrently performing a maximal contraction.

Strength can be easily assessed by the one repetition maximum test (1-RM). The basic muscle group to be tested is selected and the individual is given a series of trials to determine the greatest weight that he can lift just once for that particular lift. Start with weight that the individual can lift comfortably, and then keep adding weight until he can lift the weight correctly just one time. If he can lift this weight more than once, more weight should be added until a true 1- RM is reached. Additional strength tests are

available using dynamometers, cable tensionmeters and elaborate force transducers and recorders. These tests, however, require expensive equipment and do not cause any substantial improvement in measurement accuracy (Wilmore, 1977).

Hockey (1977) stated that grip strength is the most commonly used measurement of muscular strength. This involves the subject squeezing the hand dynamometer and exerting a maximal force as the musculature contracts forcefully. The force exerted is recorded on the dial. Reliability coefficients had been reported in the 0.90s (Johnson and Nelson, 1979; Tinkle and Mofitoye, 1961).

According to Skinner et al (1990) regardless of how strength is assessed, several factors are important; both isometric and isotonic strength increase from 10 and 14 years to 20 to 29 years, remain unchanged until 40 and 49 years, and then decline. They further stated that lower strength in children is explained more by smaller muscle fibres. Reduced strength in old age is due to muscle atrophy (especially fast twitch), reduced number of muscle fibres and decreased ability to recruit fast twitch fibres. Although strength training in older men had increased their fibre size similar to that of younger men, strength was still less suggesting that some loss with age is neurological. At least a minimum of two 20-minute sessions per week that include exercises for all the major muscle groups are necessary to improve strength. Lifting weights is the most effective way to increase strength.

Fleishman (1964) defined dynamic strength as the ability to exert muscular force repeatedly or continuously during a period of time. He maintained that strength is made up of three main factors, which he called static strength, explosive strength and dynamic strength.Muscular endurance on the other hand is primarily dependent upon the various aspects of cardiac efficiency which in turn exerts influence on the performance of the other parts of the human organism. Muscular endurance is determined by the quality of

the muscles, the extensions of their capillary beds and the nerve mechanism supplying them (Fox et al; 1993; Phillip &Hornak; 1979).

Isokinetic dynamometer is used to obtain strength curve that is the maximal force of contraction possible at each point in the full range of motion. It has been observed that muscle increases in strength if called upon to increase its work load by what is ordinarily required of it. The amount of strength the muscle can exert determines the amount of physical task which it can accomplish Verducci, 1980) also emphasized that strength can be increased through using the principle of overload.

People need strength to perform their usual daily routines. The amount needed will differ from person to person depending on the type of activity each is engaged in. Strength-training programme must be specifically related to an individual's overall exercise objectives. Our bodies respond very specifically to exercise. Only the muscles fibers that are activated during a training session can increase in strength (Jackson et al; 1999). Strength of a scholar, for example, is different from that of a farmer, both, however, should have sufficient strength to carry them through their daily routine with minimum fatigue.

Women can increase in strength and muscle mass, but the average woman won't become as big or strong as the average man because men's testosterone levels, which kick in at puberty, enable them to build a larger muscle mass. But even if a woman makes the same relative improvement (percent increase) as a man, her absolute improvement (Pounds or kilograms of muscle) will be less (Pate et al; 1995). However, they went further to state that, regardless of gender, there is a wide range of 'trainability" in both men and women, meaning that some people can make greater improvements than others. Very few women can develop large muscles, in addition, their muscle mass will be less evident than that of a man because women tend to have more body fat.

Evidence has shown that standard performance in strength tests in children in different countries (Elnashar and Mayhew; 1984, Conger et al; 1982 and Maud and Foster, 1995), are related to several factors that are not common among Nigerian children. For example, in their study of relationships among selected attributes and three measures of upper body strength and endurance in elementary school children showed that the phenomenon of zero scores on test of upper body strength and endurance observed among children was considerably reduced with pull-up test. Some activities improve strength in children.It has been found that the more the muscles are exposed to regular participation in physical activities the higher their chances of developing more strength. Since strength tends to be specific for muscle or muscle groups, there is a high degree of strength in other parts of the body. However, a high degree of relationship between strength in different parts of the body may be a result of the specific strength development of a large number of muscles (AAPHERD, 2001; Pollock et al; 1990).

Muscular strength evaluation has generated a lot of interest because of its relationship to general fitness. It was, for example, the evaluation of the strength of U.S.A. children against their European counterparts that prompted the establishment of the President's Council on Physical Fitness and sports (Dinubile, 1993). Tests have been designed to evaluate strength and endurance of different muscle groups, such as sit-up, pull-up, standing broad jump. Some of the strength tests have had to be modified to improve validity of testing among children. In this study the one minute bent knee sit-up will be used for females and the two minute straight leg sit-up will be used for males.

2.3.3 Muscular Endurance

Muscularendurance is the ability of a muscle or group of muscles to sustain repeated contractions or to continue applying force against a fixed object. Push-ups are often used

to test endurance of arm and shoulder muscles (Dikki, 1992, Falk et al; 2001, Venkateswarlu, 2009).

Endurance is defined as resistance to fatigue and quick recovery after fatigue. The definition may apply to the body as a whole or to particular body systems such as the respiratory and circulatory systems or to a local area of the muscular system. Local muscle endurance is dependent upon the quality of the muscles, the extensiveness of their capillary beds and the nerve mechanisms supplying them. Compared to muscular strength, which is one maximum contraction, muscular endurance is the ability of a muscle to contact many times. It is the ability of a muscle to repeat identical movements under certain pressures, or to maintain a certain degree of tension over a period of time (Johnson and Nelson, 1979). Sharkey (1984) defined muscular endurance as the ability to persist. He added that it is the repetition of sub-maximal contractions or sub- maximal holding time.

It has been established that strength contributes to muscular endurance. The main difference between strength and endurance lies the level of tension or resistance applied to a muscle, and consequently the number of repetitions. Muscular endurance is primarily developed by resistance exercises (isotonic exercise as in weightlifting) done repeatedly so that the muscle develops capillaries to supply additional blood. According to Nelson and Johnson (1972), a person with a high level of endurance can persist in vigorous performance. When endurance gives way to fatigue as a result of muscular work, several elements diminish such as strength, timing and alertness. Increased endurance postpones the onset of fatigue. Thus endurance contributes to improved performance in activities where fatigue is a limiting factor.

In his study, Kanehisa et al (2006) observed a very high correlation between strength and absolute muscle endurance. He described absolute muscle endurance as the

amount of time a person can work against a certain resistance regardless of strength. He stated further that this is demonstrated when different persons work against the same resistance. The stronger ones are able to continue exercise longer than the weaker ones. But conversely, there is very little relationship between strength and relative muscle endurance. It is only when the resistance is adjusted to correspond to each person's strength that the weaker person displays as much endurance as the stronger one.

Muscular endurance has been measured in a number of different ways, including the greatest number of sit ups that can be performed in a fixed period of time (usually 30seconds or 1 minute) or the maximum number of pushups, pull ups or dips/bench press that can be performed continuously in an indefinite time period. According to Wilmore (1977), many of these tests penalize the participants who have long legs, short arms, or a heavy body weight. He suggested that, to eliminate this bias, a concept has evolved that uses a fixed percentage of the individual's body weight as the resistance. The individual lifts weight as many times as possible until he reaches the point of fatigue or exhaustion. He however stated that since this is a relatively new concept, norms or standards have yet to be established.

At least three 30-minute sessions each week that include exercises such as calisthenics, push-ups, sit-ups, pull-ups and weight training for all the major muscle groups should be performed (Simmonen et al; 2003).

2.3.4 Body Composition

Body composition refers to what our bodies are made of such as muscle and bone, organs and fat and other matter, such as connective tissue. Our bodies are composed of lean tissue and fat tissue. (Pate et al; 1995). It is divided into fatness (% body fat) and lean body mass (% lean body mass). Obesity is one of the greatest threats to good health

and a high quality of life. The terms “overweight” and “obesity” conjure up immediate images, but the understanding of the terms are often subjective and murky. Where overweight stops, obesity begins. The terms are related. For men and women the normal percent fat levels are 16% and 23% respectively (Wilmore et al; 1984). Astrand (1996) stated that excess body fat percent is a pathological condition; characterized by an accumulation of fat in excess of necessary or optimal body function.

The basic problem of body composition is enlargement of the body’s fat tissue. The upper limits of normal with regard to “desirable” levels of body fat are below 19% for males and below 25% for females. Desirable in this context is a fatness level that is compatible with functional health status. Beyond this level, there is complete saturation of adipose cells with lipids and, further cellular proliferation, leading to increased body weight (Morrow et al; 2000). Although it is not possible to state with absolute certainty that being over fat or obese is detrimental to health, excess body fat seems to be a co-existing factor ;:associated with different types of hazard to health (Bray et al; 1970 Gutin et al; 1998). They include disturbance in normal bodily function, decreased flexibility, heart attack and high blood pressure. Others include psychological effects as in suffering from prejudices and discrimination, and excess fat causes hardness of breathing. This results in diminished life expectancy.

Childhood body fat composition is a health risk factor is receiving increased attention partly because of the poor prognosis of an obese or over fat adult. It has been shown that approximately 80 percent of all over fat children remain so as adults (Maud and Foster, 1995). Some studies indicate that over fatness and obesity in early childhood may be one factor in over fatness and obesity in later life (Perez et al; 2003; Kemper et al; 2001).

It is currently unclear whether the amount of visceral fat accumulation seen in children is appropriate for the pediatric body size, and whether the observed extremes are related to extremes of general body fatness or other factors. For example, some studies suggest that intra abdominal adipose tissue (IAAT) in children increases in proportion to overall fatness (Goran et al; 1995) as seen in adults (Lemieur et al; 1993), whereas others have shown that obese children tend to accumulate subcutaneous and not visceral fat (Fox et al., 1993). Total fat mass is an important, determinant of intra abdominal adipose tissue (IAAT) (Lemieur et al; 1993).

In a study of adolescent girls, there were no significant correlations among circumference, waist-to-hip-ratio or trunk to - extremity abdominal skinfold explained 92% of the variance, in SAAT and traditional indices of central fat distribution such as the trunk to extremity skinfold ratio (0.49) for SAAT were lower. In forward multiple regression analysis, the abdominal skinfold explained 92% of the variance in SAAT. Mathew et al; (2000) conceded that the normal body weight between the 'ages of 25 and 30 years should not be exceeded throughout life. A weight in excess of 15% of that regarded as normal would be considered rendering toward excess body fat composition, whereas 25% above normal is grossly over fat or obese.

Buskirk (1974) and Getchell (1979) stated that lack of exercise and over eating may stimulate the formation of adipocytes, which subsequently cause over fatness. Similarly, a number of studies have shown that nutritional status, environment and hereditary factors influence fat body composition and blood pressure in adults (Powel et al; 1977). Skinfold measurement has been widely used in the determination of body fat percent. This is associated with more complex methods of determining body density. Skinfold measurement has been used largely in adolescent and adult populations with significant accuracy (Lohman, 1989; Lohman et al; 1985, and Pate et al; 1995).

Regression equations have also been formulated (Jackson and Pollock, 1999, Lohman, 1989; Billat et al; 2004). In the present study, four skinfold measurements (Bicep, triceps, subscapular and suprailiac were taken, BMI, conicity index and waist-hip-ration were also taken.

Body composition is largely dependent on dietary and exercise habits, sex and genetic factors (Edgerton, 1976). Maintaining the same view, Getchel (1976) stated that sex and genetic background do determine the distribution of fat deposit in the body. He observed that male and female humans do not put on fat in the same place and in the same percent. He further stressed that exercise is an important means for the control of body fat and the overall body build. This suggests that physical exercise could redistribute the body weight by making the muscle firmer and aiding the loss of excess body fat. Bouchard and Malina (1983) stated that excess fat is associated with increased risk of heart diseases and diabetes. They observed further than when fatis too small in the body, it creates problems. Vitamins that are fat-soluble, for example, depend on the required amount of body fatfor them to be absorbed. This then means that body fat should be maintained within the acceptable level so as to avoid either cardiovascular problems or deficiencies of fat-soluble vitamins. In societies where sedentary life style and intake of high calorie diets are prevalent, a large percentage of both adults and children store too much of fat, and many are over fat to the extent that they can be c1assified as obese. Mathew and Fox (1981) observed that active people possess considerable less total body fat and are less prone to cardiovascular diseases than their less active counterparts. Since the world is becoming more and more obsessed by body image, created by undesirable body weight, it becomes pertinent to provide scientific explanations relating to body composition. According to Venkateswarlu (1987), obesity starts early in childhood, and if this happens, the chances for adult obesity will be three

times greater than children of normal body weight. However, present evidence suggests that overfeeding early in life, particularly during infancy, causes the generation of an abnormally large number of adipose tissue cells which persist throughout later life (Strauss, 1984). Body fat is stored around the main organs of the body and within the muscles, but half is stored in a layer just beneath the skin, making over fatness a visible phenomena.

The measurement of bodycomposition is important since obesity is a known health problem worldwide. Obesity is associated to a higher incidence of numerous diseases, which include coronary heart disease, hypertension, diabetes, and cirrhosis of the liver and intestinal obstruction. According to Johnson and Nelson (1979), because of the risk f actors associated with obesity, insurance companies have been concerned with "proper" weight for many years. Wilmore (1977) stated that life insurance statistics tell us that man who is $15\,1/2$ under weight has the best chance of surviving a heart attack.

The evaluation of body composition permits qualification of the major structural components of the body muscle, bone and fat McArdle et al (1981). They further stated that there are general procedures used to evaluate body composition.

2.4 Physical Fitness Requirements of the Nigerian Armed Forces and Other World Militaries

2.4.1 Nigeria

Fitness training in the Nigerian Armed Forces is to maintain the individual's physical fitness for any task likely to face him or her in combat.The various departments of Physical Training in these Services are responsible for organizing Physical Training in their services. At the formation level, this is coordinated by the Sports and Physical Education Officers

(SPEO) while at the unit level, it is the Physical Training Instructors. However, like the others countries Armies, the responsibility for troops physically fitness is that of commanders. The Armed Forces Personnel participate in various Physical Training activities to improve and maintain their fitness standards. Like the other countries Armies, the Nigerian Armed Forces conducts an Annual Physical Efficiency Test (APET). The APET is also employed during recruitment and selection exercises.

2.4.2 United States of America

The U.S. Army carried out a physical fitness project beginning in 1977 and continued on and off until mid 1990s. The original programme evaluated the physical tasks of all occupations and clustered them by two demand criteria (lifting and aerobic) and three intensity levels, resulting in five clusters of occupations. All occupations were then classified into one of these clusters. Fitness tests and standards were developed to predict the acceptable performance of these cluster demands. This approach was later modified to use a modified Department of Labour Classification System using only lifting capacity in place of the military cluster standards. Neither system was every fully implemented (United States President's Council on Physical Fitness and Sports, 2005).

The U.S. Air force is the only service that has in place a job task requirement based physical test and standards for occupational selection and assignments, referred to as the strength aptitude test. It is a graded dynamic lifting test procedure administered at the time of induction at the military entrance processing stations. All Air Force occupations are assigned a passive standard on the strength aptitude test Occupational tasks are objectively measured and converted into an equivalent performance standard on the aptitude test. The aptitude test has been successful. Its translation to the other services is

limited by the fact that it is one dimensional (lifting) which is characteristic of Air force occupations (United States President's Council on Physical Fitness and Sports, 2005)).

2.4.3 Canada

Canada developed minimum physical fitness standards based on common tasks criteria for personnel younger than 35 years of age inCanadian Armed Forces. A random sample of 66 men and 144 women performed the exercise prescription. (EXPSES) test and five physically demanding tasks that stimulated common military tasks. Common cuttingscores were selected as the point at which 75% of the total weighted samplepassed each task. Since there were significant differences between the sexesin task performance and technique performance in 86% of personnel (United States President's Council on Physical Fitness and Sports, 2005)).

All Armed Forces, regardless of the country, have the followingphysical fitness standards which differ from unit to unit:

All of the services have different standards for males and females. Standards also vary according to age. The Marine Corps have the arm hang for women and the pull-up for men, (United States President's Council on Physical Fitness and Sports, 2005).

The Army, Air force, Navy and Marine Corps of the U.S. have grade point based system. For the Army, Navy and Marine Corps, weight is not particularly important. The Air force uses a waist measurement as part of its overall fitness test calculations (United States President's Council on Physical Fitness and Sports, 2005).

The Navy, Army and Marine Corps have weight standards similar to those of the Coast Guard. The Navy and the Marine Corps use only height as a factor in MAW, while the Coast Guard uses height and size. The Air force dropped their weight standard programme in lieu of waste measurement in their new fitness execution. The groups were

analyzed separately (United States President's Council on Physical Fitness and Sports, 2005)).

2.4.4 Britain

The British Army has an ongoing programme to develop physical selection standards for new recruits and trainees. The standards are designed to be job-related and gender free. Based on 132 identified tasks from 249 trades (occupations), four critical tasks were identified and qualified in the field. From this field analysis, four representative military (criterion) tasks performed at five intensity levels were constructed. The representative tasks were single lift, carry, repetitive lift and loaded march. Trade entry qualification was classified in terms of performance on these four tasks. Candidate physical fitness test items were then evaluated for their predictive power on the performance of the representative tasks and selected through multiple correlational analyses. Selected test items included height and weight, static arm endurance, static lift strength, dynamic lift strength, body fat and lean body mass, back extension strength, multistage aerobic fitness test, and full pull ups (dead hand pull-up). This test battery was found to predict successful testing policy because they felt that the fitness in conjunction with circumference measurement was a better indicator of overall fitness than weight or body composition alone (United States President's Council on Physical Fitness and Sports, 2005).

Medically, unfit personnel that are unable to complete the components of testing, are offered alternate cardio testing method. The British Air force has stationary bike and/or 1.0 mile walk alternative. The British army offers 50 yard swim, 6.2 mile stationary bike, 6.2 mile outdoor bike or 2.5 mile walk test. Traditionally running is the

cardio component used because it is easy to administer and does not require a unit to have special equipment.

All the Armed Services in the British Military have waivers for various medical illnesses and of various lengths depending on the medical condition (United States President's Council on Physical Fitness and Sports, 2005).

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The purpose of this study was to compare the physical fitness levels of personnel of the three Armed Services of the Nigerian Armed Forces in their cardio-respiratory endurance, muscular strength and endurance, Flexibility and body composition. The research design, population, sample and sampling technique instrumentation, tests, and statistical techniques used to achieve the purpose are described in this chapter.

3.1 Research Design

The research design adopted in this study was a field research design(statistical percentage) suggested by Thomas and Nelson (1996). In this design, a total of 90 male and43 female personnel of the Nigerian Armed Forces were randomly selected from the 900 male and 430 female personnel available within the catchment area. The participants were tested for cardio-respiratory endurance, muscular strength, muscular endurance and body composition to determine their physical fitness levels.

3.2 Population

The population of this study consisted of all personnel of the Nigerian Armed Forces resident in Mogadishu Cantonment, Asokoro, Abuja. The population was made up of 550 Army (350 male/200 female), 430 Air-Force (300 male/130 female), and 350 Navy (250 male/100 female) respectively.

3.3 Sample and Sampling Technique

Stratified Random Sampling Technique was used for selecting the sample in this study. This technique stratified the identified tri-service population into male and female groups. The sample was selected using simple random sampling technique, in which ten percent of the total numbers of male and female participants from each of the three Armed Services, resident in Mogadishu Cantonment, were picked randomly, as suggested by Thomas and Nelson (1996). Thus, 35 male/20 female Army Personnel,30male/13 female Air Force Personnel and 25 male/10 female Navy Personnel were selected. The sample therefore comprised of 90 male and 43 female Armed Forces Personnel, which gave a total sample of 133.

The sample earmarked for the study from the Nigerian Army was grouped into male and female. 350 pieces of paper were prepared, out of which 35 were numbered and the rest pieces of paper were left blank. Another 200 pieces of paper were prepared for the female sample out of which 20 were numbered and the rest pieces of paper were left blank. The Army personnel that picked numbers 1-35 from the male group and 1 to 20 from the female group were selected as the participants for the study. In the case of the Nigerian Air Force sample, they were also grouped into male and female. 300 pieces of paper were prepared for the male group, out of which 1-30 were numbered and the rest were left blank. Another 130 pieces of paper were prepared for the female, out of which from 1-13 were numbered and the rest were left blank. The Nigerian Air Force personnel that picked numbers 1 to 30 from the male group and 1 to 13 from the female group were selected as the participants for the study.

The sample earmarked for the study from the Nigerian Navy was grouped into male and female. 250 pieces of paper were prepared for the male group, out of which, 1-25 were numbered and the rest were left blank. Another 100 pieces of paper were prepared for the females, out of which 1-10 were numbered and the rest were left blank. The Navy Personnel that picked numbers 1 to 25 from the male group and 1 to 10 from the female group were selected as the participants for the study.

The number of participants selected for each of the Armed Service was ten percent (10%) of their total population. This 10% of the total population is statistically accepted in sampling technique (Thomas and Nelson, 1996; Kerlinger, 1986).

3.4 Instruments

The following instruments were used in this study for data collection.

3.4.1 3.2km Run/Walk Test

i. Stop watch: three stop watches manufactured by Jewel Sports Company. Britain (Sharkey, 1990). The stop watches are used for the timings of run/walk tests.

ii. Whistle: A whistle was used to start and stop the participants at the expiration of the 3.2kmruntest.

3.4.2 Push – Up Test: For measurement of muscular strength and muscular endurance of the flexors of the arms, shoulder girdle, and upper back muscles.

i. Stop watch for timing

ii. Whistle to stare and stop the subject at the expiration of 1 minute test period

iii. Floor mat

3.4.3 Sit-up Test: For measurement of muscular strength and endurance.

i. Stop watch for timing

ii. Whistle to start and stop the subject at the expiration of 1 minute test period.

iii. Floor mat

3.4.4 Body Composition

Measurement of Height:

Stadiometer – The HoltainStadiometer, made of two metal planes set at right angles with an adjustable pointed arrow head. (Model NJO 70-72. Manufactured by Pfizer Import – Export Inc. USA) was used to measure height in meters, while standing without shoes against the instrument (Rose and Marfelt-Jones, 1982).

Measurement of Weight:

Weight scale: A portable bathroom type Hanson Scale. Model B 180la made in Ireland, was used to measure the participant's weight in kilograms, while lightly dressed without adoring ornaments or wearing shoes (AAHPERD, 1990).

3.5 Tests

The following tests were conducted to measure the components of physical fitness:

1. 3.2km run/walk test for cardiorespiratory endurance
2. Push – up test for muscular strength
3. Sit – up test for muscular endurance
4. BMI to measure body composition

3.6 Test Description

3.6.1 3.2km Run/Walk Test:

This test was used to determine the participants cardio-respiratory endurance.

Procedure: The participants were given a brief description on how this test would be conducted. The participants were required to run along a marked out 3.2km route. The participants were to run at their own pace. Each of the participants may walk or stop completely when tired. The timing for each participant was recorded upon the completion of 3.2km run. The performance of the participants was measured against the Nigerian Armed Forces Standard Chart for the 3.2km Run Test at Appendix II.

3.6.2 Push -Up Test

This test was for the measurement of muscular strength and muscular endurance of the flexors of the arms, shoulder girdle and upper back muscles.

Procedure: The subjects placed their palms on the floor, arms stretched elbows locked with their knees raised from the floor and locked. Their body weights rest on the arms at the front and on the toes at the back. The back and the hip are kept straight in a horizontal plane. The body is pushed downwards and upwards by the flexors of the arms, shoulder girdle and upper back muscles. The subject continued to repent the exercise for 60 seconds.The performance of the participants was measured against the Nigerian Armed Forces Standard Chart for the Push-up Test at Appendix II.

Scoring: A good Push-up is scored each time the body is pushed downwards and Pulled upwards by the flexors of the arms, shoulder, girdle and upper back muscles in a straight horizontal plane. The score is the number of correct push up performed by the subject within 60 second as scored by the Research Assistant.

3.6.3 Sit – Up Test

This is to test the participants' muscular strength and endurance. The equipment used for this test were: mats, whistle and a stop watch. Each participant was allowed a minute trial.

Procedure: The particip[ants lied on their back with fingers clasped behind the neck and elbows touching the floor with the knee straight, and the toes pointing upwards, while the heel touched the ground. The body was pulled close to the thigh. The ankle was held firm to the ground by an assistant. The subject continued to repeat the exercise for 60 seconds.

Scoring: A good sit-up is scored each time an elbow touches the knee. The scores was the number of correct sit- ups performed by the participant within 60 seconds, as scored by the Research Assistant.The performance of the participants was measured against the Nigerian Armed Forces Standard Chart for the Sit-up Test at Appendix II.

3.6.4 Body Composition

Height and weight measurements:

This was measured in light indoor clothing, without shoes, braids or handsets. The participants were made to stand on a stadiometer two meters high from the platform with adjustable flat set- square placed above the head to reduce parallax error, and a bathroom weighing scale (Hanson Model 89 DK Blue) both within precision measurement to the nearest

0.1cm and 0.1kg respectively (Hlaing, et al; 2001, Wang et al; 2000, Shukla, et al; 2002; Gallo et al; 2005 and Venkateswarlu, 2007).

The participants were requested to step on the horizontal plane (for weight or height) with their bodies stretched upward to the fullest and their heads to the Frankfurt plane (Lohman, 1991, in Nicholas and Cacogan, 2008). The performance of the participants was measured against the Nigerian Armed Forces Standard Chart for BMI at Appendix II.

The formula for calculating Body Mass Index is:

$$BMI = wt\ (kg)/ht^2\ (m)$$

3.7 Sequence of Testing

To avoid fatigue on the subjects, the tests were conducted in the following order:

a. BMI measurements
b. Push – up Test
c. Sit – up Test
d. 3.2km Run/Walk Test

3.8 Research Assistants

Ten research assistants were used because of the number of participants involved in the study. They consisted of five physical education teachers and five PT Instructors. They were trained and a pretest was conducted to determine their level of understanding on how the test was to be conducted on the participants.

3.9 Statistical Techniques

The data collected were analyzed to test the hypothesis of the study using the following statistical techniques;

i. Descriptive statistics of mean, standard deviation and standard error to determine the average performance of the participants.

ii. One Way Analysis of Variance for differences among the Personnel of the Nigerian Armed Forces and among Sex in selected variables.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The purpose of this study was to find out and compare the physical fitness levels of Nigerian Armed Forces, which involved Nigerian Army, Nigerian Air force and Nigerian Navy. To achieve this purpose, the data collected were statistically analyzed, the results of which are presented and discussed in this chapter.

4.2 Results

Information regarding the mean age, height and weight of the three arms of the Nigerian armed forces and of the male and female participants of the Nigerian army, Air force and Navy are presented in Table 4.2.1.

Table 4.2.1: Demographic Characteristics of Age, Height and Weight of the Participants.

Variables	Army			Air Force			Navy		
	Male N = 35	Female N = 20	Total N= 55	Male N =30	Female N = 13	Total N =43	Male N =25	Female N = 10	Total N = 35
Age (years)	31.34	27.60	29.47	32.40	27.08	29.74	29.84	27.60	28.72
Height (mts)	1.66	1.64	1.65	1.65	1.65	1.65	1.65	1.65	1.65

Weight (kg)	66.29	60.50	63.395	63.27	62.23	62.75	63.40	62.30	62.85

Table 4.2.1 shows that the mean age of the Nigerian Army, Nigerian Air Force and Nigerian Navy Personnel was 29.47, 29.74 and 28.72 respectively. The mean age of the Nigerian Army male and female subjects was 31.34 and 27.60 respectively. The mean age of Nigerian Air Force male and female subjects was 32.40 and 27.08 respectively, whereas the mean age for Nigerian navy male and female subjects was 29.84 and 27.60 respectively. By the mean age, the Nigerian Air Force subjects were older compared to subjects from the other two Armed Services. Similarly, by their mean age, participants from Nigerian Navy were the youngest compare to the subjects from the other two Armed Services.

Table 4:2:1 also shows that the mean height of each of the three arms personnel was 1.65 meters. The male and female subjects of the Nigerian Army were taller (M=1.66; 1.64) than their counterparts from Nigerian Airforce and the Nigerian Navy (M=1.65; 1.65). The Nigerian Army Personnel were heavier (M=63.395) than their counterparts from Nigerian Airforce (M=62.75) and the Nigerian Navy (M=62.85kg).

Information regarding the mean scores of Nigerian Army, Nigerian Airforce and Nigerian Navy Personnel in cardio respiratory endurance, muscular strength and endurance, flexibility and body composition is shown in table 4:2:2

Table 4:2:2 Mean andStandard Deviation Scores of the Physical Fitness Test ofthe Participants

	Army	**Air Force**	**Navy**

	Male	Female	Mean Scores	Male	Female	Mean Scores	Male	Female	Mean Scores
Cardio-respiratory Endurance	2.38	2.06	2.22	2.07	1.93	2	2.13	1.57	1.85
Muscular Strength	24.60	19.70	22.15	20.50	19.69	20.095	21.68	18.80	20.24
Muscular Endurance	24.58	19.69	22.135	20.48	19.70	20.09	21.67	18.78	20.225
Body composition (BMI)	14.55	14.95	14.75	15.71	16.33	16.02	14.36	16.10	15.23

Table 4:2:2 shows that the Nigerian Army Personnel had better cardio respiratory endurance (M=2.22) than their counterparts from Nigerian Airforce (M=2.0) and Nigerian Navy (M=1.85). Similarly, the Nigerian Army Personnel had better scores in their muscular strength (M=22.15)than their counterparts from Nigerian Airforce (M=20.095) and Nigeria Navy (M=20.24). Nigerian Army personnel also had better scores in their muscular endurance (M=22.135) than their counterparts from Nigerian Airforce (M=20.09) and Nigerian Navy (M=20.225). In body composition, Nigerian Army Personnel (M=14.75) were better than their counterparts from the Nigerian Airforce (M=16.02) and Nigerian Navy (M=15.23)

Test of Hypothesis

Major hypothesis: There are no significant differences among the Nigerian Army, Nigerian Airforce and Nigerian Navy Personnel in their cardiorespiratory endurance, muscular strength and endurance, flexibility and body composition.

Sub hypothesis I. There is no significant difference among the Nigerian Army, Nigerian Airforce and Nigerian Navy Personnel in their cardio respiratory endurance. Sub hypothesis was tested by using One Way Analysis of variance, the results of which are shown in Table 4:2:3

Table 4:2:3 Results of One Way Analysis of Variance for differences in the Cardiorespiratory Endurance of the Participants

Source	Sum of Squares	DF	Mean Square	F	Sig.
Between Groups	2.256	2	1.128	3.581	.031
Within Groups	40.954	130	.315		
Total	43.211	132			

$F(2,130) = 3.00 < 0.05$

The result in Table 4:2:3 shows significant differences among the three arms of the Nigerian Armed Forces in their cardiorespiratory endurance as tested by the 3.2km run/walk test.

Table 4:2:4: Result of the Scheffe'sPost hoc Test on the mean scores for differences in the Cardio-respiratory Endurance of the Participants

Forces(I)	Forces(J)	Mean Difference (I-J)	Std. Error	Sig
Army	Air force	.23433	.11425	.126
	Navy	.29286	.12136	.054
Air force	Army	-.23433	.11425	.126
	Navy	.05853	.12778	.900
Navy	Army	-.29286	.12136	.054
	Air force	-.05853	.12778	.900

*The mean difference is significant at the .05 level

Table 4:2:4, the Scheffe's Post hoc Test revealed that these significant differences were due to the highest scores of Nigerian Army Personnel compared with their counterparts from

Nigerian Navy. However, the difference in cardiorespiratory endurance between Nigerian Army and Nigerian Airforcewas not significant.

Sub hypothesis II. There is no significant difference amongst the Nigerian Armed Forces personnel in their muscular strength.

Sub hypothesis II was tested using One Way Analysis of Variance, the results of which are shown in Table 4:2:5

Table 4:2:5: Results of One Way Analysis of Variance for differences in Muscular Strength of the participants

Source	Sum of Squares	DF	Mean Square	F	Sig.
Between Groups	176.504	2	88.252	3.901	.023
Within Groups	2940.654	130	22.620		
Total	3117.158	132			

F (2 130) = 3.00 < 0.05

Table4:2:5 shows significant differences among the three arms of the Nigerian Armed Forces in their muscular strength.

Table 4:2:6 Result of the Scheffe's Post hoc Test for differences in the Mean Scores for Muscular Strength of the Participants

Forces(I)	Forces(J)	Mean Difference (I-J)	Std. Error	Sig.
Army	Air force	2.562	.968	.033
	Navy	1.961	1.028	.166
Air force	Army	-2.562	.968	.033

	Navy	-.601	1.083	.857
Navy	Army Air force	-1.961 .601	1.028 1.083	.166 .857

* The mean difference is significant at the .05 level

Scheffe'sPost hoc Test (Table 4:2:6) revealed that significant differences was located between the Nigerian Army Personnel which had better muscular strength than the Nigerian Airforce Personnel. However, the difference between the Nigerian Army Personnel and the Nigerian Navy Personnel was insignificant.

Sub hypothesis III. There is no significant difference amongst the Nigerian Armed Forces personnel in their muscular endurance.

Sub hypothesis III was tested using One Way Analysis of Variance, the results of which are shown in Table 4:2:7

Table 4:2:7 Results of One Way Analysis of Variance for differences in the Muscular Enduranceof the Participants

Source	Sum of Squares	DF	Mean Square	F	Sig.
Between Groups	176.504	2	88.252	3.901	.023
Within Groups	2940.654	130	22.620		
Total	3117.158	132			

$F\ (2, 130) = 3.00 < 0.05$

Table 4:2:7 shows significant differences among the three arms of the Nigerian Armed Forces in their muscular endurance,

Table 4:2:8: Result of the Scheffe's Post hoc Test for differences in the Mean Scores for Muscular Endurance of the Participants

Forces(I)	Forces(J)	Mean Difference (I-J)	Std. Error	Sig.
Army	Air force	2.562	.968	.033
	Navy	1.961	1.028	.166
Air force	Army	-2.562	.968	.033
	Navy	-.601	1.083	.857
Navy	Army	-1.961	1.028	.166
	Air force	.601	1.083	.857

* The mean difference is significant at the .05 level

Scheffe's Post hoc Test (Table 4:2:8) revealed that significant differences was located between the Nigerian Army Personnel which had better muscular strength than the Nigerian Airforce Personnel. However, the difference between the Nigerian Army Personnel and the Nigerian Navy Personnel was insignificant.

Sub hypothesis IV: There is no significant difference among the Nigerian Armed Forces Personnel in their body composition.

Sub hypothesis IV was tested using One Way Analysis of Variance, the results of which are shown in Table 4:2:9

Table 4:2:9 Results of One Way Analysis of Variance for differences in the body composition of the Participants

Source	Sum of Squares	DF	Mean Square	F	Sig.
Between Groups	38.249	2	19.124	2.449	.090
Within Groups	1015.006	130	7.808		
Total	1053.255	132			

$F(2,130) = 3.00 < 0.05$

Table 4:2:9show insignificant differences among the Nigerian Armed Forces Personnel in their body composition.

The main purpose of this study was to compare the physical fitness level of the personnel in the three arms of the Nigerian Armed Forces no attempt was made to find the significant level of the differences between male and female subjects of each arm of the Nigerian armed forces. However, the general trend was that the male subjects had better scores in all the variables than the female subjects of the three arms of the Nigerian Armed Forces.

Discussion

The purpose of this study was to compare the physical fitness of personnel of the Nigerian Armed Forces (Nigerian Army, Nigerian Airforceand Nigerian Navy). The Physical fitness components tested were cardio-respiratory endurance, muscular strength, muscular endurance and body composition. The findings of the study revealed significant differences among the personnel of the Nigerian Army, Nigerian Airforce and the Nigerian Navy in their physical fitness components which are discussed in this section.

This study revealed significant differences among the three arms of the Nigerian Armed Forces in cardio-respiratory endurance. The Nigerian Army Personal had better cardio-

respiratory endurance than the Nigerian Airforce and the Nigerian Navy Personnel. The Nigerian Airforce Personnel however, had greater cardio-respiratory endurance than the Nigerian Navy Personnel (See Table 4:2:2). This may be attributed to the fact that the intensity, frequency and duration of physical training of the Nigerian Army were more than those of the airforce and the Nigerian Navy. These finding is in agreement with the finding of Suleiman (2008), which showed higher level of cardio-respiratory endurance among the Nigerian Army Personnel compared with their counterparts in the Nigerian Airforce and the Nigerian Navy. This finding maybe justified on the basis of the fact that the cardio-respiratory adaptation to training depends largely on the intensity, duration and mode of training (Katch, et al; 2010; Venkateswarlu, 1990, 2009, 2010). This is attributable to increased capacity to utilize oxygen with increased training and enhanced cardiovascular dynamics in terms of improved circulation and increased red blood cells concentration that promote oxygen transport. Studies conducted elsewhere have conclusively shown that cardio-respiratory endurance improves better with increased training (Astrand, 1996; Katch; 2010; Venkateswarlu; 2010). The results of this study also showed that the male personnel of the Nigerian Army had greater cardiorespiratory endurance than their female counterparts which supports the earlier findings of Matthew and Fox (1981), Pollock et al (1984). That sex difference in cardio-respiratory endurance response to training maybe attributed not exactly to the difference in the capacity to adapt, but to the inherent morphological differences between male and female subjects. It is well known that a female has a smaller heart and lower circulation than their male counterpart.

Muscular strength refers to the capacity of a muscle to develop activity tension, irrespective of the specific condition under which tension is measured. Muscle endurance on the other hand, is the ability of a muscle or group of muscles to sustain repeated contractions or to continue applying force against a fixed object. (Simmonen et al; 2003).

Strength is defined as the ability of the body to apply force. It refers to the amount of force a muscle, or group of muscles can exert. Endurance is defined as resistance to fatigue and quick recovery after fatigue. The definition may apply to the body as a whole or to particular body systems such as respiratory circulatory systems or to a lot area of the muscle system. This study revealed significant difference among the three arms of the Nigerian Armed Forces in their muscular endurance, and muscular strength. This is because the Nigerian army personnel on the average had a higher score for the push – ups and for the sit – ups compared with the scores of the Nigerian Air force and the Nigerian Navy, while the Nigerian Air force had a higher score for push-ups and sit- ups respectively than the Nigerian Navy. These finding is in agreement with that of the U.S army (Robinson et al; 2001), which shows a higher scores in push - up and sit- up among the Nigerian Army personnel as compared with their counterparts from the Nigerian Air force and the Nigerian Navy respectively. This finding may be attributed to the fact that the Nigerian Army personnel are involved in more demanding physical tasks than their counterparts in the Nigerian Air force and the Nigerian Navy. This finding may be justified based on the fact that lifting weights is the most effective way to increase strength training (Chado, 1987; Venkateswarlu, 2009, 2010). This study also revealed that the Nigerian Armed Forces men had better score than their female counterparts, which supported the earlier findings. The sex difference in muscular strength and endurance may be attributed to the morphological difference between male and female subjects, as the female subjects had lesser strength and therefore had lesser score in their push-ups and sit –ups respectively.

Body Composition:

Body composition refers to what our bodies are made of, muscle and bone, organs and fat, and others matter, such as connective tissue. Previous studies have shown that physical activities promote favourable body composition. (Skinner et al; 1990). This study revealed no significant difference among the three arms of the Nigerian armed forces in their body composition obtained by the computation of BMI. The result of this study has shown favourable body composition of the three arms of the Nigerian armed forces. This can be attributed to the fact that the body weight of the three armed forces was very similar. This finding is in agreement with that of Morrow et al; (2000) which shows that it is not possible to state with absolute certainty that being over fat is detrimental to health. This may be justified on the basis of the fact that the three arms of the Nigerian armed forces are always involved in physical activities, which suggests that physical exercise could redistribute the body weight by making the muscle firmer and aiding the loss of excess body fat (Katch et al; 2010; Venkateswarlu, 1990,2009).

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary:

This study was carried out to compare the differences in the physical fitness of the male and female personnel of the Nigerian Armed Forces. The study focused primarily on the components of health related fitness which arecardio-respiratory endurance, muscular strength, muscular endurance and body composition. Generally, in most Armed Forces of the world, these components form the basis for determining personnel physical fitness levels. Cardio-respiratory endurance was determined by 3.2km run test, muscular strength by push - uptest and muscular endurance by sit-uptest.Body composition was determined by the computation of BMI. A total of 1,330 male and female participants were selected from the three Armed Services. This comprised of 350 male and 200 female participants from the Nigerian Army, 300 male and 130 female participants from the Nigerian Airforce and 250 male and 100 female participants from the Nigerian Navy. The age, height and weight of all the subjects were recorded and the means

scores of which were 29.31 years, 1.65 metres and 63kg respectively. The participants were then tested for cardio-respiratory endurance, muscular strength, muscular endurance and body composition. The collected data were statistically analyzed to test the hypothesis of the study. The findings of the study showed the following:

a. Nigerian Army Personnel performed significantly better in cardio-respiratory endurance than their counterparts from the Nigerian Airforce and the Nigerian Navy.

b. Nigerian Army personnel had significantly greater muscular strength and muscular endurance.

c. There were no significant differences among the Nigerian Armed Forces personnel in their body composition.

5.2 CONCLUSION

Within the limitations of this study and from the results obtained, the following conclusions were made:

1. The male and female personnel of the Nigerian Army had greater cardio-respiratory endurance than their counterparts from the Nigerian Navy and Nigerian Air Force.

2. Male participants from the Nigerian Army had better muscular strength and muscular endurance than their counterparts from the Nigerian Navy and Nigerian Air Force. However, female participants from the Nigerian Navy had slightly better muscular strength and muscular endurance than their counterparts from the Nigerian Army and Nigerian Air Force.

3. Generally, the male participants from the 3 Armed Services had better cardio-respiratory endurance than their female counterparts.

4. The male personnel of the Nigerian Navy had better body composition than those from the Nigerian Army and Nigerian Air Force. The female personnel of the Nigerian Army were however better in body composition than their counterparts from the Nigerian Navy and Nigerian Airforce.

5.3 RECOMMENDATIONS

On the basis of the findings of this study, the following recommendations are made:

1. During joint military operations, the volume of physically demanding tasks to be assigned to the 3 Armed Services should take the following order:

   a. Nigerian Army.

   b. Nigerian Navy.

   c. Nigerian Airforce.

2. The Armed Services should strengthen the physical fitness training programmes of their female personnel.

3. The 3 Armed Services should embark on weight control programmes for their personnel.

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APPENDIX 1

DEPARTMENT OF PHYSICAL AND HEALTH EDUCATION, AHMADU BELLO UNIVERSITY, ZARIA, NIGERIA

INFORMED CONSENT FORM

In order to participate in this test to determine my health and fitness status, I……. a subject do undersigned and voluntarily accepted to partake in the research conducted on Comparative study of the physical fitness of Nigerian Armed Forces Personnel. In Mogadishu Cantonment Abuja commencing as from …… date……

As part of the participant in the test, I understand and agree that during the participation, pains and discomforts may arise during and after the exercise. I have been duly informed and instructed to stop whenever such conditions become severe and unbearable.

……. ……

Candidate's signature Date

APPENDIX II

NIGERIAN ARMED FORCES STANDARD PHYSICAL FITNESS CHARTS

3.2 KM Run (FEMALE)

Serial	Time in Mins/Sec	Age Group								Remarks
		17-22	23-29	30-34	35-40	41-45	46-50	51-55	56 & above	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1.	19.00	100%								
2.	19.30	90%	100%							
3.	20.00	80%	90%	100%						
4.	20.30	70%	80%	90%	100%					
5.	21.00	60%	70%	80%	90%	100%				
6.	21.30	50%	60%	70%	80%	90%	100%			
7.	22.00	40%	50%	60%	70%	80%	90%	100%		
8.	22.30	30%	40%	50%	60%	70%	80%	90%	100%	
9.	23.00		30%	40%	50%	60%	70%	80%	90%	
10.	23.30			30%	40%	50%	60%	70%	80%	
11.	24.00				30%	40%	50%	60%	70%	

12.	24.30					30%	40%	50%	60%	
13.	25.00						30%	40%	50%	
14.	25.30							30%	40%	
15.	26.00								30%	
16.	26.30									

Note: 3.2Km Carries 20% of the Physical Efficiency Test
Source: Nigerian Armed Forces Physical Training Pamphlet (2nd Edition, 1996)

3.2 KM Run (MALE)

Serial	Time (Mins/Sec)	Age Group								Remarks
		17-22	23-29	30-34	35-40	41-45	46-50	51-55	56 & above	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1.	17.00	100%								
2.	17.30	90%	100%							
3.	18.00	80%	90%	100%						
4.	18.30	70%	80%	90%	100%					

5.	19.00	60%	70%	80%	90%	100%				
6.	19.30	50%	60%	70%	80%	90%	100%			
7.	20.00	40%	50%	60%	70%	80%	90%	100%		
8.	20.30	30%	40%	50%	60%	70%	80%	90%	100%	
9.	21.00		30%	40%	50%	60%	70%	80%	90%	
10.	21.30			30%	40%	50%	60%	70%	80%	
11.	22.00				30%	40%	50%	60%	70%	
12.	22.30					30%	40%	50%	60%	
13.	23.00						30%	40%	50%	
14.	23.30							30%	40%	
15.	24.00								30%	

Source: Nigerian Armed Forces Physical Training Pamphlet (2nd Edition, 1996)

PUSH – UP (MALE)

Serial	Repetition	Age Group								Remarks
		17-22	23-29	30-34	35-40	41-45	46-50	51-55	56 & above	

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1.	70		100%							
2.	60	100%	90%	100%						
3.	50	90%	80%	90%	100%					
4.	40	80%	70%	80%	90%	100%				
5.	30	70%	60%	70%	80%	90%	100%	100%		
6.	20	60%	50%	60%	70%	80%	90%	90%	100%	
7.	10	50%	40%	50%	60%	70%	80%	80%	90%	

Note: Push – Ups are done in a one –minute time period
Push – Ups carries 15% of the Physical Efficiency Test.

Source: Nigerian Armed Forces Physical Training Pamphlet (2nd Edition, 1996)

PUSH _ UP (FEMALE)

Serial	Repetition	Age Group								Remarks
		17-22	23-29	30-34	35-40	41-45	46-50	51-55	56 & above	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1.	60		100%							
2.	50	100%	90%	100%						
3.	40	90%	80%	90%	100%					
4.	30	80%	70%	80%	90%	100%				
5.	20	70%	60%	70%	80%	90%	100%	100%		
6.	10	60%	50%	60%	70%	80%	90%	90%	100%	

Source: Nigerian Armed Forces Physical Training Pamphlet (2nd Edition, 1996)

SIT – UP (MALE & FEMALE)

Serial	Repetition	Age Group								Remarks
		17-22	23-29	30-34	35-40	41-45	46-50	51-55	56 & above	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1.	70		100%							
2.	60	100%	90%	100%						
3.	50	90%	80%	90%	100%					
4.	40	80%	70%	80%	90%	100%				
5.	30	70%	60%	70%	80%	90%	100%	100%		
6.	20	60%		60%	70%	80%	90%	90%	100%	
7.	10	500%	40%	50%	60%	70%	80%	80%	90%	

Note: Sit – Ups are done in a one –minute time period
Sit – Ups carries 15% of the Physical Efficiency Test.

Source: Nigerian Armed Forces Physical Training Pamphlet (2nd Edition, 1996)

BODY MASS INDEX (BMI) STANDARD CHART

	Male							Female						
Serial	Age	Excellent 100%	Good 85%	Moderate 75%	Over weight 60%	Significantly Overweight 45%	Remarks	Serial	Age	Excellent 100%	Good 85%	Moderate 75%	Over weight 60%	Significantly Overweight 45%
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(M)	(n)	(o)
1.	≤ 19	12.0	12.1-17.0	17.1-22.0	22.1-27.0	≥ 27.1		1.	≤ 19	17.0	17.1-22.0	22.1-27.0	27.1-32.0	≥ 32.1
2.	20-29	13.0	13.1-18.0	18.1-23.0	23.1-28.0	≥ 28.1		2.	20-29	18.0	18.1-23.0	23.1-28.0	28.1-33.0	≥ 33.1
3.	30-39	14.0	14.1-19.0	19.1-24.0	24.1-29.0	≥ 29.1		3.	30-39	19.0	19.1-24.0	24.1-29.0	29.1-34.0	≥ 34.1
4.	40-49	15.0	15.1-20.0	20.1-25.0	25.1-30.0	≥ 30.1		4.	40-49	20.0	20.1-25.0	25.1-30.0	30.1-35.0	≥ 35.1
5.	≥ 50	16.0	16.1-21.0	21.1-26.0	26.1-31.0	≥ 31.1		5.	≥ 50	21.0	21.1-26.0	26.1-31.0	31.1-36.0	≥ 36.1

Note:

- **BMI = $\frac{\text{Weight (in Kg)}}{\text{Height (in m}^2\text{)}}$**
- BMI carries 30% of Physical Efficiency Test.

Source: Nigerian Armed Forces Physical Training Pamphlet (2nd Edition, 1996)