EFFECTS OF 10-WEEK ROPE SKIPPING EXERCISE ON THE HEALTH RELATED FITNESS COMPONENTS OF CIVILIAN FEMALE TEACHERS IN NIGERIA DEFENCE ACADEMY STAFF SCHOOL KADUNA, KADUNA STATE.

BY

SORIYAN YETUNDE OLUFUNTO
SPS/11/MHE/00030

A DISSERTATION SUBMITTED TO THE DEPARTMENT OF PHYSICAL AND HEALTH EDUCATION, BAYERO UNIVERSITY, KANO, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE DEGREE (M.Sc.) IN PHYSICAL AND HEALTH EDUCATION (EXERCISE AND SPORTS SCIENCE)

SUPERVISOR:

Dr. A. I. DARKI

JANUARY, 2017.

DECLARATION

The researcher hereby declares that this work is the product of her own effort, undertaken under the supervision of Dr. A. I. Darki. She also declares that to the best of her knowledge, it has not been presented and will not be presented elsewhere for the award of degree or certificate. All the sources of information herein have been duly acknowledged.

Sign_____ Date_____

Soriyan Yetunde Olufunto
(SPS/11/MHE/00030)

CERTIFICATION

This is to certify that the research work for this dissertation and the subsequent preparation of this dissertation by Soriyan Yetunde Olufunto (SPS/11/MHE/00030) was carried out under my supervision.

_____	_____
Dr. A. I. Darki (Supervisor)	Date
_____	_____
Dr. M. Njidda (Head of Department)	Date

APPROVAL PAGE

This research work has been examined and approved as meeting the requirements for the award of Masters of Science degree (M.Sc) in Physical and Health Education (Exercise and Sports Science).

_____ _____
Date
(External examiner)

_____ _____
Prof. L. M. Emiola Date
(Internal examiner)

_____ _____
Dr. A. I. Darki Date
(Supervisor)

_____ _____
Dr. Musa Njidda Date
(Head of Department)

_____ _____
Dr. Ya'u Usman Haruna Date
(Faculty of Education Representative to SPS Board)

ACKNOWLEDGEMENTS

All glory, honour and adoration be to the Almighty for making this research work a reality. The researcher thanks the effort of her supervisor; Dr. A. I. Darki who took his time to read through the manuscripts and made the necessary corrections despite his tight schedule of duty.

The researcher is indebted to Head of Department, Physical and Health Education; Dr. Musa Njidda, also indebted to all academic staff of the department such as; Prof. Lasun Emiola, Prof. M.G Yakasai, Prof. O.O Oyerinde Prof. Rabiu Muhammad, Dr. Badamasi Lawal, Dr. Sadiq Ismaila, Dr. A.T Yusuf, Dr. Musa Sa'ad Muhammad, Dr. A.M Getso, Dr. M.J Yakasai, Dr. L.I Yazid and Dr. A.M. Madaki, Dr. A.I Hassan, Mal. M.H Darma, Mrs. H.U Umar, Mal. A. Aniki and Mal. K.S Kankarofi, for their moral and academic support during the period of her study in Bayero University, Kano. The researcher also thanks the Departmental Secretary (Haj. Nusrat Abdulsalam) for her support in one way or the other, during the researcher study in the department. Sweetest appreciation goes to her "Onitemi" Ayobami Okunlola. Pastor Gabriel of Mountain of Fire Miracles Ministries who despite short notice and in spite of his many commitments, finds time to pray for her. Furthermore, the researcher wishes to thank all the civilian female teachers of NDA staff school Kaduna, who volunteer to participate in this research work. Their efforts are hereby acknowledged with gratitude. Real appreciation goes to Dr. Omolola, (NDA PT WING). Malam Aminu Bashir (Ogah Bash), who took their time to put the researcher through many difficult assignments.

Among others who through their constants prayers greatly contributed to the successful completion of the course, are the researcher's loving parents Chief and Chief Mrs. Samuel Olusoga Soriyan. The researcher cannot in a short-while forget her junior ones who bear her absence from home since the sojourn in the Northern part of Nigeria with patience and understanding. The researcher's sincere appreciation goes to Ife, Emmanuel and

Epiphany on whose companionship she overcome boredom. Lastly, the researcher appreciated the wonderful concern of her children Engineer Omar Arinze, Engineer and Mrs. Olakunle & Amara Meduwon and Olufunke Okunlola.

Thank you all and God bless.

DEDICATION

This dissertation is dedicated to my father Chief Samuel Olusoga Soriyan and my children; Arinze Omar, Amarachi and Medunwon.

TABLE OF CONTENTS

PAGES

LIST OF TABLES

ABSTRACT

The purpose of this study was to determine the effects of ten weeks regular rope skipping exercise on the health related fitness of female civilian teachers of NDA staff school of Kaduna State In order to achieve the purpose of this study, three research questions were raised and three hypotheses were tested. Pre-test, post-test, experimental and control groups design method was used in this study. The population of the study comprises all female civilian teachers in Nigerian defense Academy Staff School of Kaduna State. Simple random sampling technique was used to select sixty (60) apparently healthy female civilian teachers in NDA Kaduna (30 in experimental and 30 in control groups). The exercise was a rope skipping, 10 minutes per session, 3 times per week (Monday, Wednesday and Fridays). Week 1^{st}-4^{th} was conducted at 50-55% Vo2 max, Weeks 5^{th}-8^{th} at 55-60% Vo2 Max, week 9^{th}-10^{th} at 60-65% Vo2 Max intensity. The height, weight, flexibility, BMI and heart rate of the participants were measured. Descriptive statistic of mean and standard was used to describe the physical characteristics of the participants while Analysis of Covariance (ANCOVA) was used to test all the three formulated hypotheses at the 0.05 level of significance. The findings of this study revealed that there was significant effect of the 10 weeks rope skipping exercise on the cardiovascular parameters of the civilian female teachers in Nigerian defence academy staff school Kaduna. There was significant effect of the 10 weeks rope skipping exercise on the trunk flexibility of civilian female teachers in NDA Kaduna. The 10 weeks rope skipping exercise produces no effect on the BMI of the subject. It was recommended, among others, that school authority should use the rope skipping exercise as part of school fitness programmes for the female teachers in Nigerian defence academy staff school.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Physical fitness, physical activity and exercise are terms that describe different concepts. However they are similar to one another. Physical activity is defined as any bodily movement produced by the skeletal muscles and resulting in a substantial increase in the energy expenditure that can be measured in kilo calories (Pollock, 1998). More so physical activity in daily life can be categorized into occupational, sports, conditioning, household or other activities whereas exercise is a form of physical activity that is planned, structured and repetitive and can also have a final or an intermediate objective with evaluative processes to measure improvement or otherwise. In addition, physical fitness is a set of attributes that are either health or skill related. These qualities effectively allow the participant to act for a relative longer time without fatigue and still have a reserved energy for further mechanical advantages (World Health Organization, 2002).

According to Emiola (2008), physical exercise is any physical activity that is planned, structured, repetitive and purposive (Unlike play), in the sense that improvement or maintenance of physical fitness is an objective. Benerth and Phem (1996) considered fitness with the following component: aerobic capacity, muscular strength, muscular endurance, flexibility and body composition. Brownwell and Stinkard (2008); Ischemed (2007), further emphasized that physical exercise is the best means by which degenerative diseases like obesity, diabetes, overweight and coronary heart disease can be controlled. Health related fitness components are factors that describe how well the systems of the body works; such as cardio-vascular system, trunk flexibility, body max index. Health related fitness components are the bedrock of being physically fit. Physical fitness indicates a specific component which has been measured to reflect a person's fitness level (Carton, 1997). Women of all ages had

improved the quality of their lives and also reduced the risk of developing coronary heart diseases, hypertension, cancer and diabetes by participating in moderate fitness activities. Daily exercise has also enhanced so many people's mental wellbeing and promoted healthy musculo-skeletal functions (American College of Sports and Medicine, 2006).

The study of Serbescu, Flora, Hantiu, Greene, Benhamou and Courteix (2006), found that after an exercise training intervention, improvements were seen in body composition or lipids and lipoproteins that were measured as health outcomes, which in theory are not physiologically linked to flexibility. Inconsistent results were found with regards to the association between flexibility (as measured by sit-and-reach) and body composition. Aires, Mendonca, Silva, Gaya, Santos, Ribeiro and Mota (2010), also found no association between performance on the sit-and-reach test and BMI. These inconsistencies could be due to differences in study designs, such as the length of the studies, the ages of the children, or the appropriateness of the health outcome itself (body composition). body mass index is a simple index of weight and height that is commonly used to classify under weight, over weight and obesity in adult. It is defined as the weight in kilogram divided by the square of the height in meters (kg/rn2). To calculate these parameters, one need tools like the weighing scale to measure weight and a tape measure for the height Global data base on body mass index (2013).

Melby, Scholl, Edward and Bullough (1993), admitted that more and more people are starting to join gym club in an effort to lose weight and get in shape; this may not be that necessary if one can get a great workout just using the skipping rope to improve the health and quality of life. Rope skipping exercise was designed to maintain cardio vascular fitness, improve health status and to maintain proportionate body size (Johnson & Updyke, 1996). Rope skipping contributes to optimum health and quality of life (Fargard, 2001). Rope skipping is one of the most popular and age friendly form of exercise that can improve the

cardio vascular strength and keep one relaxed and happy (Elizerberth, 2004). Also, rope skipping exercise helps women to burn calonies and reduce body weight. (Unpublished material by Dr. B. Babajide Omolola NDA Kaduna, 2013)

Siddiq, Nessa and Hassan (2010), opined that rope skipping is the most suitable exercise for those that are physically inactive, beginners and fun seekers. According to Michel (2008), cardio respiratory endurance entails ability to prolonged muscular work and this depends on efficient supply of oxygen to the working muscle where vital system like the circulatory and respiratory system play major roles. Endurance according to Daul, Schaffer and Daul (2004), is described as sufficient determinant of performance and it is the most important component of fitness. It reflects the state of some of the physiological systems that are vital to the general health of an individual. Howley and Frank (2007), stated that flexibility is the range of motion around a joint, it is the capability of the joint to move through a normal range of motion to prevent injuries, it requires range of motion without discomfort. Every physically active individual requires a degree of flexibility which can be measured with a device called Goniometer (Knudson & McHugh, 2000).

Astrand (1986), observed that women who exercise regularly are capable of doing greater effort and resist fatigue better than inactive individuals. Rope skipping enables higher maximal cardiac output with less increase in pulse rate and blood pressure, during 10 minute rope skip of sub-maximal exercise (Fargard, 2001). It also lowers blood lactate, which means more capacity to perform more work aerobically and the ability to push oneself to a higher blood lactate level before exhaustion. Exercise also allows quicker and better heat dissipation during sub-maximal exertion. Onekata (2001) stated that, during the rope skipping exercises, the body's circulatory and respiratory system (heart and lung) must supply fuel and oxygen to the muscles, providing cardio respiratory endurance through rope skip and other supportive exercises can help reduce the risk of heart diseases, cancer and also help in body weight

control and maintenance. In addition, regular rope skip makes the cardio and respiratory systems more efficient by enlarging the heart muscle, enabling more blood to be pumped with each stroke and also increase the number of small arteries in trained skeletal muscle, which may further supply more blood to the working muscles. Rope skip regularly improves respiratory system by increasing the amount of oxygen that is inhale, absorbed and distributed to body tissues via the alveoli tree. Also, cardio-respiratory fitness is of much benefit to the individual, such as reducing risk of heart disease, lung cancer, diabetes, stroke, improve sexual drive, and decreasing labour pain during child delivery (Onekata, 2001).

According to Lopez, Mathers, Ezzati, Jamison and Murray (2006), a sedentary lifestyle is a type of lifestyle with no or irregular physical activity. A female who lives a sedentary lifestyle may be known as Fat. Sedentary activities include sitting, reading, watching television, playing video games and computer use for much of the day with little or no vigorous physical exercise. A sedentary lifestyle can contribute to many preventable causes of death. Screen time is the amount of time a person spends watching a screen such as a television, computer monitor, or mobile device. Excessive screen time is linked to negative health consequences. Also, lack of physical activity is one of the leading causes of preventable death worldwide. (Fargard 2001).

According to Wynne (2007), fitness assessments can diagnose an individual's level of fitness and also identify the components of fitness that need improvement. Some of the benefits of fitness include; increased cardio-respiratory efficiency, improved circulation and decrease in body size. Green (2008), observed that it is widely accepted that a major public health problem is the increase in degenerative disease, rather than infectious diseases associated with changes in life styles. The most life threatening degenerative condition is obesity which is increasing among the youth while the most consequence of physical inactive is being overweight. Physical inactivity is more common among female than males due to

barriers like low level of income, lack of motivation, culture and tradition, parental demands and gender stereotyping. The level of general physical activity participation by female in Nigeria is decreasing (Odunaiya, 2010; Govt of Victoria, 2012). It is against this background that the researcher investigated the effect of 10-weeks rope skipping on the health related fitness components of civilian female teachers of Nigerian Defence Academic (NDA) staff school Kaduna, Kaduna State. Nigerian Defence Academy Staff School is the only Military College in Africa with a Staff school, The Female Civilian Teachers are the majority among the staffer in the school, with a Principal and two Vice Pricipals, Administration and Academics.

1.2 Statement of the Problem

Recently, a great decline in physical performance and response to duties had been observed, as a result of physical inactivity among the civilian female teacher of Nigerian defense academy staff school. Claude and Owen (1995), observed that a sedentary lifestyle is a serious risk for a number of diseases that become prevalent with aging in women. Unfortunately, civilian female teachers in Nigerian defence academy staff school Kaduna tend to exert less energy in the course of discharging their official responsibility. It is even likely to be more so when they are pre occupied with such activities as petty trading and of course the usual chit chat after the conventional chores. In addition, there seems to be an increase in the number of sick female teachers in the recent years and record from the NDA medical centres and the registry showed an unprecedented incidence of early retirement, due to ill health.

There also seem to be increasing patronage to the academy medical centres with several complain of fitness related degenerative diseases such as coronary heart diseae, high blood pressure and joint pains such as arthritis and body weakness (NDA Medical Reports, 2014). Despite the enormous opportunities and favourable condition available in a military setup for

civilian teachers, quite a number of the teachers are not utilizing such program (NDA Fitness Centre Report, 2013). It was against this background that the researcher investigated the effect of 10-weeks rope skipping on the health related fitness components of civilian female teachers in NDA staff school Kaduna, Kaduna State.

In view of the aforementioned, the study answered the following question:

- Will 10-week rope skipping exercise affect the cardio vascular parameters (RHR, SBP and DBP) of civilian female teachers in NDA staff school Kaduna?
- Will 10-week rope skipping exercise affect the trunk flexibility of civilian female teachers of NDA staff school Kaduna?
- Will 10-week rope skipping exercise affect the body mass index of civilian female teachers of NDA staff school Kaduna?

- **Hypotheses**

The following hypotheses were formulated to guide the study

Major hypothesis:

10-week rope skipping exercise would not have significant effects on the health related fitness components of the civilian female teachers of NDA staff school Kaduna.

Sub-hypotheses:

Ho_1: The 10-week rope skipping will not have significant effect on the cardiovascular parameters, (RHR, SBP and DBP) of civilian female teacher of NDA staff school Kaduna.

Ho_2: The 10-week rope skipping exercise will not have significant effect on the truck flexibility of the civilian female teachers of NDA staff school Kaduna.

Ho_3: The 10-week rope skipping exercise will not have significant effect on the body mass index of civilian female teachers of NDA staff school Kaduna.

1.4 Purpose of the Study

The purpose of the study was to investigate the effect of 10-week rope skipping exercise on the health related fitness components of civilian female teachers of NDA staff school Kaduna, with the view to identify the possible effectiveness or otherwise of rope skipping exercise on the health related fitness components.

1.5 Significance of the study

The outcome of this study will create awareness on the benefit of rope skipping as a form of aerobic exercise to the civilian female teachers of NDA staff school Kaduna.

The outcome of this study will also enable the civilian female teachers to engage more in rope skipping exercise that will help them burn those extra calories in their body thereby reducing the excess fat and achieving leaned body.

The outcome of this study will add to the existing body of knowledge in relation to rope skipping exercise.

1.6 Delimitation of the Study

This study was delimited to the effect of 10-weeks rope skipping exercise on the health related fitness components of civilian female teachers of NDA staff school Kaduna, Kaduna State. It was further delimited to the following variables; cardiovascular parameters (RHR, SBP and DBP), trunk flexibility and body mass index of civilian female teachers who had volunteered to take part in the study.

1.7 Operational Definition of Terms

The following terms were operationally defined:

- **Rope skipping exercise:** Rope skipping is an aerobic activity where civilian female teachers in NDA staff school Kaduna jump over the rope that is swung so that it passes under the feet and over their head.

- **Civilian Female teachers:** Refers to non military female teachers in NDA staff school Kaduna, Kaduna State.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Introduction

This study investigated the effects of ten-week rope skipping exercise on the health related fitness components of civilian female teachers in NDA staff school of Kaduna, Kaduna State. Literature related to this study was reviewed under the following sub-headings:

- Overview of aerobic exercise and physical fitness
- components of health related fitness
    - Flexibility
    - Cadiorespiratory endurance
    - Body max index (BMI)
- Disease risk factors in sedentary life style among female
- Rope skipping as a form of aerobic exercise
- Types of rope skipping
- Effects of rope skipping
- Summary

2.1 Overview of Aerobic Exercise and Physical Fitness

The term aerobic has been referred to as oxygen system where physical activities are done in the presence of sufficient oxygen. Mayo (2008) declared that aerobic exercise are program that can help an individual live longer and healthier which further reduce health risk, aerobic exercise is also said to keep excess body fat at bay, strengthen the heart and boost the mood. Banchard and Depress (1995) also described aerobic as a form of exercise that is conditioning where breathing control the amount of oxygen, it goes to the muscle to help

burn fat to provide fuel for body mechanism. In addition, healthy adult are advised to aim for at least 80 minutes of moderate aerobic exercise (rope skipping) a week.

Anderson, Foster and Guigan (2005) categories aerobic in two forms the indoor and the outdoor aerobic, examples of indoor are stair climbing, treadmill and rope skipping while the outdoor are walking, cycling, jogging and rope skipping. The above physical exercise in adulthood has been found to develop the muscles, promote good posture, improve neuro muscular, coordinate and also increase the capacity of the circulatory and respiratory system. Onokata (2001) also asserted that aerobic exercise can contribute to individual mental and emotional well being so also to slow down the effect of aging.

2.2 Components of Health Related Fitness

Health related fitness components are factors that described how well the systems of the body works such as cardio-vascular system, Trunk flexibility, body max index. Health related fitness components are the bedrock of been physically fit. Physical fitness indicates a specific component which has been measured to reflect a person fitness level (Carton, 1997). Also, physical fitness in term of physical and organic efficiency which he says implied anatomic and physiologic soundness as well as motor fitness e.g. flexibility, muscle strength and endurance. Swaind and Frankline (2006) declared that fitness program involving progressively increasing intensity of the exercise will elicit greater cardio-protective benefits as it positively affects the cardio-respiratory muscular skeleton and endocrine functions.

People of all ages has improve the quality of their lives and also reduced the risk of developing coronary heart diseases, hypertension, cancer, diabetes by mere participation in moderate fitness activities. Daily exercise has also enhance so many people's mental wellbeing and promoted healthy muscular-skeletal functions. Furthermore, health related components comprises of characteristic that generally helped to promote health and to prevent diseases (American College of Sport and Medicine, 2006).

2.2.1 Flexibility

Flexibility is the ability to use your joints fully. You are flexible when the muscles are long enough and the joints are free enough to allow movement. Women with good flexibility have fewer sore and injured muscles. Also, the sit-and-reach and the trunk lift are two tests used to measure flexibility (Buffalo, 2016). Plowman (2008) defined flexibility as the ability to "move freely through a full range of motion. Holt, Holt and Pelham (1996) defined Flexibility is defined as "the intrinsic property of body tissues which determines the range of motion achievable without injury at a joint or group of joints." Kraus, Raab and Hypokinetic (2006) referred to muscle "tension" and "tightness" when discussing flexibility in their classic book Hypokinetic Disease. Fleischman (2006) identified two flexibility components using factor analysis: extent flexibility and dynamic flexibility. Extent flexibility was defined as "the ability to flex or stretch the trunk and back muscles as far as possible" (twist and touch tests). Dynamic flexibility was defined as "the ability to make repeated, rapid, flexing movements" (rapid bending, twisting and touching movements). Corbin, Dowell, Tolson and Landis (2008) defined flexibility as "the wide range of movement or the ability to bend in many directions". Corbin and Lindsey (1979) referred to flexibility as "the ability to use the joints fully."

U.S. Department of Health and Human Services (1996) defined flexibility as "a health-related component of physical fitness that relates to the range of motion available at a joint. This is the range of motion around a joint and is the capacity of the joint to move through a normal range of motion to prevent injuries and to also perform activities through stages of life such as during child delivery period (Howley & Frank, 2007). More so, flexibility as fitness that relates to the range of motion possible at a given joint without

discomfort. It relate to the nature of joint structure, the condition of the ligament and fascia that surround the joint and muscle extensibility. Every physically active individual or athletes requires a degree of range of motion regardless of what types of activity or sports. Enhancing body flexibility involves two methods namely static stretching which increases flexibility using passive techniques to change structure of the ligaments tendons and muscles. The muscle is statically stretched for 10-15 seconds with few numbers of repetitions. The second type is ballistic stretching that greatly enhances range of motion (Knudson, Magnusson & Mchugh, 2000). They added that, keeping the muscle warm after the workout is a great way to increase flexibility and Pre-activity warm up raises body temperature, increases blood flow to the muscles and lubricates the joints. It is important to warm-up and too stretched.

Research have shown that flexibility and muscular elasticity hold so much benefits for the athletes when it comes to principle of reversibility, when nonchalant athlete ways giving attention to building strength in order to facilitate management of the increased flexibility much mobi1ity increases while stability decreases. There is need for both stability and mobility so as to increase (Knudson, 1999). Addition, flexibility is measured with a device called Goniometer and on the field with test flexibility using sit and reach Range of motion at a join is an attempt to equalize the respective roles of agonist and antagonist muscles, more so having flexibility in the muscles allow for more movement around the joint and the individual can achieve this with a basic stretching workout especially amongst working class women. Flexibility and muscular elasticity have so much advantage for physically active individual (Knudson, 1999).

The evidence relating flexibility to health outcomes among adults is equivocal. The American College of Sports Medicine's (ACSM's) position statement indicates that flexibility exercises may enhance postural stability and balance (Garber, Blissmer, Deschenes, Franklin, Lamonte, Lee, Nieman & Swain, 2011). Plowman (2008) reported that some studies show an

association between flexibility and low-back pain, while others do not. Reuter, Mehnert, Leone, Kaps, Oechsner and Engelhardt (2011) compared a stretching and relaxation treatment (ostensibly a control condition) with a walking or gym-based exercise treatment in a randomized study of 90 Parkinson's patients. After 6 months, the control patients showed improvements in their reported pain, balance, and health-related quality-of-life measures equal to those of the exercise treatment groups. As with the bulk of the literature on flexibility and health outcomes, few studies have focused specifically on stretching (and changes in flexibility) as the key exposure as it may relate to functional capacity. Moreover, the heterogeneity of populations and conditions studied makes general conclusions tenuous. The study of Matton, Thomis, Wijndaele, Duvigneaud, Beunen, Claessens, Vanreusel, Philippaerts and Lefevre (2006) revealed that exercise intervention did not change the flexibility of the participants.

Flexibility Fitness Tests

According to Norkin and White (2003), Flexibility tests measure joint range of motion and can be generally be classified into two categories: laboratory tests and field tests. Laboratory tests are those often used in controlled settings and are administered to patients or study participants on a one-to-one basis with specifically designed devices. As a result, the administration of laboratory tests can be expensive and time-consuming. Field tests, in contrast, are used in schools, fitness clubs, or similar practical group settings and can be administered to more participants at a relatively lower cost and in a relatively shorter time. Characteristics of laboratory and field tests are briefly described below.

Laboratory Tests:

Most clinical assessments of flexibility fall within the category of "goniometry," which is derived from the Greek words "gonia" (i.e., angle) and "netron" (measure) (Norkin & White, 2003). Thus, measuring flexibility can simply be viewed as measuring the angle of joints or

their range of motion (ROM). The devices used for the assessments are called goniometers. Although they vary in size, shape, and material used, goniometers usually consist of three parts-the body and two thin extensions called "arms." The body resembles a protractor that forms a half (0 to 180 degrees) or full (0 to 360 degrees) circle. One arm is called the "stationary arm" and other the "moving arm." During the assessment, the examiner determines the range of motion by placing the goniometer along the bone immediately proximal and distal to the joint being measured (Norkin & White, 2003).

Field Tests:

Field tests for flexibility have been used in a number of fitness test batteries. In the United States, the shoulder stretch (sometimes called the zipper), trunk lift (assesses both flexibility and muscle fitness), and sit-and-reach (assesses low-back and hamstring flexibility) have been used as modifications of these tests. There are also several other tests not used in national batteries, such as the Schober test, the modified Schober test, and the straight leg raise (Meredith & Welk, 2010).

In the shoulder stretch, the person being tested reaches over the shoulder and down the back with one hand, and reaches behind the back and upward with the other hand, trying to touch the fingers of the hands together. The distance between the hands or distance of overlap is measured on both sides of the body (Meredith & Welk, 2010).

The trunk lift: is presumed to measure both muscle strength and flexibility. In this test, the person being tested lies prone on the floor, lifts the upper body (trunk) off the floor, and holds the position while the height of the chin from the floor is measured (Meredith & Welk, 2010).

Sit-and-reach: and other similar tests that require a person to flex the hip to touch the toes are the most common field tests of flexibility. Such tests are designed to assess low-back and upper hamstring (complex of three posterior thigh muscles) flexibility.

Meredith and Welk (2010) stated that the test for flexibility is done with a measuring tape or 36 inches ruler after a short warm up for the lower back and hamstring muscles, the subject is seated with shoes removed and the legs outstretched and feet 10 inches apart legs are flat on the floor not bent, the measuring tape is positioned at the edge of the fingers while the subject record the highest reading. After which the below table is consulted for actual rating.

Table 2.2.1.1: Flexibility Classification Table:

Women	20's	30's	40's	50's
Excellent	22+	21+	20+	19+
Good	16-21	15-20	14-19	13-18
Average	13-15	12-14	11-13	10-12
Below average	Below 13	Below 12	Below 11	Below 10

Source: Health A-Z.com (2000).

2.2.2 Body Composition:

The America centre for disease control and prevention (2006) revealed that the human body can be divided into fat-free mass and body fat. Fat-free mass composes of all the body's non fat tissues bone water musc1e connective tissues and teeth, while body fat includes both essential and non-essential body fat. Essential bodies, fat are lipids in the nerves, brain, heart, lungs, liver and mammary glands. Troain and Flegal (1998) explained that the fat deposit for normal body functioning makes up to 12% of total body in girls and also increases as the girl advances in age, the larger percentage in girls is due to fat deposit in the uterus, breast, thigh etc and much more non-essential fat exist within fat cells located below the skin and around major organs (non-saturated fat). Brainwald (2004) stated that the key to keeping a healthy ratio of fat-to fat mass is to maintain an energy balance such as energy from food eaten and the energy been released as fuel for physical daily activities all must be balanced that

meaning the energy input must be equal to energy output for a well maintained balanced weight than that used may result in excess weight.

Body composition refers to the relative amount of muscle, fat, bone, and other vital parts of the body (U.S. Department of Health and Human Services, 1996). A person's total body weight (what you see on the bathroom scale) may not change over time. But the bathroom scale does not assess how much of that body weight is fat and how much is lean mass (muscle, bone, tendons, and ligaments). Body composition is important to consider for health and managing the weight of an individual (U.S. Department of Health and Human Services, 1996). Buffalo (2016) stated that body Composition is the percentage of body weight that is fat compared to other body tissue, such as bone and muscle. People who have a high percentage of fat are more likely to be ill and have a higher death rate than lean people. Exercise and eating the right foods in the proper amounts can improve body composition. Body composition can be measured using an instrument called calipers, a specialized scale, or it can be calculated by using the body mass index (BMI) which uses height and weight to determine the BMI.

The experimental studies by Serbescu, Flora, Hantiu, Greene, Benhamou, Courteix (2006) found that after an exercise training intervention, improvements were seen in body composition or lipids and lipoproteins that were measured as health outcomes, which in theory are not physiologically linked to flexibility. Inconsistent results were found with regard to the association between flexibility (as measured by sit-and-reach) and body composition. The studies showed an association between decreases in flexibility and higher skinfold measurements or BMI. Aires, Mendonca, Silva, Gaya, Santos, Ribeiro and Mota (2010) also found no association between performance on the sit-and-reach test and BMI. These inconsistencies could be due to differences in study designs, such as the length of the studies, the ages of the children, or the appropriateness of the health outcome itself (body

composition). According to Global data base on body mass index (2013), body mass index is a simple index or weight or height that is commonly used to classify under weight, over weight and obesity in adult. It is defined as the weight in kilogram divided by the square of the height in meters (kg/rn2). To calculate these parameters, tools like the measuring scale to measure weight and a tape measure for the height.

Body Mass Index (BMI) is a number calculated from a person's weight and height. BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems. It was devised between 1830 and 1850 by the Belgian polymath during the course of developing "social physics" it is defined as the individual's body mass divided by the square of their height-with the value universally being given in units of kg/rn^2 (Chumlea, Baumgartner & Garry, 1992).

The World Health Organization Expert Consultation (2002) concluded that the proportion of Asian women with a high risk of type 2 diabetes and cardiovascular disease is substantial as the BMI is lower than the existing WHO cut off point for over weight (= $25kg/m^2$). However, the cut off point for observed risk varies from $22kg/m^2$ to $25kg/m^2$ and for high risk $26kg/m^2$ to $31kg/m^2$. Obesity is defined as that percentage of body fat that begins to increase the chances of cardiovascular disease. Ideal body fat level for women is 8% to 22% though, body fat is essential for certain bodily function. Sometimes body type, genetically prevent an individual from achieving unrealistic body' shaping goals. 'The BMI is sometimes used by insurance companies as a measure of fitness. The most accurate instrument used for measuring the body fat is the skin caliper. Though other methods of measuring body composition are Durman formula, Jackson Pollack three point methods and Slaughter Lohrnan two point methods.

Table 2.2.2.1: Table for classification of body fat percentage

Sex	Thin	Normal	Elevated	High risk

Male	0%-10%	10%-25%	25%-30%	30%above
Female	0%-20%	20%-35%	35%-40	40%above

Source: Health A-Z.com (2000).

American College of Cardiology Association (2005) asserted that once the body mass index is known, the individual can then take precautions against cardio vascular disease. A classified fit person does not really need too much body mass as hypo kinetic diseases are caused by excess body fats. Body composition are exactly what the body is made of measuring the body mass index is the proper way to determine the progress of the effects of physical activities on the subject. Body composition can also be determined by proportion that is the relationship of one part of the body to the next part, it can be done by the use of ratio e.g. proportion of leg length = leg length/height, fore arm/upper arm.

Benjamin, James, Nicholas and Michie (2011) revealed that pre and post changes in Body Mass Index (BMI), associated behaviors and cognitions among service users who set dietary or physical activity goals during a 12-month period (2008–2009; N¼4418). Sixty-nine percent of clients were from the two most deprived population quintiles and 94.7% were overweight or obese. Mean BMI decreased from 34.03 to 32.26, with overweight/obesity prevalence decreasing by 3.7%. This may be as a result of increase in fruit and vegetable consumption, reductions in fried snack consumption, increases in frequency of moderate or intensive activity and gains in self-efficacy and perceived health and wellbeing. In his study, Wilson (2004) concluded that the school physical activity intervention of jump rope captures both student and family interest in a positive way. The jump rope program is not only fun; it can provide physical and emotional benefits such as a lower risk of obesity heart disease, diabetes, cancer, osteoporosis, asthma, and depression. The jumping rope program in elementary schools changed not only the school environment, but also promotes student healthy behavior that may stretch well into the future.

Danladi (2005) identified two methods of determining body composition namely chemical model and anatomical model. Chemical model is getting the percentage of oil and non oil food in the body knowing the density of fat and the density of the whole body and the density of the non fat in the body caliper. According to Cettman and Pollock (1987), an impressive finding to highlight with rope skip is that, the energy expenditure following higher total volume workout appears to be elevated with an increase in fat utilization during exercise period. Melby, Scholl, Edward and Bullough (1993) stated that more and more people are starting to join gym club in an effort to lose weight and get in shape; this may not be that necessary when one can get a great workout just using the skipping rope to improve the health and quality of life, the result had been tremendous. Combination of rope skips and diet moderation will speedily get rid of excess body fat in the healthiest manner possible.

2.2.3 Cardio-Vascular Parameters

The terms “cardiorespiratory parameters” are made up of two individual words: ‘cardiorespiratory’, and ‘parameters’. American Heritage Dictionary (2000), defines it as the heart and the respiratory system. Similarly, American Heart Association (2009), defines cardiorespiratory as anything pertaining to, or affecting both the heart and the lungs and their functions. On the other hand, the word ‘parameter’ means a factor that affects what can result from a process or anything that contributes causally to a result. Buffalo (2016) sees parameter as a definable, measurable, or variable characteristic, or value, selected from a set of data or population because it is considered essential to understanding or solving a situation or problem. From the foregoing definitions, we can, therefore imply that the terms ‘cardiorespiratory parameters’ refer to definable and measurable characteristics relating to the heart and lungs and their overall function especially as it relates to a set of population.

Cardio-respiratory endurance is the ability of the body's circulatory and respiratory systems to supply fuel during sustained physical activity (USDHHS, 1996). To improve your

cardio-respiratory endurance, try activities that keep your heart rate elevated at a safe level for a sustained length of time such as walking, swimming, or bicycling. The activity you choose does not have to be strenuous to improve your cardio-respiratory endurance. Start slowly with an activity you enjoy, and gradually work up to a more intense pace (USDHHS, 1996). Buffalo (2016) defined cadio-respiratory endurance as the ability to exercise the entire body for long periods of time. It requires a strong heart, healthy lungs, and clear blood vessels to supply the body with oxygen. Activities to improve fitness in this area include running, swimming and aerobic dance. A person must do the activity continuously for a minimum of 20 minutes within their target heart rate zone. Endurance/cardiovascular activity should be done a minimum of 3 days per week. Every other day is preferable. The mile or the pacer will measure fitness testing in this area.

Cardiovascular endurance is the ability of the heart, blood vessel, blood arteries and respiratory system to supply fuel to the working muscles (oxygen) cardio-respiratory endurance is said to be the ability of the circulating system to supply food and oxygen to the muscles and to dispose off the excess lactic acid and carbon dioxide (Onekata, 2001). Also, cardio-respiratory endurance is the body's ability to sustain dynamic exercise using large muscles group over time and at a moderate to high intensity level. During the exercise of rope skip the body circulatory and respiratory (heart and lung) must supply fuel and oxygen to the muscles, proving cardio respiration endurance through rope skip and other supportive exercises can help reduce the risk of heart diseases, cancer and also help in body weight control and maintenance. In addition, regular rope skip make the cardio and respiratory systems more efficient by enlarging the heart muscle, enabling more blood to be pumped with each stroke, and also increase the number of small arteries in trained skeletal muscle, which may further supply more blood to the working muscles, rope skip regularly improves respiratory system by increasing the amount of oxygen that is inhale, absorbed and

distributed to body tissue via alveoli tree. Cardio-respiratory fitness is of so much benefit to the individual, such as reducing risk of heart disease, lung cancer, diabetes, stroke, improve sexual drive, and decrease in labour pain during child delivery (Onekata, 2001).

Astrand (1986) observed that women who exercise regularly are capable of doing greater effort and resist fatigue better than inactive individuals, rope skipping enable higher maximal cardiac output with less increase in pulse rate and blood pressure, during 3 minute rope skip of sub-maximal exercise it also lower blood lactate, which means more capacity to perform more work aerobically and the ability to push oneself to a higher blood lactate before exhaustion. Exercise also allows quicker and better heat dissipation during sub-maximal exertion. According to Seigal (1984), inactiveness may result in degenerative disease which will affect the level of cardio respiration. The key to cardio respiratory endurance is regular participation in aerobic activity like rope skip, regular rope skip act as a preventive measure which has been found to reduce the risk of cardio vascular disease.

2.2.4 Systolic and diastolic blood pressures and exercise

According to Roland (1996), the SBP is the pressure exerted on the arteries when the left ventricle of the heart is contracted. Also, when engaged in aerobic exercise such as running or jogging and cycling, normal blood pressure responds with an increase in SBP and no change or slight decrease in DBP. This response is proportional as the overall exercise increases. In other words, as exercise intensity gradually increases, SBP gradually increases. However, if there is a drop in SBP greater than 10 millimeters of mercury from baseline, despite increases in cardio exercise intensity, this is considered an abnormal response. Exercise-induced decreases in SBP may occur in people with cardiovascular disease which may however, have been predisposed by obesity. Several studies have documented the effect of aerobic exercise on systolic blood pressure of obese children for example, Lisa (2009), reported that a programme of regular physical exercise of one hour, three times a week

resulted in significant improvements in systolic blood pressure and total body fat in a small study of obese children aged 6 to 11. More recent investigations have demonstrated that prolonged aerobic exercise alone is sufficient to improve vascular function in obese children and adolescents (Plowman & Smith, 2008).

Konstantina, George and Loannis (2012) support the fact that an exaggerated blood pressure response during an acute exercise bout has been considered as an indicator of cardiovascular risk. In women, it increased levels of adiposity have been partially linked to autonomic nervous system dysfunction and consequently, an increased prevalence of hypertension in adulthood. During sympathetic stimulation induced by exercise, arterial blood pressure response has been reported higher in obese populations compared with lean aged-matched children (Dipla, Zafeiridis, Koidou, Geladas & Vrabas, 2010). Differences in reported blood pressure responses could be partly or collectively as: (i) basal blood pressure differences (ii) variations in body fat distribution (iii) differences in participants' age, since cardiovagal autonomic function undergoes a gradual maturation during childhood, and (iv) method of blood pressure measurement (continuous beat-by-beat finger photoplethysmography, or intermittently every 60 or 120 s by a conventional aneroid sphygmomanometer (Pausova, Abrahamowicz & Mahoboubi, 2010).

Genetic factors and family history of hypertension could also be contributing factors, since women with a family history of hypertension exhibit higher basal blood pressure levels and greater mean arterial pressure during mental stress and handgrip exercise than women of normotensive (Cavalcante, Cavalcante, Pacheco & Gama, 1997). Low fitness levels can also exaggerate the blood pressure response whether systolic or diastolic to exercise in women. In a recent study by Legantis, Nassis, Dipla, Vrabas, Sidosis, & Geledas (2014) on role of cardiorespiratory fitness and obesity on hemodynamic responses in children, found that obese and overweight children exhibited an exaggerated systolic blood pressure response (assessed

by finger photoplethysmography) during isometric handgrip exercise compared with their fit overweight and obese counterparts.

Dipla et al (2010) reported an attenuated increase in exercise heart rate, associated at least partially with a lower vagal withdrawal in obese compared with lean boys. However, the magnitude of the blood pressure response to exercise (assessed as the change from baseline, using beat-by-beat finger photoplethysmography) was similar in lean and obese boys. It is quite observable that the mechanism mediating the response of blood pressure to exercise is that during exercise, neural signals originating from higher cerebral regions and peripheral afferents from arterial baroreceptors and the skeletal muscle result in parasympathetic and sympathetic adjustments. Consequently, mean arterial pressure rises (Kontantina, George & loannis, 2012).

American College of Sport and Medicine (2005) revealed that regular exercise makes the heart rate maintains its own rhythm to be beating steadily between 70-80 times each minutes, which makes the system more efficient by pumping more blood with nutrients physical activeness also lead to meaningful increase in insulin sensitive and glucose metabolism making body cells to transport more efficient glucose into the muscle cells liver and adipose tissue.

Steyn (2004) noted that during exercise blood circulation in the arterial blood pressure, pave way for contraction and beats which sends a surge of blood through the vessels. When the pressure increase with maximum contraction, it is said to be systolic and when the heart relaxes, it is called diastolic pressure, the average systolic pressure at rest is 120mm hg in young adult while the diastolic pressure is 70 - 80 mm hg, to measure the blood pressure of an individual two things are needed, that is the systolic and diastolic pressure. Common measurement of blood pressure is the use of a method called Auscultory method. Goscard (2006) stated that a high dose aerobic exercise produces greater increase in v02 max;

studies have also shown that there is little mild improvement in aerobic capacity (5% 95%) when participating in rope skip. Kass and Castriotta, (1994); Peterson, Miller, Ruiney and Wenger, (2008) suggested that the mild increase in aerobic capacity are due primarily to increased fat free mass from the rope skip aerobic exercise, cadiorespiratory endurance can also be referred to as cadio-vascular endurance.

2.3 Disease Risk Factors in Sedentary Life Style among Female

According to Lopez, Mathers, Ezzati, Jamison, and Murray (2006), a sedentary lifestyle is a type of lifestyle with no or irregular physical activity. Female who lives a sedentary lifestyle may colloquially be known as a slob or couch potato. It is commonly found in both the developed and developing world. Sedentary activities include sitting, reading, watching television, playing video games, and computer use for much of the day with little or no vigorous physical exercise. A sedentary lifestyle can contribute too many preventable causes of death. Screen time is the amount of time a person spends watching a screen such as a television, computer monitor, or mobile device. Excessive screen time is linked to negative health consequences. Also, lack of physical activity is one of the leading causes of preventable death worldwide.

Sitting still may cause premature death. The risk is higher among those that sit still more than 5 hours per day. It is shown to be a risk factor on its own independent of hard exercise and BMI. The more still, the higher risk of chronic diseases. Female that sit still more than 4 hours per day have a 40 percent higher risk than those that sit fewer than 4 hours per day. However, those that exercise at least 4 hours per week are as healthy as those that sit fewer than 4 hours per day (Dunstan & Owen, 2012). World Health Organization (2010) pointed out that a sedentary lifestyle and lack of physical activity can contribute to or be a risk factor for:

- Anxiety

- Colon cancer
- Depression
- Diabetes
- High blood pressure
- Lipid disorders
- Mortality in adults
- Obesity
- Osteoporosis
- Scoliosis
- Spinal disc herniation (Low back pain)
- Cardiovascular disease

Powell, Thompson, Caspersen and Kendrick (2012) viewed that physical activity is an important factor in maintaining good overall health and wellbeing. Being physically active has significant health benefits, including reducing the risk of some chronic conditions, helping to control weight and improving mental wellbeing. Some forms of physical activity may also help manage long-term conditions, such as arthritis and Type 2 diabetes, by reducing the effects of the conditions and improving people's quality of life. In recent decades, there has been a decline in physical activity due to the increasingly sedentary nature of many forms of work, activities such as watching television or using a computer, and changes in transportation. Sedentary behaviour is believed to be associated with the rise in women, which increases the risk of cardiovascular disease, colon and breast cancers, Type 2 diabetes and osteoporosis.

Aerobic exercise is notable for providing cardio vascular conditioning after training. American Health Association (2008) recommends that everyone that could reach minimum duration of 30 minutes of some the cardio-vascular exercises in 5-7 days per week would reach the recommended minimum guidelines for reducing the risk of heart disease, diabetes, hypertension and high cholesterol. The American College of Sport Medicine (2010) also recommends a minimum of three sessions of 30 minutes of total moderate to vigorous exercise to improve cardio respiratory fitness and help manage weight as desirable among the working class females. The heart rate also increases indirect relation with intensity of the exercise so much that heart rate level can vary significantly from one person to another base on the fitness level, genetics environment and exercise tolerance.

According to Brosse (2002), regular aerobic exercise helps women live longer, healthier and it reduces health risk, keep excess pounce at bay. It also help to control blood sugar absorbed into the body via junk food and fallacies. Aerobic assist in weight management and improves the lungs function and also lower blood pressure to fight against complication during pre-natal and post-natal experiences. Aerobic exercise may help alleviate the condition of osteoporosis as it boosts the mineral density of the bone. Aerobic overload training significantly improves varieties of function capacity related to oxygen transport and use. It also makes mitochondria from well-trained skeletal muscles have a greatly increased capacity to generate ATP aerobically by oxidative phosphorylation. The plasma volume and total hemoglobin tends to increase with endurance training the adaptation that enhance circulation and thermoregulatory dynamics that facilitate oxygen delivery capacity during exercise and other physical activities of daily chores. Menstrual cycle and child delivery period (labour) (Mayo, 2008).

2.4 Rope Skipping as a form of aerobic Exercise

Rope kipping may be used for cardio-vascular workout in similarity to jogging or bicycle riding. This aerobic exercise can achieve a “burn rate” of up to 700 calories per hour of vigorous activities with about 0.1 calories consumed per jump (Tawne & Tawney, 2000). Also, ten minutes jumping roughly equivalent of running eight miles. Swain & Franklin (2006) explained that jumping rope for 15-20 minutes is enough to burn off calories from a candy bar individual Whalton (2000) declared that Women can participate in the exercise. Since Jumping rope techniques are relatively simple compared to many other athletic activities and very appropriate for a wide range of ages and fitness levels. Rope roping is a low-cost physical activity, thus; its impact on the physical fitness is being studied by various researchers. Jump-roping involves the muscles in arms and legs, and it also improves cardiovascular function and metabolism. Rope is a portable tool and jump-roping require minimum space. On the other hand, jump-roping is incredibly cheap compared to the other sports (Loredo & Cooper, 2006).

According to Amao (2007), rope is a primary tool used in the game of skipping and played majorly by children, women and other young adult where one or more participant jump over a rope that is swung so that it passes under their feet and over their heads. The participant turning and jumping the rope could be as much as three. They take turns, two of who turn the rope while one or more jumps. Sometimes the later is played with turning the rope, this form of activities is called double dutch and the second one is more difficult Jump rope rhymes are often chanted in the beginning when the skipper jumps and ends when the skipper messes up. For a novice, a beaded rope is recommended because it holds its shape and easier to control than a light weight clothed or vinyl rope and can be done a 50 meters land space. In addition, the exercise surface is very important. Do not jump on the carpet grass, concrete or asphalt. The carpet reduces impacts; the downside grabs the shoe and twists the ankle or knee of the participants. Moreover, it recommended to use wood floor, piece of

plywood, or an impact mat made for exercise. Alternate jumping with lower intensity exercise such as marching will enable one to jump for longer period and appropriately jump into a varied exercise routine. Attention should pay to the heart rate zone, so as not to endanger one's health.

According to Tsai (2009), rope skipping is a simple exercise which only requires a rope, and could be performed anytime or anywhere. Moreover, rope skipping will not be constrained by weather, place, or age, and is recognized as to its effectiveness in improving health status. Both sexes could jump rope, and this exercise brings significant improvements in the physical ability in physically and mentally disabled students. Also, rope skipping sounds as an inexpensive and simple exercise that can be performed anywhere, either at home or a nearby park, it might even observe children skipping ropes on sidewalks.

1. Rope skipping exercise can be beneficial in losing weight. It is so effective in burning calories that an hour of skipping rope will make you burn up to 1000 calories.
2. The exercise is easy to learn, doesn't need you to look for a guide or coach. The best thing about this activity is that once you start skipping, you learn very quickly and in no time you start skipping like a kid.
3. It's inexpensive as you only need a rope.
4. It turns out to be fun when you start doing it with a friend or a group of friends.
5. It enhances the coordination and rhythm between hands and feet movements.
6. Strengthens your bones and increases your stamina and endurance.
7. When practicing it with your friends, it develops a sense of teamwork and social skills in you.
8. It makes you more vigilant and alert. It increases your attention skills.
9. It can be a healthy sport and competitions can be held for it all year round.
10. It can be exercised by people from any age groups and both genders.

11. Skipping enhances flexibility and athletic abilities. It improves your reflexes, balance and posture.

12. It tones your muscles in arms, legs and abs.

13. Without running it speeds your heart rate like that of a runner and so requires a lot of energy to maintain a good fitness point.

2.5 Type of Rope Skipping Exercise

Cooper and Kenneth (2003) categorized the types of rope skipping as the following

1). Basic jump or Easy Jump:- this is the beginners first techniques to master where the jumper keeps both feet slightly apart and jumps at the same time over the rope.

2). Alternate jump (speed jump). The jumper uses alternate feet to jump of the ground. This technique can be used to effectively double the number of skips per minute as compared to the above techniques. This is used for speed step.

3). Crisscross:- this method is made similar to the basic jump with the only difference being that while jumping, the left hand goes to the right part of the body vice versa for the right hand, with arms crossing in front of the body.

4). Side swing:- the rope passes the side of the skipper body, without jumping ii usually the skipper perform basic jumping after a side swing or cris cross.

5). Toad:- this is more complicated, the jumper perform the cross" maneuver with one arm crossing under the opposite leg from inside.

6). F**ront-back cross:** Perform the criss-cross whilst crossing one arm behind the back.

7). Double under: A high basic jump, turning the rope twice under the feet. Turning the rope three times is called a triple under.

8). Leg over: A basic jump with one arm hooked under the adjacent leg.

9). Awesome Annie: Alternates between a leg over and a toad without a jump in between.

10). Inverse toad: Perform the toad whilst one arm crosses the adjacent leg from the outside.

11). Elephant Jump: A cross between the inverse toad and the toad, with both arms crossing under one leg.

12). Frog or Donkey kick: The participant does a handstand, returns to their feet and turns the rope under them. A more advanced version turns the rope during the return to the ground.

13). The James Hirst: The participant performs a back-flip into a split and then back to a skip in the upright position.

2.6 Effect of Rope Skipping:

Rope skipping offers numerous health and athletic benefits. It elevates the heart rate, and its helps in developing the cardiovascular system. According to Jesse (2006), it can be used as an effective high-intensity interval training exercise to burns the same amount of calories that steady-state exercises burn in a shorter period of time. It is a high-quality workout activity for those looking to lose body fat, because it's very effective at burning calories. However, rope skipping can be detrimental to muscle mass, because the increased demand for fuel partly comes from the breakdown of muscle.

Rope skipping is among the most effective calorie-burning exercises. According to Harvard Health Publications, a 155-pound person burns about 744 calories every 60 minutes they jump rope, while a 185-pound person burns about 888. At this rate, a 185-pound person can lose nearly a pound of body fat every three and a half sessions. However, those concerned about losing muscle mass should limit their jump rope sessions because the increased amount of burned calories leads to an increased need to utilize other energy sources beyond body fat (Mahboobeh & Mandana, 2015).

Rauma (2007), asserted that rope skipping as a form of aerobic exercise is more beneficial in artheroselerosis, fat reaction and insulin sensitivity improvement. Rauma (2007), stated that rope skipping improves muscular strength and endurance, enhances the joint flexibility and also alters body mass fat (increased fat loss). Studies had shown that

regular rope skipping exercise decrease risk factors for cardio-vascular diseases (Ormsbee, 2007). Rope skipping has been reported to have a beneficial influence on functional capacity, quality of life, risk factor of anemia and lipid level (Daul, Schaffer & Daul, 2004).

Several researchers studied the effects of jumping rope on health-related physical fitness in students with mild intellectual impairment or visual impairment, and found that jumping rope significantly improved balance, cardiovascular endurance, muscular strength, body composition, and flexibility (Chen & Lin, 2012). Studies also suggested that with effective exercise prescriptions involving jumping rope, individuals demonstrated an improvement in cardiovascular function, body composition, flexibility, and muscular strength and endurance, which further contributed to advancements in health-related physical fitness (Syu, 2010). Koindi and Lacovides (l997) believed that much virtues and values of rope skipping as a form of exercise amongst women have been extolled and celebrated as a means to improving sport performance and a key constituent of health, fitness and longevity. American Heart Association (2003) reported that regular rope skipping exercise with other behavioral therapy helps in managing symptoms experienced by patient of chronic illnesses such as diabetes. Hypertension and cancer these are major diseases that had claimed lives of so many women. Rope skipping exercise has a number of proven positive health effects especially on the heart (the power house of all individual).

In his study, Haskell (1993) discovered that rope skipping as an aerobic exercise helps the individual sleep better and also renewed the energy and even depression. As a psychotic condition can also be managed by incorporating simple rope skip in regular exercise, it also prevent heart diseases by increasing the flexibility of the coronary, stimulate bone growth thereby alienating an osteoporosis condition, a condition of loss of bone mineral density. It has been reported that it provides needed stimulus for bone formation. Conroy and Earle (2004) discussed that habitual rope can be protective against increase in blood pressure

commonly noticed with increase age amongst women. Furthermore, exercises like rope skip that involves moderate resistance can high repetition with short rest are much associated with reduction in blood pressure. Therefore regular participation in rope skip often results in a decrease in resting heart rate by 5 to 25 beats per minutes rope skip, for 30 minutes will burn up to 300 calories. Another great benefit is ho it increases cardiovascular fitness by improving the ability of the systems to work adequately, thereby paving way for great ability to perform daily chores and become less breathless during exercise session, rope skipping exercise is a way of improving muscle tone in the legs.

2.7 Summary

Literature related to this study covered some relevant areas with convincing evidences on the effects of 10 weeks rope skipping exercise on the health related fitness components of civilian female teachers in NDA staff school Kaduna. From the literature reviewed the term aerobic has been referred to as physical activities done with the presence of sufficient oxygen. Aerobic as a form of exercise that is a condition where breathing controlled the amount of oxygen, it goes to the muscle to help burn fat to provide fuel for body mechanism. Aerobic are in two forms, the indoor and the outdoor aerobic examples of indoor are stair climbing, treadmill rope skipping while the outdoor examples are walking, cycling, jogging and rope skipping.

Literature also reviewed the components of health related fitness; health related fitness components are factors that described how well the systems of the body works such as cardio-vascular system, trunk flexibility, body max index. In addition, health related fitness components are the bedrock of been physically fit. Physical fitness indicates a specific component which has been measured to reflect a person fitness level. Furthermore, health related components comprises of characteristic that generally helped to promote health and to prevent diseases.

Literature further reviewed the disease risk factors in sedentary life style among female. A sedentary lifestyle is a type of lifestyle with no or irregular physical activity. A female who lives a sedentary lifestyle may colloquially be known as a slob or couch potato. Also, a sedentary lifestyle and lack of physical activity can contribute to or be a risk factor for: anxiety, colon cancer, depression, diabetes, high blood pressure, lipid disorders, mortality in adults, obesity, osteoporosis, scoliosis, spinal disc herniation (low back pain) and cardiovascular disease. In this study, rope skipping as a form of aerobic exercise was also reviewed; rope kipping may be used for cardio-vascular workout in similarity to jogging or bicycle riding. This aerobic exercise can achieve a "burn rate" of up to 700 calories per hour of vigorous activities with about 0.1 calories consumed per jump. Rope skipping is a simple exercise which only requires a rope, and could be performed anytime or anywhere. Moreover, rope skipping will not be constrained by weather, place or age and is recognized as to its effectiveness in improving health status. Both sexes could jump rope, and this exercise brings significant improvements in the physical ability in physically and mentally disabled students.

Literature further pointed out the type of rope kipping exercise; such type include: basic jump or easy jump, alternate jump (speed jump), crisscross, side swing, toad, front-back cross, leg over, awesome annie, inverse toad, elephant jump, frog or donkey kick and lastly, the james hirst. Literature highlighted the effect of rope skipping; rope skipping offers numerous health and athletic benefits. It elevates the heart rate, and its helps in developing the cardiovascular system. Rope skipping as a form of aerobic exercise is more beneficial in artheroselerosis, fat reaction and insulin sensitivity improvement.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This study investigated the effects of 10-week rope skipping exercise on the health related fitness components of civilian female teachers in Nigerian Defence Academy Staff School Kaduna, Kaduna State. This chapter is presented in the following order: research design, population of the study, sample and sampling technique, data collection instrument, data collection procedure and data analysis.

3.1 Research Design

Experimental design of pretest and posttest, involving experimental and control groups were used in order to determine the effects produced by the treatment. This was in conformity with the method advanced by Horteval and Weebly (2009) who stated that pre-test/post-test comparisons allow assessment of training effect between two groups. This is a common evaluative tool in training and education as its implementation is simple.

3.2 Population of the Study

The population of this study comprised all female civilian teachers in Nigerian Defence Academy Staff School Kaduna, with a total population of one hundred and thirty seven (137) (School Staff Nominal roll, July, 2014).

3.3 Sample and Sampling Technique

Simple random sampling technique was used to select sixty (60) willing civilian female teachers of Nigerian Defece Academy Staff School Kaduna to assign to experimental and control groups. Subjects were arranged on a line according to their height and numbers were given to them. All those with even numbers, formed the experimental group while those with odd numbers, formed the control group, that helps in balancing the groups and prevent initial group difference.

3.4 Data Collection Instrument

The following were used to collect data for this study:

- **Skipping rope:-** was used for skipping
- **Mats:-** was used for the flexibility test
- **Counter:-** was used for counting the number of skips per minute
- **Stop watch:-** was used to record the time taken to skip.
- **Flexibility box:-** was used for sit and reach
- **Analogue blood pressure apparatus:-** was used in measuring blood pressure of the participants.
- **A Hanson's weighing scale**:- was used for measuring the body weight of the participants
- **Ruler:-** was used in taking the height of the participants.

3.5 Data Collection Procedure

An introductory letter was obtained from the head of department, Physical and Health Education Department, Bayero University, Kano, and taken to the school authorities of Nigerian Defence Academy Staff School Kaduna, to seek their permission to conduct the study. After permission was granted, four research assistants were involved in the conduct of

this study. The procedures of the study were fully explained to the research assistants and the participants. Two research assistants were assigned to the control group and two to the experimental groups. They helped in organizing and conducting the tests.

Training Procedure:

The exercise was rope skipping which took place within the NDA staff school playground. All the participants were effectively educated about the rope skipping protocols and benefits, as well as the risk involved in the exercise. A written informed consent form was signed by the participants before the commencement of the exercise. The procedure for the rope skipping exercise was as follows:

- In order to build confidence in the participants, each exercise was preceded by at least ten-minutes jogging and stretching warm up for both experimental and control groups.
- The participants jump while whipping the rope is in one hand,
- The participants steps into the rope, one at a time, Moving forward and allowing the rope to go underneath each foot, one step at a time puts it all together.
- The participants start basic rope jump using both feet, landing on the balls of the feet.
- Split jump, Jump rope while alternately shifting each foot forward.

The exercise duration was 10 minutes per session, at 3 times per week (Mondays, Wednesdays and Fridays), as recommended by Rabin (2005). Training intensity for Weeks 1^{st}-4^{th} was at 50-55% Vo2 max, Weeks 5^{th}-8^{th} at 55-60% Vo2 Max and weeks 9^{th}-10^{th} at 60-65% Vo2 Max of the subjects. The trained medical assistants used the measurement of the pulserate to determine the Vo2 Max using the rythm of the rope skip to activate the pulserate.

Measurement procedure:

The height, weight, BMI, trunk flexibility and resting heart rate of the participants in both control and experimental groups were measured before the beginning of the training and at the end of the 10 weeks training.

- ***Height*:-** A calibrated wall was used with specific marks in meters. The participants' heights were measured by standing barefooted against the wall back of the body and the head touching the wall. The participants remained relaxed with the head erect, a ruler was placed on the head and straight to the wall to determine the height in meters.
- ***Weight*:-** Each participant wearing a light cloth, stood on the weight measuring scale without any footwear, upright, the hands by the sides and the reading was taken by the research assistants in kilogram.
- ***Body Max Index (BMI)*:-** BMI of each participant was calculated using their height square divided by weight.
- ***Trunk flexibility*:-** In this research, sit and reach was used to evaluate the flexibility of the lower back and the posterior thigh. The test have been validated against other test of flexibility and its reliability is relatively high (Baumgatner & Jackson 1991). Sit and reach test was conducted with a sit and reach box developed by AAHPERD (1980) for experimental and control groups. Before the test, subjects were directed to warm up which included slow sustained and static stretch of the lower back and posterior tight which would improve the validity and reliability of the test as described by Baumgardner and Jackson (1991).

The test procedure requires the subjects to remove their shoes, sit down and at the test apparatus with knees fully extended and feet, shoulder width a parts, flat against the end board. For performances, the subjects extend the arm forward with hands placed on top of each other. The subjects' reaches directly forward, palm down along the measuring scale. This position was maintained for at least one second before measurement was taken. The

farthest the point reached measured to the nearest centimeter was recorded as the subjects score at the end of the fourth trial.

The researcher and some research assistants sat close to the scale and noted the farthest distance reached by the fingertip of both hands of the subjects. As no moving backward or forward bends is allowed, this may invalidate the test and would cause injuries.

- ***Heart rate*:-** On every exercise days, the participants blood pressure were taken before and after the exercise session with the assistance of the nurses on ground. Through the use of Digital BP Monitor, the participant are been made to sit comfortable, the medical assistance wraps the cushioned part of the instrument round the upper arm of the participants and then inflates the pressure off, the cuff gradually until a faint rushing sounds occurs, this procedure of pressure and sound reduction continues until no sound occur anymore at this end, the values for HR, SBP and DBP were displayed on the monitor.

3.6 Data Analysis

Descriptive statistics of mean and standard deviation were used to organize and describe the physical characteristics of the respondents while Analysis of co-variance (ANCOVA) was used to test the formulated hypotheses at the 0.05 level of significance.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This study investigated the effects of ten weeks rope skipping exercise on the health related fitness components of civilian female teachers in Nigerian Defence Academy Staff School Kaduna, Kaduna State. The data collected for this study were statistically analyzed and presented in this chapter.

4.2 Results

Sixty civilian female teachers participated in the study. The results of the analysis are presented in the table below:

Table 4.2.1 Physical characteristics of the subjects

Variables Unit	Experimental (n=30) Pre $\bar{x}$±SD	Post $\bar{x}$±SD	Control (n=30) Pre. $\bar{x}$±SD	Post $\bar{x}$±SD

Age Yr	40.367±5.027	40.367±5.027	40.367±5.027	40.367±5.027
Height M	1.69±.0312	1.68±.0312	1.68±.0366	1.68±.0366
Weight Kg	71.93±4.118	68.97±3.624	69.17±6.675	70.90±6.567

Table 4.2.1 presents the physical characteristics of the respondents such as age, height and weight, of both experimental and control groups.

Hypotheses Testing:

Sub-hypothesis I: 10 week rope skipping exercise will not have significant effect on the cardiovascular parameters (Resting heart rate, Systolic Blood Pressure and Diastolic Blood Pressure) of civilian female teachers of NDA staff school Kaduna.

Table 4.2.2: ANCOVA table on the effect of ten weeks of rope skipping exercise on the cardiovascular parameters (RHR, SBP and DBP)

	Experimental (n=30)		**Control**		**Sum of Square**	**Mean Square**	**df**	**F**	**P-value**
	Pre.	**Post.**	**Pre.**	**Post.**					
variables	**x̄± S. D**	**x̄± S. D**	**x̄± S. D**	**x̄± S. D**					
RHR B/M	93.5±5.32	90.42±6.59	76.3±3.43	92.03±8.37	1746.178	1746.168	1	30.95	0.001
SBP mmHG	126±4.01	117.00±5.04	116.53±5.91	120.02±7.88	545.470	545.470	1	14.61	0.001
DBP mmHG	79±4.48	76±4.85	75.66±6.68	78.83±4.85	231.181	231.181	1	15.00	0.001

The results in table 4.2.2 above indicates that 10-weeks rope skipping exercise had significant effects on the cardiovascular parameters (RHR, SBP and DBP) of the participants with an F of 30.95 and P value of 0.001 for the RHR, an F of 14.61 and a P of 0.001 for the SBP, and F of 15.00 and a P-value of 0.001 for the DBP. The null hypothesis tested was rejected meaning that there were significant effects of the ten weeks of rope skipping exercise

on the cardiovascular parameters of civilian female teachers of Nigerian defence academy staff school Kaduna. All the parameters were significantly reduced by the training.

Sub-hypothesis II: 10 week rope skipping exercise will not have significant effect on the trunk flexibility of civilian female teachers of NDA staff school Kaduna.

Sub-hypothesis III: 10-week rope skipping exercise will not have significant effect on the body mass index of civilian female teachers of NDA staff school Kaduna.

Table 4.2.3: ANCOVA table on the effect of ten weeks of rope skipping exercise on the trunk Flexibility and BMI

	Experimental (n=30)		**Control**		**Sum of Square**	**Mean Square**	**df**	**F**	**P-value**
	Pre.	**Post.**	**Pre.**	**Post.**					
variables	**x̄± S. D**	**x̄± S. D**	**x̄± S. D**	**x̄± S. D**					
Trunk Flexibility mm	18.0±2.51	19.13±2.59	16.90±2.52	15.37±2.17	111.654	111.654	1	98.941	0.001
BMI Kg	25.6±1.34	24.5±1.22	24.2±2.43	24.2±2.43	.898	.898	1	.246	0.001

The results in table 4.2.3 above indicates that 10-weeks rope skipping exercise had significant effects on the trunk flexibility & BMI of the participants with an F 98.941 and P value of 0.001 for the trunk flexibility, and F of .246 and a P of 0.001 for the BMI, and F of 15.00 and a P-value of 0.001 for the DBP. The null hypothesis II tested was rejected meaning that there were significant effects of the ten weeks of rope skipping exercise on the trunk flexibility of civilian female teachers of Nigerian defence academy staff school Kaduna. While the null hypothesis III tested was accepted meaning that there were no significant

effects of the ten weeks of rope skipping exercise on the BMI of civilian female teachers of Nigerian defence academy staff school Kaduna.

4.3 Discussion

This study investigated the Effect of 10 Week Rope Skipping Exercise On The Health Related Fitness Components of Civilian Female Teachers In Nigerian Defence Academy Staff School, Kaduna, Kaduna State. Discussions of results of the study are presented below on table by table basis as follows cardiovascular parameters of the subjects, trunk flexibility of the subjects and the BMI of the subjects.

Cardiovascular parameters of the civilian female teachers in Nigerian defence academy staff school Kaduna.

The findings of the study revealed that there was a significant effect of 10-weeks rope skipping exercise on the cardiovascular parameters of the subjects. Their resting heart rate, systolic and diastolic blood pressure were significantly reduced. This finding is in line with the finding of Perry (1998), who found that rope skipping burn calories and is vigorous enough to get women's heart rate going besides jogging. Rope skipping is another form of aerobic exercise that burns calories at a 30% faster rate than walking releases natural endorphins and hormones that enhance mood and suppress depression, it is an easiest form of exercise to reduce body weight. The findings of the current study also supported that of Chen and Lin (2012), who conducted a study on Jumping Rope Intervention on Health-Related Physical Fitness of Students with Intellectual Impairment. They revealed that 12-week jumping rope training demonstrated significant effects on cardiovascular endurance of students with intellectual impairment. In line with this finding, Orhan, Kharazi, Akbar and Ercan (2012) conducted a study on the effect of two training types on cardiorespiratory fitness and body fat of male and female students. Two groups (male and female) were assigned with endurance exercises and two groups (male and female) were assigned with

sprint exercises for 12 weeks, 3 sessions per week, and one hour per session, in order to evaluate the level of cardiorespiratory fitness and body fat. Heart rate was measured for assessing cardiorespiratory fitness and subcutaneous fat was measured using a caliper. Their results showed that there is a significant relationship between endurance exercises and cardiorespiratory fitness and body fat of male and female students.

Trunk flexibility of the subjects:

The finding of the current study also revealed that there was significant effect of the ten weeks rope skipping exercise on the trunk flexibility of the civilian female teachers in NDA staff school Kaduna. This finding is in line with the finding of Knudson and Mchugh (2000), who revealed that rope skipping is like ballistic stretching that greatly enhances range of motion and improve flexibility. This finding further supported that of Chen and Lin (2012) who revealed that 12-week jumping rope training had significant effects on flexibility of students with intellectual impairment. Knudson (1999), sated that range of motion at a join is an attempt to equalize the respective roles of agonist and antagonist muscles.

BMI of the subjects:

The findings of the current study however revealed that there is no significant effect of ten weeks rope skipping exercise on the BMI of civilian female teachers in NDA staff school Kaduna. This finding is in line with that of Chen and Lin (2012), who found that 12-weeks jumping rope training had no significant influence on the BMI of students with intellectual impairment. The finding of the current study supported that of John (2010), who conducted a study on how to assess the effectiveness of a school based physical activity programme during one school year on physical and psychological ealth in young schoolchildren. The secondary outcome measured included body mass index and cardiovascular risk score (average z score of waist circumference, mean blood pressure,

blood glucose, inverted high density lipoprotein cholesterol, and triglycerides). 498 children completed the baseline and follow-up assessments (mean age 6.9 (SD 0.3) years for first grade, 11.1 (0.5) years for fifth grade). After adjustment for grade, sex, baseline values, and clustering within classes, children in the intervention arm compared with controls showed more negative changes in the z score of the sum of four skinfolds (-0.12, 95 % confidence interval -0.21 to -0.03; P=0.009). The current finding is contrary to that of Benjamin, James, Nicholas and Michie (2011).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

- **Summary**

This study investigated the effects of 10 weeks rope skipping exercise on the health related fitness components of civilian female teachers in Nigerian defence academy staff school Kaduna, Kaduna State. In order to achieve the purpose of the study, three hypotheses were tested. A pre-test, post-test experimental and control groups design was used. The population of this study comprised all civilian female teachers in Nigerian Defence Academy Staff School Kaduna, with a total population of one hundred and thirty seven (137). The sample used for this study comprised randomly selected sixty (60) apparently healthy civilian female teachers. Pre and post data was collected on subjects using trunk flexibility test, resting heart, systolic and diastolic blood pressure and BMI. Analysis of Covariance (ANCOVA) was used to test all the three formulated hypotheses at the 0.05 level of significance. The findings of the study revealed that there was significant effect of 10-week rope skipping exercise on the cardiovascular parameters (RHR, SBP, DBP) and the trunk flexibility of civilian female teachers in Nigerian defence academy staff school Kaduna. There was however, no significant effect of the 10-weeks rope skipping exercise on the BMI of the subjects.

5.2 Conclusions

Based on the findings of this study, the following conclusions were drawn:

- 10-weeks of rope skipping exercise resulted in significant reduction in the resting heart rate, systolic and diastolic blood pressure of civilian female teachers in Nigerian defence academy staff school, Kaduna.
- 10-weeks of rope skipping exercise resulted in a significant increase in the trunk flexibility of civilian female in NDA staff school, Kaduna.
- 10-weeks of rope skipping exercise had no significant effect on the BMI of civilian female teachers in NDA staff school, Kaduna.

5.3 Recommendations

Based on the findings of this study, the following recommendations are made:

- Rope skipping exercise should form the part of the fitness programmes for female teachers in Nigerian defence academy staff school in order to encourage them to be more active and improve their health related fitness.
- School authorities should organize fitness trainings and workshops for their teachers, so that they can be informed about the health benefits of physical activities.

- **Recommendations for further studies**
  - A similar study should be conducted to cover all secondary schools teachers in Kaduna State.
  - A study should also be carried out to cover even military staff of the Nigerian defence academy staff school, Kaduna.

REFERENCES:

AAHPERD (American Alliance for Health, Physical Education, Recreation and Dance) (1980). *Health related physical fitness test: Technical manual*. Reston,

Aires, L., Mendonca, D., Silva, G., Gaya, A. R., Santos, M. P., Ribeiro, J. C., Mota, J. (2010). A 3-year longitudinal analysis of changes in body mass index. *International Journal of Sports Medicine*, 31(2):133–137.

Amao, A. K. (2007). The role of built environments in physical activity, eating and obesity in childhood. *Future Child*, 16:89-108.

American Centre for Disease Control and Prevention (2006). Treatment of obesity in the elderly. *American Family Physicians*, 47: 1183-1189.

American College of Cardiology Association (2005). Explosive Exercise. *Medicine & science in sports & exercise*, 30:6.

American College of Sports and Medicine (2006). *ACSM's guidelines for exercise testing and prescription* (7th Ed.). Philadelphia: Lipponcottwilliams and wilkins.

American Heart Association (2003). The BMI testing. Available at: www.americanheart.org. retrieved 20-April, 2015.

American Heart Association, (2009). AHA's review of physical activity and cardiovascular Health: A guide for healthy living. Access 28/12/2010.

American Heritage Dictionary (2000). Published by Houghto Miflin Company. Access on 12/12/201/2012. Available at www.ref-trade.com.

Amusa, B. M. & Toriola, H. (2008). The long-term benefits of a multi-component exercise intervention to balance and mobility in healthy older adults. *Archives of Gerontology and Geriatrics*, 52(2):211–216.

Anderson, M.L., Foster, C. & Guigan, M. R. (2005). Training vs body image; does training improve subjective appearance rating?. *Journal of Strength and Conditioning Research*, 7(3):255-259.

Astrand, N. (1986). Obesity and overweight in South African primary school children-the Health of the Nation Study. *South African Medical Journal,* 96:439–444.

Banchard, C. R. & Depress, J. P. (1995). Physical activity and Health: Arthrosclerosis, Metabolic and Hypertensive diseases. *Research Quarterly for Exercise and Sport*, 66:268-75.

Baumgardner, N. & Jackzson, M. S. (1991). The efficacy of exercise as an intervention to treat recurrent nonspecific low back pain in adolescents. *Pediatric Exercise Science*, 19(3):349–359.

Benerth, J. C. & Plum, F. (1996). *Cecil Texbook of Medicine* (20th Ed.). London, W.B Saunder Company.

Benjamin, G., James, C., Nicholas, R. & Michie, S. (2011). Behaviour change among overweight and socially disadvantaged adults: A longitudinal study of the NHS Health Trainer Service. *Psychology & Health,* 27(10): 1178–1193.

Brainwald, E. (2004). Heart disease. A textbook of Cardiovasucular Medicine (5th Ed.). Philadelphia, W.B . Sauders Company.

Brosse, A. L. (2002). Excised and the treatment of Clinical depression in adults: recent Findings and the future directions. *Spot Medicine*, 32 (12): 741-760.

Brownwell, K. D. & Stinkard, A. J. (2008). *Physical Activity in the Development and Control of Obesity*. Philadelphia,W. B Saunder Company.

Buffalo, N. Y. (2016). *Fitness Focus Components of Health Related Fitness*. Physical Education Department, Buffalo Academy of the Sacred Heart. A Blackboard solution.

Carton, D. (1997). *Overweight and Obesity: Health Consequences*. Available at: www.ede.gov/needphp.dnpa/obesity/index.htm. retrieved 4-May-2013.

Cavalcante, J. W., Cavalcante, L. P., Pacheco, W. S. & Gama, C. G. (1997). Blood pressure response in women with normatensive and of hypertensive treated with pressure stimulus. *Journal of Cardiology*, 69(3)323-326.

Cettman, H. & Pollock, J. (1987). Strength and power predictions of sports speed. *Journal of Strength and Conditioning Research,* 19(2): 349-357.

Cheddo, N. Tipton, C. B. & Schaver, D. (1992). Health, fitness and physical activity. *President's Council on Physical Fitness and Sports Research Digest*, 3(9):1–8.

Chen, C. & Lin, Y. (2012). Jumping Rope Intervention on Health-Related Physical Fitness in Students with Intellectual Impairment. *The Journal of Human Resource and Adult Learning*, 8(1):56.

Chumlea, W. C., Baumgardner, K. & Gary, D. (1992). Comparison of percent body fat estimates using air displacement lethysmography and hydrodensitometry in adults and children. *International Journal Obese Related Metabolic Disorder,* 26(2):389-397.

Claude, B. R. & Owen, S. (1995). Physical Activity Atherosclerotic, Metabolic and Hypertensive Disease. R*esearch Quarterly for Exercise and Sports*, 58(4):268-275.

Conroy, B. P. & Earle, K. (2004). *Adaptive responses of bone to physical activity. British Medical Journal*, 1:64-74.

Cooper, G. & Kenneth, H. (2003). *Aerobic for women*. New York Bantam Books Inc.

Corbin, C. B. & Lindsey, R. (2007). *Fitness for life*. Glenview, IL: Scott, Foresman and Company.

Corbin, C. B., Dowell, L. J., Tolson, H. & Landis, C. (2008). *Concepts and experiments in physical education.* Dubuque, IA: William C. Brown Book Company.

Danladi, I. M. (2005). Body fat and blood pressure levels in school boys in Kano city, Nigeria. *The African Symposium: An on-line Educational Research Journal*, 2:1-7.

Danladi, I. M., Abel, L. T. Makama, A. M. & Badamasi, L. (2012). Prevalence of childhood and adolescent overweight and obesity in Benue State, Nigeria. *Tropical Medicine & International Health*, 17(11): 1369-1375.

Daul, A. E., Schaffer, R. F. & Daul, K. (2004). *Exercise during hemolialysisclinnephrol,* Toronto, Philip's Publishing Co.

Dipla, K. A., Zafeiridis, I., Koidou, N., Geladas, N. D. & Vrabas, I. S. (2010). Altered hemodynamic regulation and reflex control during exercise and recovery in obese boys. *American Journal of Physiology,* 299(6):2090-2096.

Dunstan, D. W. & Owen, N. (2012). *//*New Exercise Prescription: Don't Just Sit There: Stand Up and Move More, More Often. *Arch International Medicine,172(6):500–501.*

Elizerberth, S. (2004). Effect of endurance training on blood pressure, blood pressure regulating mechanisms and cardiovascular risk factors. *Hypertension*, 46:667-75.

Emiola, M. L. (2008). All work and all play: The Health Assurance in Exercise. 86th Training Lecture Unilorin Press, P4.

Fleishman, E. A. (2006). *The structure and measurement of physical fitness.* Englewood Cliffs, NJ: Prentice-Hall.

Garber, C. E., Blissmer, B., Deschenes, M. R., Franklin, B. A., Lamonte, M. J., Lee, I. M., Nieman, D. C. & Swain, D. P. (2011). American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: Guidance for prescribing exercise. *Medicine and Science in Sports and Exercise*, 43(7):1334–1359.

Goscard, A. P. (2006). *Exercise training reduces coronary risk and effectively rehabilitates Hemodialysis patient's nephron*, *Sports Medicine Journal*, 43:311-6.

Government of Victoria, (2012). Introduction To Physical Activity For Women. http://www.betterhealth2vic.gov.au/bhcv2/beharticles.nsf/pages/physical_activity_women. retrieved 7-August-2015.

Green, K. (2008). Understanding Physical Education. London, SAGE Publication Ltd.

Haskell, W. L. (1993). Cardiovascular disease prevention and lifestyle interventions: Effectiveness and efficacy. *Journal of Cardiovascular Nursing*, 18(4):245-55.

Health A-Z.com, (2000). *Flexibility fitness Classification*. Retrieved 30-june-2013

Holt, J., Holt, L.E. & Pelham, T. W. (1996). *Flexibility redefined. In Biomechanics in sports XIII*. (Bauer, T. editor). Thunder Bay, Ontario: Lakehead University.

Horteval, G.I. & Weebly, H. (2009). Secular trends in the body mass index of Canadian children. *MAJ*; 163: 1429-33.

Howley, E. T. & Frank, B. D. (2007). Heath and fitness instructions handbook. (3rd Ed.) India. *Human Kinetics.*

Ischemed, J. (2007). Adipose compare with physical activities in predicting mortality among women. *England Journal of Medicine*, 351 (26): 2694-2703.

Jack-Jerry, M. & Stephen, F. O. (2005). American college of sports medicine position stand: Physical activity and bone health. *Medicine & Science in Sports & Exercise*, 36(11):1985-96.

Jesse, M. (2006). *Maximizing the Fitness Benefits of Rope Skipping*, England. Ezine Publisher

John, K. (2010). *The effectiveness of a school based physical activities programme during one school year on physical and psychological health in young school children,* Switzerland, ASR Publishers.

Johnson, P. B. & Updyke, W. F. (1996). *Physical education. A problem solving approach to fitness*. *World Journal of Sports Science*, 44(7):39-43.

Kass, H. S. & Castriotta, K. (1994). The Effect of Plyometric Exercises Use on the Physical and Skillful Performance of Basketball Players. *World Journal of Sport Sciences,* 3(4): 316-324.

Knudson M. & McHugh, M. (2000). Current issues in flexibility fitness and sports. *Research digest series*, 3(10): 1-8.

Knudson, M. (1999). *Modulatory Role of Food, Feeding Regime and Physical Exercise on Body Weight and Insulin Resistance Life Science*, 76:1553-73.

Koindi, E. & Lacovides, A. (l997). Exercise for renal rehabilitation program (ERRP) psychological effects of low and high intensity home based exercise training on function and capacity in healthy middle aged men. *American Journal of Cardiology, 57:446-449.*

Konstantina, D., George, & Loannis, V. S. (2012). Blood pressure control at rest and during exercise in obese children and adult. *Journal of Obesity*, 34(9):44-49.

Kraus, H. & Raab, W. (2006). Hypokinetic and Flexibility. *Springfield*, IL: Charles C. Thomas Publishers.

Legantis, C. D., Nassis, G. P., Dipla, K., Vrabas, I., Sidosis, L. S. & Geledas, N. D. (2014). Role of cardiorespiratory fitness and obesity on hemodynamic responses in children. *Journal of Sports Medicine and Physical Fitness*, 32(8):91-97.

Len, H. Charital, M. K. & Vella, T. (2000). *Physical fitness and dynamic health*. New York: Dial Press.

Lisa, N. (2009). Exercise in young obese children reduces BP, improves markers of arthrosclerosis. *Journal of the American College of Cardiology*, 34(19):49-52.

Lopez, A. D., Mathers, C. D., Ezzati, M., Jamison, D. T. & Murray C. J. (2006). *Global and regional burden of disease and risk factors: systematic analysis of population health data. Lancet,* 367 (9524):1747–57.

Loredo, E. & Cooper, M. (2006). *The Jump Rope Book, England. Workman Publishing Company.*

Mahboobeh, S. J. & Mandana, G. (2015). The effect of jump-rope training on the physical fitness of 9 to 10 years old female students. *Advances in Applied Science Research*, 6(4):135-140.

Maifferty, N. & Hovalty, J. (1997). Effects of manual resistance training on fitness in adolescents. *Journal of Strength and Conditioning Research*, 23(8):2287–2294.

Matton, L., Thomis, M., Wijndaele, K., Duvigneaud, N., Beunen, G., Claessens, A. L., Vanreusel, B., Philippaerts, R. & Lefevre, J. (2006). Tracking of physical fitness and physical activity from youth to adulthood in females. *Medicine and Science in Sports and Exercise*, 38(6):1114–1120.

Mayo, C. (2008). Neuro-musculoskeletal and Performance Adaptations to lower-extremity Plyometric Training. *Sports Medicine,* 40: 859-895.

Melby, C., Scholl, J, Edward, T. V. & Bullough, G. (1993). Cardiovascular responses to sub-maximal stationary cycling during hemodialysis. *American Journal of Medicine,* 177(12):912-918.

Meredith, M. D. & Welk, G. J. (2010). *Fitnessgram/Activitygram test administration manual*. (4th ed). Champaign, IL: Human Kinetics Publishers.

Michel, N. (2008). Fitness vs physical activity patterns in predicting mortality in men. *American Journal of Medicine,* 177 (12): 43-47.

NDA Medical Reports, (2014). Nigeria Defence Academy, Kaduna.

NDA Fitness Centre Report, (2013). Nigeria Defence Academy, Kaduna.

NDA school Nominal roll, (2014). Nigeria Defence Academy, Kaduna.

Norkin, C. C. & White, D. J. (2003). *Measurement of joint motion: A guide to goniometry. (3rd ed).* Philadelphia, PA: F. A. Davis Company.

Odunaiya, N. A. (2010). Physical Activity Level of Senior Secondary School Students In Ibadan, Western Nigeria. *West Indian Medical Journal,* 59(5):529-34.

Onekata, T. Musa, D. I. & Arogbonlo, S. (2001). *Physical Activities for Fitness Health.* Kano, Rainbow Royale Publishers.

Onokata, P. C (2001). Prevalence of stunting, underweight and obesity in school-aged children in Uyo, Nigeria. *Pakistan Journal of Nutrition*, 9:459–466.

Orhan, S., Kharazi, P., Akbar, A. & Ercan, G. (2012). A Study of the Effect of Two Training Types (Endurance and Sprint) on Cardiorespiratory Fitness and Body Fat in Male and Female Students. *Annals of Biological Research,* 3 (1): 231-235.

Ormsbee, N. A. (2007). Physical Activity Level of Senior Secondary School Students In Ibadan, Western Nigeria. *West Indian Medical Journal,* 59(5): 529-34.

Pallock, M. L. (1998). Physical education: A problem-solving approach to health and fitness. *Medicine and Science in sport & exercise,* 6(4):33-38.

Pausova, P. M., Abrahamowicz, A. & Mahoboubi, D. (2010). Functional variation in the androgen-receptor gene is associated with visceral adiposity and blood pressure in adolescent. *Journal of the American College of Cardiology*, 55(3):706-715.

Perry, P. S. (1998). *Exercise physiology theory and application to fitness and performance*. Debuguecia: Brown, SBD Publishers.

Peter, S. (2012). *Jump Rope. Workman Publishing Company England.*

Peterson, S., Miller, M., Ruiney, L. & Wenger, G. (2008). Review article: child and adolescent obesity in the 21st century; an Australia perspective. *Asian Pediatric Journal of Clinical Nutrition*, 2(4):524-8.

Plowman, A. S. & Smith, A. L. (2008). *Exercise physiology for health, fitness and performance*. Philadelphia: Lippincott Williams and Wilkims Publishers.

Plowman, S. A. (2008). *Fitnessgram/Activitygram Reference Guide. Welk GJ, Meredith DM, (editors). Dallas, TX: Cooper Institute of Muscular strength, endurance, and flexibility assessments*.

Powell, K. E., Thompson, P. D., Caspersen, C. J., Kendrick, J. S. (2012). Physical activity and the incidence of coronary heart disease. *Annual Review on Public Health*, 1(8):253-287.

Rauma, H. P. (2004). Effects of aerobic physical exercise on inflammation and artherioclorosis in men. *Ann. Med,* 1(7):1007-1014.

Rauma, H. P. (2007). *Resistance training in contemporary issues that works*. *American College of Sport Medicine*, 6(3):75-79

Reuter, I., Mehnert, S., Leone, P., Kaps, M., Oechsner, M. & Engelhardt, M. (2011). Effects of a flexibility and relaxation programme, walking, and nordic walking on Parkinson's disease. *Journal of Aging Research,* 9(4):232-473.

Roland, T. W. (1996). Developmental exercise physiology. Champaign I.L: Human Kinetic.

Rubin, L. (1994). Cancer in the elderly: exercise intervention increases quality of life in patients with multiple myeloma. *ACSM's certified news*, 17(2):1-3.

Sa'ad, M. M. (2012). Sport as a therapy in type 1 Diabetes Mellitus. *Journal of Research in Health and Sports Science*, 11(1):81-88.

Sani, E. H. (1999). Effect of acute static stretch on maximal muscle performance: A systematic review. *Medicine and Science in Sports and Exercise*, 44(1):154-164.

School Staff Nominal Roll, (2014).

Seigal, G. (1984). Physical activity: health and wellness; some challenges in the 21st century. *African Journal for physical, health education recreation and dance, 10:220-229.*

Serbescu, C., Flora, D., Hantiu, I., Greene, D., Benhamou, C. L. & Courteix, D. (2006). Effect of a six-month training programme on the physical capacities of Romanian schoolchildren. *Acta Paediatrica*, 95(10):1258–1265.

Siddiq, I., Nessa, M. & Hussain, A. (2010). *Effects of Resistance Training on Individuals With Diabetes Mellitus*, 2(4):307-312.

Strydon, N. P. (2004). Diet, Nutrition and prevention of type 2 diabetes. *Public Health and Nutrition,* 7(7):14-65.

Swain, D. P. & Franklin, B. A (2006). Comparison of cardioprotective benefit of vigorous versus moderate intensity aerobic exercise. *American Journal of Cardiology*, 97:141-147.

Syu, F. (2010). Status of field-based fitness testing in children and youths. *Preventive Medicine*, 31(2):77–85.

Tawne, K. & Tawney, H. (2000). *The life rediness program: a physical rehabilitation program for the patient on hemodialysis*, Strong Publishers, 581-591.

Troain, H. & Flegal, D. (1998). Effects of aerobic exercise on blood pressure: a meta-analysis of randomized, controlled trials. *Annals of Internal Medicine*, 136(7):493-503.

Tsai, B. L. (2009). *Rope Skipping Training. Human Kinetics Publishers Ghana.*

U.S. Department of Health and Human Services, (1996). *Physical activity and health: A report by the Surgeon General*. Atlanta, GA: HHS, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

Wealk, J. & Blair, K. P. (2000). *Jumping rope is cheap, portable and burn more calories than you may think. First Class Publishers.*

Whalton, D. (2000). *Physiological alterations resulting from a 10 weeks program of Jogging. Longman Publishers*

WHO, (2012). Obesity And Overweight Fact Sheet N°311https://apps.who.nt/infobase.

Wilson, M. J. (2004). Promotion of Jump Rope in an Elementary School. *Florida Public Health Review*, 1:59-62.

World Health Organization, (2002). *Arterial Hypertension. Technical Report Series*, Geneva.

World Health Organization, (2010). *"Physical Activity"*. Retrieved from original, January 23, (2012).

Wynne, S. (2007). *ICTS 144 Physical Education Teacher Certification Exam*. Boston, XAMonline,Inc.

APPENDIX: A

BAYERO UNIVERSITY, KANO,

DEPARTMENT OF PHYSICAL AND HEALTH EDUCATION

INFORMED CONSENT FORM

This is an experimental study designed to determine the effects of 10-week rope skipping exercise on the health related fitness components of civilian female teachers in Nigeria Defence Academy staff school Kaduna, Kaduna State.

You will perform 10-week rope skipping exercise. The exercise duration will be 10 minutes per session, 3 times per week, with moderate intensity of about 60-65% Max HR. While performing the exercise, you are free to stop at any point if feeling dizziness or fatigue. Please do note that your height, weight, trunk flexibility, blood pressures, VO2max and resting heart rate will be taken as you performed the exercise. Please also note that there are going to be some changes that might occur during or after the exercise. These include abnormal or irregular heartbeat, fatigue and muscle pain, but be assured that after some times, it would return normal.

On the other hand, there are also going to be benefits coming out as a result of the exercise, which is the scientific basis of the exercise testing. The participant is free to ask questions for further clarifications.

INDEMNITY:

I have read this form and I fully understood the terms and conditions guiding the test procedures including any possible risk that might arise. I hereby agree to participate in this exercise.

Sign...…… Date……
(Participant)

Sign…….. Date……
(Researcher)**.**