# THE EFFECT OF CIRCUIT TRAINING METHOD IN TEACHING PHYSICAL EDUCATION ON SELECTED PHYSICAL FITNESS COMPONENTS WITH SPECIFIC REFERENCE TO MELKA SODA PREPARATORY SCHOOL

**Himam Ahimed**

**A Thesis Submitted to**

**The Department of Science and Mathematics Education**

**Presented in Partial Fulfillment of the Requirements for the Degree of Master of Education in Teaching Physical Education**

**Addis Ababa University**

**Addis Ababa, Ethiopia**

**September, 2016**

## Addis Ababa University

## School of Graduate Studies

This is to clarify that the thesis prepared by Himam Ahimed, entitled: *The Effect of Circuit Training Method in Teaching physical Education on Selected Physical Fitness Components with Specific Reference to Melka Soda Preparatory School* and Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Education in Teaching Physical Education complies with the regulation of the university and meets the accepted standards with respect to originality and quality.

**Signed by the Examining Committee:**

Examiner _____Signature _____Date_____

Examiner _____ Signature _____ Date_____

Advisor_____Signature_____ Date_____

Advisor _____Signature_____Date_____

---

Chair of Department or Graduate Program Coordinator

***ABSTRACT***

*The Effect of Circuit Training Method in Teaching Physical Education on Selected Physical Fitness Components: With Specific Reference to Melka Soda Preparatory School.*

Himam Ahimed

Addis Ababa University, 2016

*The purpose of this study was to identify the effects of circuit training Method in Teaching Physical Education on selected physical fitness variables on male students of Melka Soda preparatory School in Oromia Region. The selected physical fitness variables for the study were: cardio respiratory endurance, speed, power on lower extremities, and muscular endurance. The training program was stipulated to 2 days per week for 2 months and 40 minutes per session. From the total population of 120 students of Melka soda preparatory school, 45 male students were purposively selected from grade 11 natural students under the study. The data design was quasi-experimental design and the collected data were analyzed by SPSS software statistics of paired t - test with comparison of one group pre-test and post- tests results. The pre test and post test was given to see whether or not statistically significant difference at ($P<0.05$) between each test of the physical fitness variables. In general, the results of this study showed that, there were significant difference on all physical fitness variables of CRE, speed, Power on upper extremities and muscular endurance on upper extremities. Extremities of physical fitness variables, due to the two moth circuit training method.*

***Key Words:*** *Pre test, Post test, Circuit Training, Cardio respiratory endurance, Speed, Power, Muscular endurance.*

## ACKNOWLEDGEMENTS

First and foremost, I would like to express my deep and heartfelt thanks to my advisor, Dr, Aschenaki Taddese, for his polite approach, advice, and constructive comments that have shaped my thesis immeasurably. I always appreciate him not only for his commitment but also for his insightful and critical comments for further improvements.

It is an honor to me to thank, Addis Ababa University for sponsoring to conduct this study. Moreover, my thanks go to all my instructors of physical education and health since department for enabling me to acquire the necessary skills and sharing me their experiences.

I would also like to express my gratitude to the students of Melka Soda preparatory sample school for participation in the study. Besides, I would like to thank the administration of the school for allowing me to carry out this study in the school and also special tanks to student Bariso Aga who assisted me during practical session, pre test and post test were recorded.

Last but not least, I would like to extend my thanks to my wife, Zeytuna Mohammed and my parents, brothers, sisters and friends for their life-long inspiration, encouragement and moral support they provided throughout my research work.

# Table of Contents


Contents Page

List of Tables ..... viii

List of Figures ..... ix

List of Acronyms ..... x

CHAPTER ONE ..... 1

INTRODUCTION ..... 1

1.1 Background of the Study ..... 1

1.2. Statement of the problem ..... 3

1.3. Hypotheses of the Study ..... 4

1.3.1. The Alternative Hypothesis (H1) ..... 4

1. 4. Objectives ..... 4

1.4.1. General objective ..... 4

1.4.2. Specific Objectives ..... 5

1.5. Significances of the study ..... 5

1. 6. Delimitations of the Study ..... 5

1.7. Limitations ..... 6

1.8. Operational Definitions ..... 6

1.9. Organization of the Study ..... 7

CHAPTER TWO ..... 8

REVIEW OF RELATED LITERATURE ..... 8

2.1. Physical Fitness ..... 8

2.2. The importance of Physical Fitness ..... 9

2.3 .Physical fitness components ..... 10

2.3.1. Health Related Physical Fitness ..... 11

2.3.2. Skill-related Physical Fitness ..... 11

2.4. The selected physical fitness components and tests ..... 12

2.4.1. Cardio-Respiratory Endurance ..... 12

2.4.1.1. Cardio respiratory endurance fitness test ..... 13

2.4.2 .Speed ..... 13

2.4.2.1. Speed test: 30 meter sprint test ..... 14
2.4.3 .Power ..... 14
2.4.3.1. Lower Extremity Power Test: Standing vertical jump test ..... 14
2.4.4. Muscular Endurance ..... 15
2.4.4.1. Muscular Endurance test: Pull up test ..... 15
2.5. Circuit Training method ..... 15
2.6. Effect of Circuit Training ..... 17
CHAPTER THREE ..... 19
RESEARCH DESIGN AND METHODOLOGY ..... 19
3.1. Introduction ..... 19
3.2 .Research Design and Methodology ..... 19
3.2.1. Research Design ..... 19
3.2.2. Research Methodology ..... 19
3. 3 Research Site ..... 20
3.4. Sources of Data ..... 20
3.5 The Population, Sample Size and Techniques ..... 20
3.6. Variables ..... 21
3.6.1. Independent variables ..... 21
3.6.2. The dependent variables ..... 21
3.7. Medical Reference ..... 21
3.8. Safety procedure ..... 21
3.9. Procedures ..... 22
3.10. Reliability and Validity of Data ..... 23
3.10.1 Reliability of Data ..... 23
3.10.2 Validity of fitness test ..... 23
3.11. Procedure of tests ..... 23
3.11.1. Twelve Minutes Run Test procedure ..... 23
3.11.2 .Speed: 30m sprint run test procedure ..... 24
3.11.3 Power: Standing vertical jump test procedure ..... 25
3.11.4 Muscular Endurance: Pull up test Procedure ..... 26
3.12. Training program ..... 27
3.13. Ethical Consideration ..... 28

CHAPTER FOUR ..... 29
4. ANALYSIS OF THE DATA AND RESULTS OF THE STUDY ..... 29
4.1. Introduction ..... 29
4.2. Cardio-respiratory Endurance (12 minute running/walking) ..... 29
4.3. Speed (30m sprint run) ..... 32
4.4. Power (Standing vertical jump) ..... 34
4.5. Muscular Endurance (Pull-Up test) ..... 36
4.6. Discussion on Hypothesis ..... 40
CHAPTER FIVE ..... 41
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS ..... 41
5.1. Summary ..... 41
5.2. Conclusions ..... 42
5.3. Recommendations ..... 42
References
Appendices

## List of Tables

Table 1 Components of physical fitness ..... 11
Table 2 Validity of fitness test ..... 23
Table 3 Normative data of the Cooper Test for Male Students ..... 24
Table 4 Normative time for 30m sprint test For Male Students in second ..... 25
Table 5 Normative Standing Vertical jump test of Male students in centimeter ..... 26
Table 6 Normative Scale of pull-up test for Male students ..... 27
Table-7 Schedule of Training Program..... 28
Table 8 -Paired t-test analysis of one sample for variance on Cardio-respiratory Endurance (12min run/ walk) of students before and after circuit training at two different testing periods ..... 31
Table 9 Paired t-test analysis of one-sample for variances on speed (30m sprint running by second) of students before and after training at two different testing periods ..... 33
Table 10 Paired t-test one Sample for variances of power on lower extremities (Standing vertical jump by cm) of students before and after training at two different testing periods ..... 35
Table 11 Paired t-test one-Sample for Variances on Muscular Endurance (Pull-up) of students before and after training at two different testing periods ..... 37
Table 12 Correlation table among CRE, Speed, power and Muscular Endurance ..... 39

# List of Figures

Figure 1 Graphical presentation of Cardio-respiratory Endurance (12 minute running /walking)……..30

Figure 2 Graphical presentation of Speed (30m sprint run)…….....…..32

Figure 3 Graphical presentation of power (Standing Vertical jump) pre and post test.....…..34

Figure 4 Graphical presentation of Muscular Endurance (Pull –Up test).....…..36

Figure 5: ANOVA two-factor graph which shows improvement status between the four dependent variables .....…..38

## LIST OF ACRONYMS

CRE-Cardio-respiratory Endurance

DF-Degree of Freedom

NASPE-National Association for Sport and Physical Education

PE-Physical Education

SPSS-Statistical Package for Social Science

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the Study

Twenty first century has witnessed a land mark development in science and technology including space, defense, atomic energy, computer, internet service etc. By the internet invention we can collect required information within a fraction of second from any part of the world. Due to this advanced scientific technological invention, the body movements of the human being have been restricted. Tension and competitive feeling increased. Man has been felt the prey of stress, hypo kinetic and psychosomatic diseases. So time has come that man should not ignore the importance of any physical activities. Every one desires good health and it is the ultimate objective of all those who want happiness in life. Minor health disorders are quite common to all. In the case of major health problems, the precautionary measures are plenty. Some people control their diseases like blood pressure, diabetes, acidity, asthma etc. by taking medicines regularly. But such practice does not in away completely eliminate the health disorders; on the other hand it leads to several other adverse health problems. The continuous, systematic and regular practice of any physical activities is an effective tool to maintain good health and also helps eliminate all the dreadful diseases from the human body. Matveyer. L, (1981, P. 11)

According to the National Association for Sport and Physical Education (NASPE, 2004 and 2006) the main purpose of physical education is to help children learn to achieve and maintain a health-enhancing level of physical fitness and to promote the importance of physical activity for life. NASPE defines quality physical education as: the ability to help all students develop health fitness components, physical competence, cognitive understanding, and positive attitudes toward physical activity so that they can adopt healthy and physically active lifestyles. So, physical education is a multifaceted process that teaches a wide range of skills and activities with the aim of helping students

becoming physically educated, physically fit, and able to enjoy a wide variety of physical activities, and make a commitment to lifelong health and physical well-being. (NASPE, 2004 and 2006; Perrin, 1994; Straub, 1994; Winner & Hetland, 2001)

In addition, physical education provides a natural platform and valuable opportunities to develop self-management skills, social and co-operative skills, and build character. It serves to complement other educational areas in promoting the desired outcomes of education. In particular, physical education helps to cultivate healthy habits, teamwork, resilience and resolve. Physical activity can even help elderly people live longer (Rakowski and Mor, 1992). Physical activity has additionally benefited that are often overlooked. So time has come that man should not ignore the importance of any physical activities.

One of the main objectives of the Physical education teachers at these educational levels is to make the students active as long as possible during the classes. Also physical education teachers would be able to develop other curricular contents and at the same time they could be improving the previous physical fitness gains. These programs could permit to keep the physical fitness level achieved without interfering in the normal course of the physical education. The current emphasis on assessment and academic testing in core subjects has minimized the importance of physical education and holistic learning for children. Some experts feel that a child without physical education, music, and art is a disadvantaged child (Coleman, 1999; Lambert, 2000)

Fitness is a general term to describe someone's body conditions physiologically, psychologically or sociologically. However, the meaning of fitness is various. Physical fitness can be referred to the total dynamic physiological state including aerobic endurance, strength, flexibility, speed, body composition, coordination, nutrition and diet, and rest and relaxation of an individual ranging on a continuum from optimal human performance to severe debilitation and death (Hazel dine, 1995). In addition, these components of physical fitness also interact with other factors such as the genetic factor (Watson, 1995). Basically, physical fitness includes cardio respiratory endurance, speed, an aerobic power, body composition, muscular endurance and muscular strength**.**

However, the researcher selected four components of physical fitness to assess the effects of circuit training. The four selected aspects of physical fitness included cardio respiratory endurance, power, speed, and muscular endurance.

There are many training methods that help to improve the physical fitness of students. Circuit training, for example, is a typical training method suggested by the Curriculum Development Committee (1988) to improve the general fitness of students. Also circuit training is considered to be more effective than other methods of training in developing physical fitness. It is long lasting and can be performed at different stations without apparatus. It also increases the elasticity of our body and makes the body more active and supple.

Fundamentally, circuit training consists of a series of different training exercises. The training exercises may be grouped into different stations where different parts of body are trained. This type of training is simple and easy to handle and participants can perform the tasks at each station in rotation. It helps to improve the general fitness of students with the limit of space, time and equipment (Pauletto, 1991).

The researcher believes that the results of this study was identified the effect of circuit training on the selected physical fitness components and utilize the learning time effectively and optimally.

**1.2. Statement of the problem**

Physical education subject is carried out in both theoretical and practical class, to achieve and maintain its objectives. So, the physical education teachers make the students beneficial with different aspects of personalities. In most secondary education level of Ethiopia, especially in rural area physical education teachers used a traditional training method during practical work as I have experienced.

Different researchers were studied on different training method. For instance, Suresh (2011) was conducted on the effect of Aerobic training, Yogic training and detraining on health related physical fitness of college male students in Pondicherry University.

I have realized the problem during my six year's physical education and sport teaching experience. I have seen that most students face problem to do different skills effectively and efficiently during practical class. Even though there might have been a research conducted on circuit training, nobody has conducted in my local area where I am teaching. Thus in order to fill the gap, this study will attempt to answer the hypothesized of the significance deference between the pre test and post test effect of circuit training on selected physical fitness variables .

Generally the purpose of the study was to identify the effect of circuit training on selected physical fitness. Namely: cardio respiratory endurance, speed, power on lower extremities, and muscular endurance on upper extremities of Melka Soda preparatory school male students.

### 1. 3. Hypotheses of the Study

#### 1.3.1. The Null Hypothesis (Ho)

Accordingly the following hypotheses are formulated.

1. Ho, there is no a significance difference between the pre and post test effects of circuit training on cardio-respiratory endurance.
2. Ho, there is no a significance difference between the pre and post test effects of circuit training on speed.
3. Ho, there is no a significance difference between the pre and post test effects of circuit training on lower extremities of power.
4. Ho, there is no a significance difference between the pre and post test effects of circuit training on upper extremities of muscular endurance.

### 1. 4. Objectives **of the Study**

#### 1.4.1. General objective

The main objective of this study is to assess the effect of circuit training on selected physical fitness components with specific references to Melka Soda Preparatory School.

### 1.4.2. Specific Objectives

The following objectives were set for the present study.

1. To identify the significance difference between the pre and post test effects of circuit training on cardio-respiratory endurance.
2. To identify the significance difference between the pre and post test effects of circuit training d on speed.
3. To identify the significance difference between the pre and post test effects of circuit training on lower extremities of power.
4. To identify the significance difference between the pre and post test effects of circuit training on upper extremities of muscular endurance.

## 1.5. Significance of the Study

The study is said to be significant for the following reasons

1. The findings of the study may add to the existing source of knowledge with regard to the training on selected physical fitness variables.
2. The findings of the study may help the individuals to compare and contrast the pre and post test changes that occur in selected physical fitness variables after circuit training.
3. Physical education teachers would be develops the culture of using circuit training method during physical education practical work.
4. Provide scientific base and guidance for the physical education teachers, coaches and students to understand the effects of circuit training.
5. Use as references to other researchers who conduct further research in the similar field.

1. 6. Delimitations of the Study

This study was delimited to the following points

1. education practical2. The selected subjects were consisted forty five (45) male students of one group pre test and post test under quasi-experimental design.
3. The male students selected from Melka Soda preparatory School and the selected training method was circuit training.
4. The duration of training period was stipulated to two days per week for two months.

5. The selected physical fitness components were:- cardio respiratory endurance, Speed, power on lower extremities and muscular endurance on upper extremities.

6. The selected physical fitness were delimited to one test for each physical fitness variables as follows: Cardio-respiratory endurance (12 min run/walk test), Speed (30min sprint run test), Power on lower extremities (standing vertical jump test), Muscular endurance on upper extremities (pull up test).

## 1.7. Limitations **of the Study**

The following factors are the limitations of the study, since the researcher could not have control over them.

1. No effort was put in order to find out the effect of environmental changes during pre test, Post tests and the training period. However, dry weather prevailed mostly.
2. Food habit taken by everyone and life style could not be controlled
3. The study might have been affected while training or dropout due to different illness
4. Shortage of related references or materials
5. The heredity might have influenced on the criteria variables
6. Previous physical training in sports and games were not taken into consideration

## 1.8. Operational Definitions

- *Cardio Respiratory Endurance* - is the ability to perform large muscle, dynamic, moderate to high intensity exercise for prolonged periods.
- *Muscular endurance*-is the ability of a muscle group to perform repeated contractions over a period of time sufficient to cause muscular fatigue.
- *Power* – is the ability to perform one maximum effort in a short a period as possible, the product of strength and speed.
- *Speed*-is the ability of individual to make successive movements of the same kind in the Short period of time.
- *Circuit Training* –is a number of special exercise systems those are designed to develop various physical fitness components.

## 1.9. Organization of the Study

Generally, the study can be divided into five chapters. Following a concise abstract about the study, there is a brief introduction stating the aims and the purpose of the research in the Chapter one. In addition, this chapter consisted statement of problem, hypotheses, delimitation, limitations, operational definitions and organization of study were also presented. Chapter two consisted of relevant reviews literature about the topic is discussed with previous studies and researchers. Chapter three consisted of the research design and methodology, research site, source of data, population, sample size and technique, procedures of tests, training program, validity and reliability, safety procedures, medical references and ethical consideration of the study were described. Chapter four presented analysis and the results of the study. Accordingly, the results gained were illustrated with tables and figures and also the results were also analyzed statistically by paired t-test and correlation coefficients in order to justify the differences between the variables of the study and also major findings on result was presented in this chapter. Finally, chapter five presented the summary of findings, conclusions and recommendations of the study.

CHAPTER TWO

# REVIEW OF RELATED LITERATURE

## 2.1. **Concept of** Physical Fitness

The term **'**fitness' is difficult to define since; it means many different things to different peoples. for example one individual may see himself as being' fit ' If he can run for the bus without getting to out of breath where as physically active person may seek a quick heart rate recovery as measure of a fitness, following distance run . However in the search for an acceptable definition that encompasses most individuals has defined fitness as the successful adaptation to the stressor of one's lifestyle. (Dick, cited by KEVIN, et al 1989)

The researcher suggests that, all of us must look closely at the stressor of our everyday activities and see how well we cope with that stressor if we are to gauge our fitness level satisfactory. Physical fitness is probably the most popular and frequently used term in physical education and the most important objective of physical educators is to develop physical fitness.

According to Nixon and cozens (1964), it was the desire to establish a scientific approach to the development of physical fitness which formed the basis of the first meeting of physical educators in 1885 when the profession of physical education originated. The United States president's Council on physical fitness and sports defined the terms "physical fitness as the ability to carry out daily task with vigor and alertness, without undue fatigue, with ample energy to enjoy leisure time pursuits and to meet unforeseen emergencies" (Clarke. 1971**).**

According to the different scholars mentioned above, the objective of physical education is to develop the students' physical fitness .Also physical fitness is the ability to carry out daily task without undue fatigued for a long period of time. In general, fitness implies the ability of a person to live most effectively with his and her potentials, which depend upon the physical, mental, emotional, Social and spiritual components of fitness which are highly interrelated.

The primary components of physical fitness identified by the president's council on physical fitness and sports were muscular strength, muscular endurance and cardio respiratory endurance. However, later on the president council also included some other motor performance components namely agility, speed, flexibility and balance in physical fitness. But keeping in view the general opinion of the majority of the researchers, the author has not included the components such as speed, agility, power and balance (which are more important for success in specified sports) as essential components of basic physical fitness .

In general term, fitness can be conceived as the matching of the individual to his/her physical and social environment. However, there is no universally agreed up on definition of fitness and its components .The World Health Organization (75) defined fitness as" the ability to perform muscular work satisfactorily". In keeping with this definition, fitness implies that the individual has attained those characteristics that permit a good performance of a given physical task in specified physical, social, and psychological environment. (Bouchard, Shepherd and Stephens, 1993, P 15)

### 2.2. The Importance of Physical Fitness

Physical fitness is very important to sport participation. Not only can it help to develop the skill of different physical activities physiologically but also psychologically. As physical fitness involves the performance of different body parts such as heart, lungs or muscles, it affects what we can do with our minds and so it influences to some degree qualities like mental alertness and emotional stability (Harris, 1996). There are a lot of psychological benefits from physical activities such as mental management of depression, anxiety, mood, and arousal level. Training helps athletes to concentrate on their targets and to cope with the stress during competition. Apart from the psychological benefits, there are many physiological benefits of physical training on health. Vira and Smimova (1995**)** suggest that physical training can improve the central nervous system and the endocrine systems, increase energy potential, increase metabolic and functional economy, improve oxidation process, improve the capacity of oxygen transport system, increase functional stability. Increase the number of Na, K - pumps, and improve the immune

activity of the body. These physiological benefits help the body to reach an optimum state and to function efficiently.

According to what have been discussed by different scholars mentioned above, the important of physical fitness is not only can help to develop the skill of different physical activities physiologically but also psychologically. Also physical fitness can improve internal part of the body and this can benefits to reach optimal state efficiently.

Besides the individual benefits, there are social benefits from developing physical fitness through physical activities. For instance, physical activities act as opportunities for families or friends interacting together and so a relationship between each other develops. People share their experience and learn from each other. Thus, people can obtain the benefits physiologically, psychologically and sociologically from the participation in physical activities or training (Mullan, 1997).

The researcher agreed that physical fitness has very important for our daily live and the successful performance of sport participation. Through developing fitness level our physical become free from any disease such as obesity, diabetes, hypertension and etc.

2.3 .Physical fitness components

Physical fitness is comprised of many different components. These components can be classified into two categories, of which one is pertaining to health related and the other is skill/ performance related fitness components which are given in the table .1

Table 7 **Components of physical fitness**

| COMPONENTS OF PHYSICAL FITNESS | |
|---|---|
| Health- Related Physical Fitness Components | Skill- Related Physical Fitness Components |
| Muscular Strength<br>Muscular Endurance<br>Cardio- Respiratory Endurance<br>Flexibility<br>Body Composition | Agility<br>Balance<br>Co-ordination<br>Power<br>Reaction time<br>Speed |

Greenberg, et al .1994, p 2

### 2.3.1. Health Related Physical Fitness

It is concerned with the development and maintenance of the fitness components that can enhance health through prevention and remediation of disease and illness. Health related fitness enhances one's ability to function efficiently and maintain a healthy lifestyle. Thus health related fitness is important for all individuals throughout life. Also health related physical fitness is based on the assumption that an adequate level of body development is required for health. There are five components of health related fitness namely muscular strength, muscular endurance, cardio respiratory endurance, flexibility and body composition. (Deborah Wuest and Charles Bucher, 1991)

### 2.3.2. Skill-related Physical Fitness

Skill-related physical fitness consists of the components of physical fitness that have a relationship with enhanced performance in sports and motor skills. The skill-related components of fitness are considered to be agility, balance, coordination, power, speed, and reaction time though some experts feel that other abilities such as visual tracking should be included. It is assumed that people who possess skill-related fitness will be more likely to engage in regular activity and for this reason will have enhanced health-

related fitness and a lower risk of hypo kinetic diseases and condition .Skill-related fitness components are assessed with performance measures. Such components as reaction time and speed are considered by some to be more related to heredity than healthy lifestyles, especially in children. (Deborah Wuest and Charles Bucher, 1991)

2.4. The selected physical fitness components and tests

### 2.4.1. Cardio-Respiratory Endurance

Cardio respiratory endurance is the ability to provide and sustain energy aerobically .It depend up on the ability of the cardiovascular system to transport and utilize oxygen during sustain exercise. One of the greatest causes of death in the world is coronary heart disease. These risk factors have been shown to be related to people's lifestyles. Stress, cigarettes smoking, consumptions of fat and physical inactivity are lifestyle habits that have a direct tie to coronary heart disease and its mortality. According to a recent report from the surgeon general lack of regular exercise and physical activity contribute to the development of other coronary heart disease risk factors.

Many people regard cardio-respiratory endurance as the most important component of physical fitness. It is an athlete's major defense against fatigue. Low endurance capacity leads to fatigue, in the more sedentary sports or activities. For any athlete, regardless of sport or activity, fatigue represents a major deterrent to optimal performance. Even minor fatigue can hinder the athlete total performance. (Wilmore, Costil and Kenney, 2008)

Different research suggests that by engaging in regular exercise and physical activity that improves the cardiovascular system , the individuals can reduce many risk factors associated with coronary heart diseases. This is especially true for young people. There is strong evidence that the onset and rapid development of coronary heart diseases begin during youth, and may eventually become irreversible. Aerobic activities are incorporated throughout the physical education curriculum in order to improve this component (Wesson. et al, 2000)

Cardio respiratory endurance is also the ability to take in, deliver, and extract oxygen for physical work-that is, the ability to persevere at a physical task at a given intensity level **(**Powers and Howley,2007**).** Cardio respiratory endurance improves with regular participation in aerobic activities, such as speed walking, jogging, cycling, swimming,

cross country skiing, and many others. These activities include 12 min run/walking, jogging, running, jumping rope, distance swims, stationary bicycling, basket ball, hand ball, touch football, or any other activities which utilize the large muscles of the legs and elevate the heart rate. If you want to increase total work done on a weekly basis, it is better to increase exercise duration gradually and to maintain moderate exercise intensity with a frequency of four to five times per week is recommended. (Greenberg, et al .1994: 2)

According to the different scholars defined ,Cardio respiratory endurance is the ability to provide and sustain energy aerobically and also the ability to take in, deliver, and extract oxygen for physical work that is, the ability to persevere at a physical task at a given intensity level**.**

#### 2.4.1.1. Cardio respiratory endurance fitness test

Tests for cardio respiratory endurance fitness must use the same type of exercise as the sport in which the individual participates and should generally last in the region of 8-15 minutes, any shorter and the increased anaerobic energy contribution may make the test less valid. For runners, established tests include the 12 minute "Cooper" run, in which the participants Endeavour to cover as much distance as possible. Similar field tests could be developed for cyclists and other endurance events. Alternative tests require the participants to complete a set distance as quickly as possible (typically ~1.5 miles as this has been shown to be a good indicator of aerobic fitness and is generally completed in 8-15 minutes), with those achieving the quicker times being deemed to have the better aerobic fitness . (Johnson and Nelson, 1969:143)

### 2.4.2 .Speed

Speed is the ability of individual to make successive movements of the same kind in the shortest period of time. Also its' is characterized by the fastest respond to simple. Speed is components of fitness found in varying degrees in virtually all athletic movements. For many years, coaches and athletes have sought to improve power in order to enhance performance. Throughout this century and no doubt long before, jumping, bounding and hopping exercises have been used in various ways to enhance athletic performance. Speed is the rapidity with which one repeats successive movements of the same pattern.

Great seed in muscle contraction is not always conductive to the greatness efficiency of movement. (Bouchard, Shepard, and Stephens, 1993)

#### 2.4.2.1. Speed test: 30 meter sprint test

It involves running a single maximum sprint over a set distance, with time recorded. The researcher was measure over 30metres. This test is appropriate for testing speed in sprint run over 30 meters. It is appropriate to measure over a fairly short distance, as sprints in a game are generally fairly short. It is an appropriate test for speed as that is exactly what it measures. (Bob Davis .et al, 2005)

### 2.4.3 .Power

Power is strictly the maximum rate of working of muscle, measured in single effort. The muscular power is sometimes taken as peak power developed on external device for long as five seconds. A more powerful exercise is one in which either a larger amount of work is done in a given time, or a given amount of work is done in a shorter time. Power is also a term often used when referring to the rate of transforming metabolic energy to physical performance, such as aerobic power and anaerobic power. However, instead of viewing these metabolic terms as power terms, as would a physicist he exercise physiologist would probably view them as energy terms. (Bouchard, Shepard, And Stephens, 1993)

#### 2.4.3.1. Lower Extremity Power Test: Standing vertical jump test

The standing vertical jump test can assess overall lower extremity power, bilaterally or unilaterally. Participants began each test with both feet flat on the floor and reaching as high as possible, marked their reach with a magnet. The participant then lowered themselves to jump without a preparatory or stutter step. A counter movement was performed during the jump, with the arm reaching up and placing an additional marker on the wall. The score was the vertical difference between the two magnets. A marker was placed at the back edge of the athletes' rearmost heel, and the yard stick was used to determine the distance from the starting line to the mark. The best of three trials was recorded. (Luthanen Komi, 1978)

## 2.4.4. Muscular Endurance

Muscular endurance is defined as the ability of the muscles to sustain repeated productions of force at low to moderate intensities over an extend amount of time. It indicates that your muscles are strong enough to move for long periods of time and can complete numerous repetitions. In physical education program each day during the warming up phase of each lesson students must develop muscles endurance by participating in sets of abdominal exercises in increasing numbers as the time passes.

When weak abdominal muscles add strain to the lower back muscles, lower back problems can result. Many research studies conducted to investigate the ways to provide relief to people who suffer from back pain have demonstrated that improving the endurance of the abdominal muscles can decrease the incidence and severity of the pain. It is important to evaluate the muscular endurance of arms , shoulders, and abdominal area by completing the pull up or bar dip (men), flexed arm hang (women), and the sit up(men and women). Greenberg, et al (1994:P.25)

### 2.4.4.1. Muscular Endurance test: Pull up test

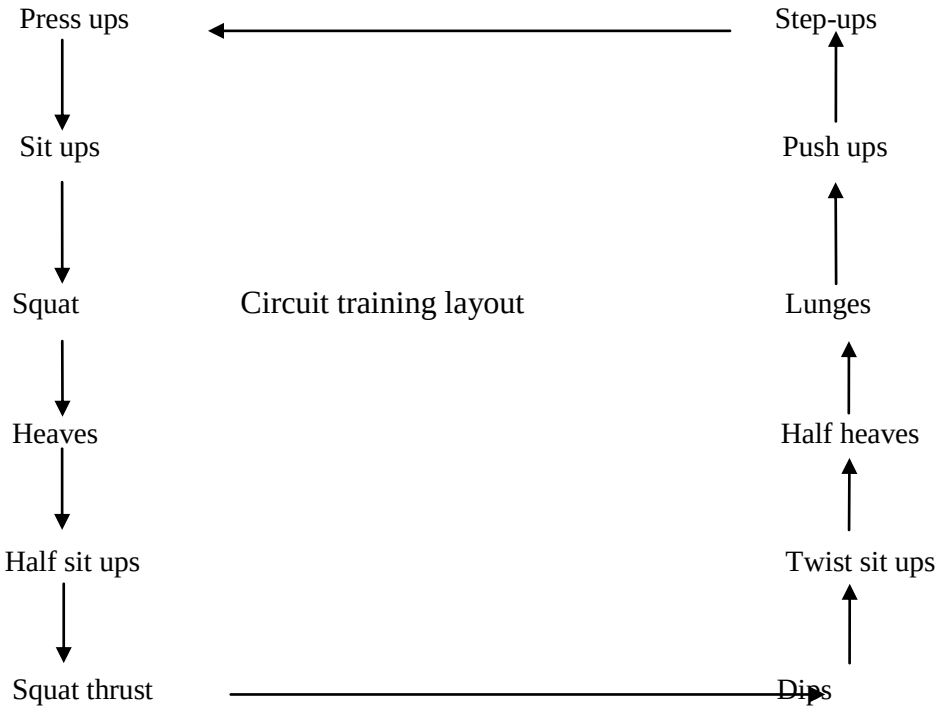
Since Pull-ups generally work the muscles in your back, rear shoulders, and arms, it's a good idea to combine Pull-ups with pushing exercises that train muscles that work in opposition to the back, rear shoulders, and biceps. For example, one choice is to combine Pull-ups with dips because they generally train the chest, triceps, and front shoulders. Pull-up test for men can compete by grasping an adjustable horizontal bar with palms facing away from the body. (Greenberg, et al .1994:P.25)

### 2. 5. Circuit Training Method

Circuit Training method term emerged in the sports training arenas in late of 1950s, when it was first introduced by Morgan and Adamson. At that time, the basic objective of the circuit training was limited to being a training system seeking for increasing the students' physical fitness within the sports activities limits inside schools. Circuit training is a work style that depends on organizing its domains on the well-known training methods (i.e. continuous, interval, and recurring). Load rationing process within the circuit training was governed by the applicable ways in this field, in terms of Intensity, volume, and intra-rest periods. (Al-Abhar, 2001)

Circuit training is a number of exercises with specified objectives which takes into consideration its design, rationing, and load variation the principle of the individual differences among the players. This can be achieved either by time-specific exercises with constant rest periods, or by time exercises performed during the shortest possible time within an entire circuit of exercises (cycle), where the initial objective of the performance is achieving it within the shortest possible period. (Reddy& Jyoti, 2012)

It can be plan in many ways targeting different aspects of physical fitness. Below is a layout of circuit.




(Reddy& Jyoti, 2012)

Above are 12 exercises of circuit. The number of exercises may vary according to the individual's fitness level and selection of exercises depends on the availability of resources and type of sessions. A person may start from any exercise on the above layout and follow the circuit around spending certain period of time on each exercise. (Reddy& Jyoti, 2012)

The role of the teacher or trainer in the circuit training method is different from that in other training methods. In this method, the teacher prepares the educational environment and follows up the students' progress in learning. He also directs the students' behavior during learning, and provides them with assistance, if necessary.

The sports training have a wide role in promoting the physical fitness components. The circuit training is considered a vital part of the training program, particularly in warming up section. This section is very essential in the training process. Not only it provides students with skills and develops many of their abilities and motor experiences, but also it provides them with necessary knowledge related to the health and scientific aspects of the body formation. This could be achieved by using the motor activities as well as group and individual games in the training lesson. (Oudat and Ghassab, 2007)

The researcher believes that the results of this study assist the workers in the sports domain to apply it in the various age stages, and utilize the learning time effectively and optimally. In addition, the current study contributes to develop the students' social skills through discussions, exchange of experiences, and providing them with the required feedback. Also the basic objective of the circuit training was limited to being a training system seeking for increasing the students' physical fitness within the sports activities limits inside schools. When designing the circuit training units, changing the load through the stations should be taken into consideration in a manner compatible to the basic muscle groups.

### 2.6. Effect of Circuit Training

Circuit training is a fertile field for the development of the educational aspects. In this concern, self-dependence, work, and self-assessment are widely available in the circuit training. Circuit training has many educational advantages such as availing mutual respect opportunity among the individuals and respecting those with humble abilities and capabilities equally at the same level of respect to those of higher abilities. (Reddy& Jyoti, 2012)

Also circuit training is one of the ways that take into account the individual differences, the players' levels and abilities, and the possibility of gradually upgrading the load grade. Additionally, it provides a chance to focus on a specific physical fitness component which needs to be promoted; thereby it avails chances for self-assessment. In addition, it is a system that helps in saving time and effort. Many individuals can be trained at the same time, because achieving the performance in the shortest time possible is the initial objective of the performance (Oudat &Ghassab, 2007). Furthermore, this method is one of the ways of physical fitness training aiming to a general development which includes all the physical aspects, as well as the heart and blood vessels fitness (Scholich, 1990). Hamoudat (2008) indicates that the circuit training method represents certain system and style in training based on the rules and laws derived from the analysis of the used training load. Circuit training aims at the development of the basic components of physical fitness. There are other advantages about circuit training. Since the training program consists of a sense of different training stations, it can arouse the interest of athletes or students by providing a variety of exercises. Moreover, many athletes or students can be trained at the same time with the limited supply of equipment and space.

It is economical to use the circuit training with basic equipment to improve the speed, power, muscular endurance, and cardio respiratory endurance fitness of athletes/students (Pauletto, 1991). Therefore, a teacher can use circuit training to help the development of the physical fitness of the students. According to the purposes of trainings there are many variations in circuit training. Scholich (1992) suggests that circuit training can be based on the endurance method, the extensive interval method, the intensive interval method and the repetition method.

Accordingly, circuit training has many important such as develops basic components of physical fitness, achieving performance in shortest period of time, it can arouse the interest of students or athlete, it help to save time and general development which includes all the physical fitness aspects.

# CHAPTER THREE

# RESEARCH DESIGN AND METHODOLOGY

## 3.1. Introduction

This Chapter presented the detail methodology showing the logical frame work that discusses research design, method of data analysis, research site, Source of data, population, procedures of data collection, sample size and technique, procedure of tests, ethical consideration, medical reference, safety procedures, as well as validity and reliability of data.

## 3.2 .Research Design and Methodology

### 3.2.1. Research Design

A quasi-experimental design was implemented in the study, which Seeks to determine if a specific treatment influences an outcome. The researcher assessed this by providing a specific treatment to one group pre test and post test. The quasi-experimental design was used when it was not possible to control for all potentially confounding variables.

Due to the real-world setting, pre-test and post-test were created using matched pairs while as many threats to validity as possible were controlled. The purpose of the pre-test and post test were, to see statistically significant difference between them on physical fitness performances following the circuit training.

### 3.2.2. Research Methodology

The data was collected as numerical form of Statistical Package for Social Science (SPSS) and it was analyzed using through quantitative forms in order to identify the effect of circuit training.

Paired t-test was employed to check whether or not any significant difference exist between the pre test scores of the study with respect to their post test results. The full preview of the Paired t-test result is displayed and discussed in chapter four. Furthermore, the analysis was supported by graphical and tables presentation.

### 3. 3 Research Site

This study was conducted in Borena Zone at Melka Soda Preparatory School Oromia region. This school was established in 2006 E.C and was found to the East of Addis Ababa which far away 530km and also 167km from Zone (Yabalo).

### 3.4. Sources of Data

The main sources of data were the pre test and post test result recorded on selected physical fitness variables to acquire adequate information and insight in the area of the study that was obtained from 45 Male students of Melka Soda preparatory school.

### 3.5 The Population, Sample Size and Techniques

The total population of students in Melka Soda preparatory School were 150 within four sections .From these four sections; two sections were grade 12 with 20 students in each class and the two sections were grade 11 with 55 students in each class. In general, 40 students were grade 12 and 110 students were grade 11 students. The class was selected purposive sampling technique of one class of grade 11 Natural Science male students from Melka Soda preparatory school students. The reason why the researcher was selected grade 11 students was, since the numbers of grade 11 students were greater than grade 12 students.

Also from the two class of grade 11, the natural students were purposively selected since they were more interested to attend the physical education practical class rather than the social one as I deduced from previous experience of practical class.

From the total of 55 students of this class, 50 students were males and 5 students were females. Accordingly, from the total 50 male students of this class, 45 healthy male students are purposively selected for this study. Lastly the researcher was purposively selected one student from the trainee group that assisted him during circuit training and also when pre-test and post test were recorded. The training or instructions was given for the selected subject before training was started.

## 3.6. Variables

**3.6.1. Independent variable**:-The independent variable of the study was circuit training method

**3.6.2. The Dependent variables: -** The dependent variables of the study were Cardio-respiratory endurance, speed, Power, and Muscular endurance

## 3.7. medical Reference

Most physicians indicate that a physical examination is necessary for individuals over the age of 40, those with the symptoms of heart disease or other medical ailments, and those who have previously been sedentary. Some physicians favor a comprehensive exam; others prefer only general screening. Although the exact contents of the ideal evaluation depends on the history and symptoms of each individual, common areas include a medical history that asks question about your own and your family's history of diabetes and coronary heart disease and associated risk factors such as hypertension , stress, smoking, eating habits, current activity level, and physical disabilities. (Jerrold, Greenberg, et al .1994, p 20)

Even though Melka Soda Woreda was 67km far away from hospital, the researcher prepared questionnaires for 50 male students of the sample size to identify students' health status such as stroke, lung, kidney, diabetes, hypertension, and cardio vascular disease as a medical reference.

Therefore, depend on the questionnaires presented for students; five male students were rejected due to health problem and the study was carried out with forty five male students (45). (See the questions enclosed in appendix-E)

## 3.8. Safety Procedures

As safety is the basic requirement of conducting physiological research, many safety precautions should be considered throughout the study. Some advanced exercises like depth jumping exercise have the potential for injuries if they are performed carelessly (Blattner & Noble, 1979). Injuries like synovitis and tendinitis may result from overtraining. In order to prevent any potential injuries in this study, many safety precautions were considered in this study.

First of all, the subjects for the study were assessed by questionnaire prepared on the health status of students. Only the healthy subjects were allowed to take part in the study. In addition, warming up exercises before the training, cool down exercise after training, proper clothing and footwear, and a flat, firm, non-slip floor were also required for safety (Norris, 1993).

Furthermore, Chu (1992) suggests that students can successfully perform during training with the considerations of the intensity level of the exercises and the experience of the students. The intensity of exercises should be gradually increased so that the students can adapt to the stress of the training.

This research is intended to study the effects of circuit training on the selected physical fitness of Melka Soda preparatory school of male students. As compared with the training effects of circuit training, the selected components of physical fitness were assessed with the physical fitness tests under the quasi-experimental group.

## 3.9. Procedures

Firstly, students perform a development of circuit training program two days per week for two months. Melka Soda preparatory school learning program was only one shift of morning time (2:00-6:15 o'clock). Since the students were interested to practice and had free time at afternoon (6:15-1o:45 o'clock), the researcher had opportunities to have two days of training time per a week. Accordingly, the circuit training program was applied one session (40 min) per week of the normal class and once a week was additional class of practical classes that was done by the researcher.

Each session last 40 minutes and consisted of a five-minute warm up and five minute cool-down exercise. All exercises were fully explained and demonstrated previously by the researcher, and students were asked to try them a few minutes before starting the first session of the intervention.

The pre test of four selected physical fitness variables were lasted in two days with two variables in each day and also the post test of four variables were lasted in two day with two variables in each day. Although, the name of selected students was alphabetically arranged and the test was started from number one (1) to the last of forty five (45) or ascending order. Accordingly, the examinee took a rest until his number was rounded to the back for next test of physical fitness variables.

## 3.10. Reliability and Validity of data

### 3.10.1 Reliability of Data

The reliability of the data was established through test and retest method by the same testers under similar conditions on each variable. Accordingly when both pre and post test results compares, the result gained were relatively similar. So the data were reliable.

### 3.10.2 Validity of fitness test

Validity is the accuracy of the results. This means whether the results which were recorded from the fitness test are a true reflection of what was actually trying to measure.

**Table 8 Validity of fitness test**

| | Fitness components | Fitness tests | Units/parameter | Instruments |
|---|---|---|---|---|
| **1** | Cardio-respiratory endurance | 12-min run/walk | In Meters | Foot ball field, Stopwatch,chalk, standing vertical jump board, whistle, bars , pen, paper and others |
| **2** | Speed | 30 m sprint | In m/sec | |
| **3** | Power | Standing Vertical jump | In Cm | |
| **4** | Muscular endurance | Pull up | In numbers/repetition | |

## 3.11. Procedure of tests

### 3.11.1. Twelve Minutes Run Test procedure

To perform twelve minute run, there are procedure: According to Gezahegne A and Araya D, 2006, the researcher ordered the students to carry out the following steps when the test was given.

1 .Before the test, the students performed warm up exercises.

2. Locate an area where specific distance is already marked. This means that the subjects were asked to stand on the starting position

3. Giving instructions to cover as much distance as possible by running, jogging or walking

4. The students were instructed to continue till the final whistle was blown and to stop before. With the starting whistle they started and at the end of twelve minutes the whistle was blown.

5. The number of minutes left was announced to the subjects every minute and the students were immediately stopped their running and perform simple cool down exercise.

6. Lastly the score was recorded

**Table 9 Normative data of the Cooper Test for Male Students**

| Age | Excellent | Very good | Good | Fair | Poor |
|---|---|---|---|---|---|
| 17-19 | >3000m | 2700-3000m | 2500-2699m | 2300-2499m | <2300m |
| 20-29 | >2800m | 2400-2800m | 2200-2399m | 1600-2199m | <1600m |
| 30-39 | >2700m | 2300-2700m | 1900-2299m | 1500-1999m | <1500m |
| 40-49 | >2500m | 2100-2500m | 1700-2099m | 1400-1699m | <1400m |
| >50 | >2400m | 2000-2400m | 1600-1999m | 1300-1599m | <1300m |

Gezahegne A and Araya D, 2006

### 3.11.2 .Speed: 30m sprint run test procedure

The procedures of 30m sprint run test are: According to Bob Davis .et al, 2005, the researcher ordered the students to carry out the following procedures during the test:

1. Students performed a warm-up exercise
2. The assistance kept time for the sprint, using stopwatches capable of measure.
3. The students lined-up on the start line.

4. As soon as started sprinting, the timers started the stopwatches.

5. When they crossed the 30m line, the timers stopped the stopwatches.

6. The best time from 2 or 3 trials is recorded as 30m sprint result.

7. To prevent muscle soreness they perform a cool-down exercise

**Table 10 Normative time for 30m sprint test For Male Students in second**

| Rating scales | Range of Second |
|---|---|
| Excellent | <4.0 |
| Very good | 4.0-4.2 |
| Good | 4.3-4.4 |
| Fair | 4.5-4.6 |
| Poor | >4.6 |

Bob Davis .et al, 2005

### 3.11.3 Power: Standing vertical jump test procedure

Standing vertical jump test is a test of the anaerobic power of the quadriceps muscle group. A standard vertical jump board is used for the test, which may digitally record the jump height, or gymnast's chalk was used instead. According to Bob Davis .et al, 2005, the researcher ordered the students to carry out the following steps:

1. The students performed a short warm-up prior to the test.

2. Stood with dominant side against the board, feet together, and reached up as high as they can and recorded standing reach height.

3. Only one dip of the arms and knees is permitted. Make the jump and touch the vertical jump board at the peak of their jump.

4. Performed three trials. No rest is required between trials, the time taken to observe and record the height of the jump was needed for recovery between consecutive trials.

5. Lastly they performed cool down exercise.

**Table 11 Normative Standing Vertical jump test of Male students in centimeter**

| Rating Scale | Range of centimeters |
|---|---|
| Excellent | >65 |
| Very good | 50-65 |
| Good | 40-49 |
| Fair | 30-39 |
| Poor | <30 |

Bob Davis .et al, 2005

### 3.11.4 Muscular Endurance: Pull up test Procedure

The researcher used the following test procedures during the test was given. According to Jerold S Greenberg, et al. (1994), the researcher ordered the students to carry out the following procedures:

1. The students performed warm up before starting the training.

2. Began by grasping the pull-up bar with both hands, palm facing forward

3. Pull up until the chin or chest touches the bar and repeated as many times as possible

4 .The body had to return to a stretch position (elbows locked) each time.

5. The score/ number of repetition were recorded.

6. Lastly, cool down exercise was performed at the end of the test.

**Table 12 Normative Scale of pull-up test for Male students**

| Rating Scale | Range in repetition | |
|---|---|---|
| | Age | |
| | **17-26** | **27-39** |
| Excellent | ≥31 | ≥28 |
| Very good | 27-30 | 24-27 |
| Good | 23-26 | 20-23 |
| Fair | 19-22 | 16-19 |
| Poor | <19 | <16 |

(Gezahegne Abate and Araya Dechasa, 2006)

## 3.12. Training program

In each training session subjects were required to have warming-up exercises such as walking/ jogging and etc for five minute at the start of training so that it helped to avoid injury in training and also let the subjects get ready with training psychologically. In addition, at the end of the training, there was about five minutes for the subjects to cool down their body. Forty five subjects were participated in the circuit training which included a series of exercises. The students performed different exercises in each circuit training session. For example, exercises prescribed during the circuit training program were: Jogging, Push-up, Pull-up, Step-exercise, running on the spot, Skipping, one leg walking/jumping, hopping jump, jumping rope, Galloping, jumping jacks.

**Table-7 Schedule of Training Program**

| | Duration |
|---|---|
| Duration of training | For 8 weeks /two months |
| Weekly | Two days per week |
| Time | 40minutes (one period) |
| Warm Up Exercises | 5 minutes |
| Cool Down Exercises | 5 minutes |
| Circuit Exercises | 30 minutes |

## 3.13 Ethical Consideration

It was an ethical dilemma to do research on students who have reduced ability to take in information, process it, and draw conclusions. First, I informed the school director that I want to conduct a research and some property of the school. Next, In spite of the fact that it was difficult to ascertain students' understanding of their participation, it was important for them to take part in research in order to gain knowledge about the physical fitness such as cardio respiratory endurance, speed, power ,and Muscular endurance.

Any person had the right to decide if he wants to take part in research in order to avoid misunderstandings. Before each test, the test taker were informed how the test was done and was shown how the test should be conducted to feel safe. Concerns about the test taker well-being during the testing session were addressed frequently and the sessions were paused if the test taker wanted a break.

Besides this, the process of data collection was done anonymously without writing their name, identification number, telephone number, so that the threat of being disclosed was very much minimized.

# CHAPTER FOUR

# 4. ANALYSIS OF THE DATA AND RESULTS OF THE STUDY

## 4.1. Introduction

The collected data on some selected physical fitness variables has been analyzed and presented by both graphically and tables in this chapter. The purpose of the study was to assess the effects of circuit training method on some selected physical fitness variables such as cardio-respiratory endurance, power, speed and muscular endurance of Melka Soda preparatory school male students.

## 4.2. Cardio-respiratory Endurance (12 minute running/walking)

Cardio respiratory endurance fitness is tested by exercise in which the individual participates and generally last in the 12 minute "Cooper" run to cover as much distance as possible. So the below graph displayed the number of students observed in different scale of 12 minute running to test the effect of cardio respiratory endurance.

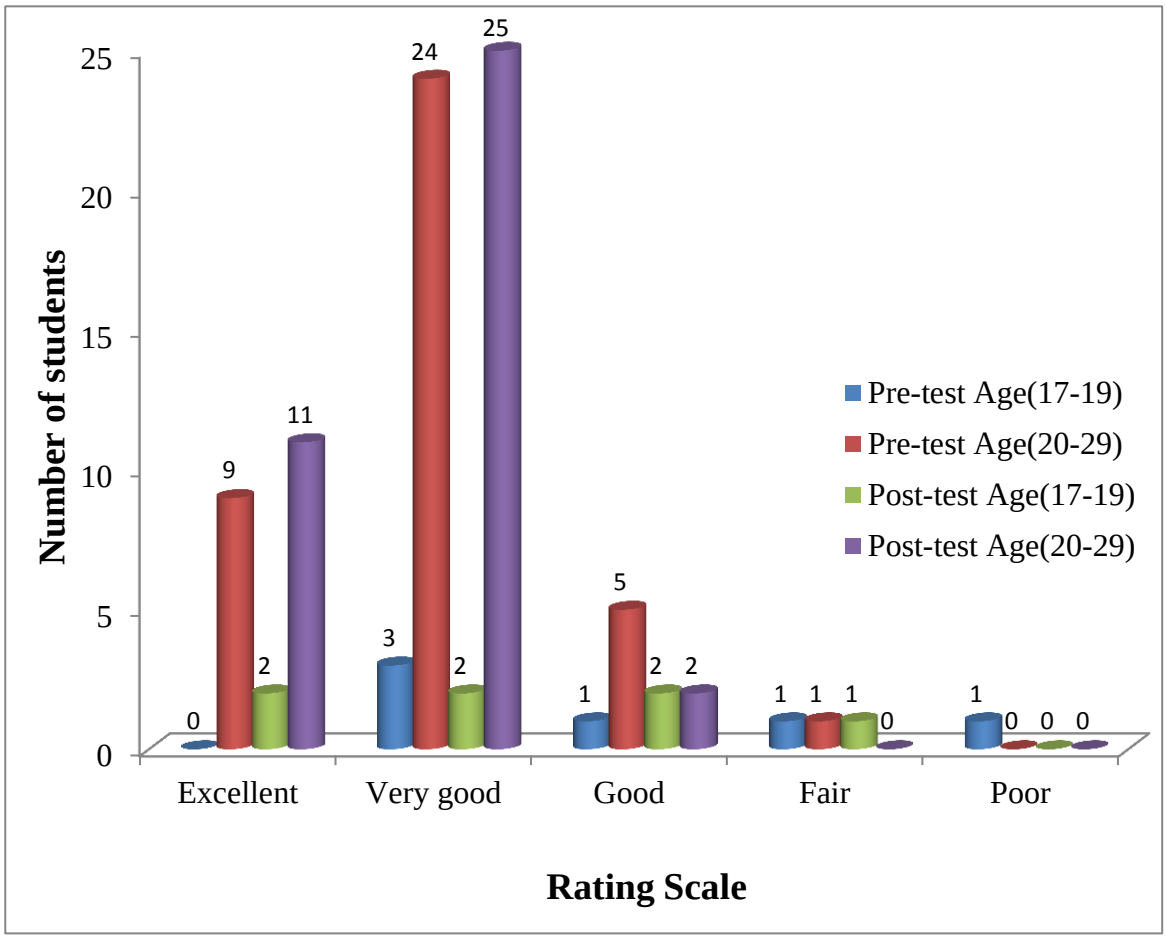



**Figure 1 Graphical presentation of Cardio-respiratory Endurance (12 minute running /walking)**

As we observed from the above graph there was improvement rating scale of participants on cardio respiratory endurance after two month training compared to before training or pre and the post test. When we observe from age point of view, the improvement is something age dependent, for example during pre-test there was no involvement of students at the age of 17-19 in excellent rating scale but two students were involved during post test and also at the age of 20-29 it increased from nine (9) to twelve(12). Similarly one student is observed in poor rating scale during pre test in the age group of 17-19. However no student is observed in the post test period in this age group. On the other hand no improvement was observed in fair rating scale before and after training in both age groups (17-19) and (20-29). As a general the result of 12 minute run indicates that relatively some improvement was observed on cardio respiratory endurance with two month of circuit training.

**Table 8 -Paired t-test analysis of one sample for variance on Cardio-respiratory Endurance (12min run/ walk) of students before and after circuit training at two different testing periods**

| CRE | N | Degree of freedom(Df) | Mean | Mean Deference | Standard Deviation | t-value | p-value |
|---|---|---|---|---|---|---|---|
| Pre-test | 45 | 44 | 2631.20 | 58.911 | 57.038 | -6.929 | .000 |
| Post-test | 45 | 44 | 2690.11 | | | | |

As shown above in table (8), pre and post-test result of students in cardio-respiratory endurance on cooper test/12minute running were given. Deferent research suggested that by engaging in regular exercise and physical activity can improve cardiovascular system, the individual can reduce many risk factors associated with coronary heart disease. This is especially true for young people. This is strong evidence that onset and rapid development of coronary heart diseases begin during youth. Aerobic activities are incorporated throughout the physical education curriculum in order to improve this CRE. (Wesson.et al, 2000)

Before giving circuit training method of 12 minute running/walking, students have showed low improvement with total mean value of 2631.20m in 12minute run/walk was observed and after the circuit training was given with the total mean value of 2690.11m/12minute run/ walk and with the mean deference of 58.911m was observed. With this test result, the improvement observed before and after circuit training for two month was statistically tested by paired t-test.

The result indicated as t-value= -6.929, Df=44, SD=57.038 and p-value=.000 at ($p<0.05$) level of confidence. Hence, the result of the study indicates that, post test result of students after circuit training were significantly deference from pre -test mean after two month circuit training with respect to their cardio respiratory endurance.

### 4.3. Speed (30m sprint run)

The graphical below showed that, the number of students observed pre and post test of speed in different rating scale that was tested by 30m sprint run.

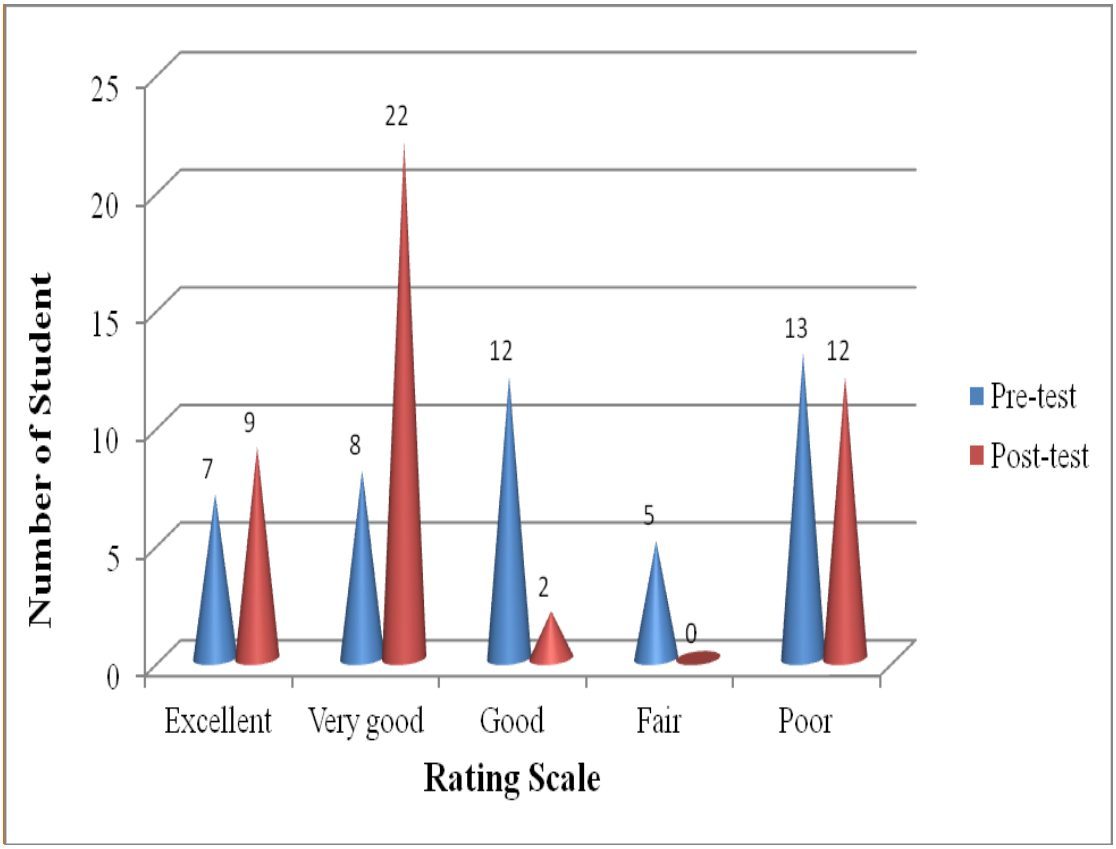



**Figure 2 Graphical presentation of Speed (30m sprint run)**

As it is indicated in above diagram improvement was observed on speed for 30m sprint running in all rating scales. In particular case the number student before training in rating scale of very good were 8, after two month training their number enhanced to 22. Similarly some of students in which they were under good and fair rating scale, they became under category of very good rating scale after two month circuit training. On the other hand number of student found in the rating scale of very good rating more in number compared to other category. In opposite to that number of student found in good rating scale are few in number, this might be due to good improvement up on two month circuit training. Finally the result indicates that an improvement on the student's speed in 30m sprint running was observed after two month of circuit training compared to they got training.

**Table 9 Paired t-test analysis of one-sample for variances on speed (30m sprint running by second) of students before and after training at two different testing periods**

| Speed | N | Degree of freedom | Mean | Mean Deference | Standard Deviation | t-value | p-value |
|---|---|---|---|---|---|---|---|
| Pre- test | 45 | 44 | 4.5044sec | .3sec | .25406 | 7.921 | .000 |
| Post-test | 45 | 44 | 4.2044sec | | | | |

As shown in table (9) pre-test result and post-test improvement result of speed on 30m sprint run were given for sampled students after two month circuit training .The result observed mean value before training or pre test result on speed =4.5044sec, post test result=4.3044 sec, mean deference=.3sec, Sd= .25406, t-value=7.921 and p-value =.000 with 44 degree of freedom was observed after two moth circuit training at ($p<0.05$) level of confidence.

Hence, the result of the study indicates that, post test result of students after two month circuit training was significantly deference from pre -test mean with respect to their speed. Speed is the rapidity with which one repeats successive movement of the same pattern and also great speed in muscle contraction is not always conductive to the greatness efficiency of movement. (Bouchard, et al .1993) .Hence, the speed was tested by 30m sprint run and also the result gained was significantly deference due to two month circuit training method.

### 4.4. Power (Standing Vertical jump)

Standing vertical jump was given to assess power of physical fitness variable. However, the below figure 3 presented that, the change between pre test and post test rating scale of students on standing vertical jump.

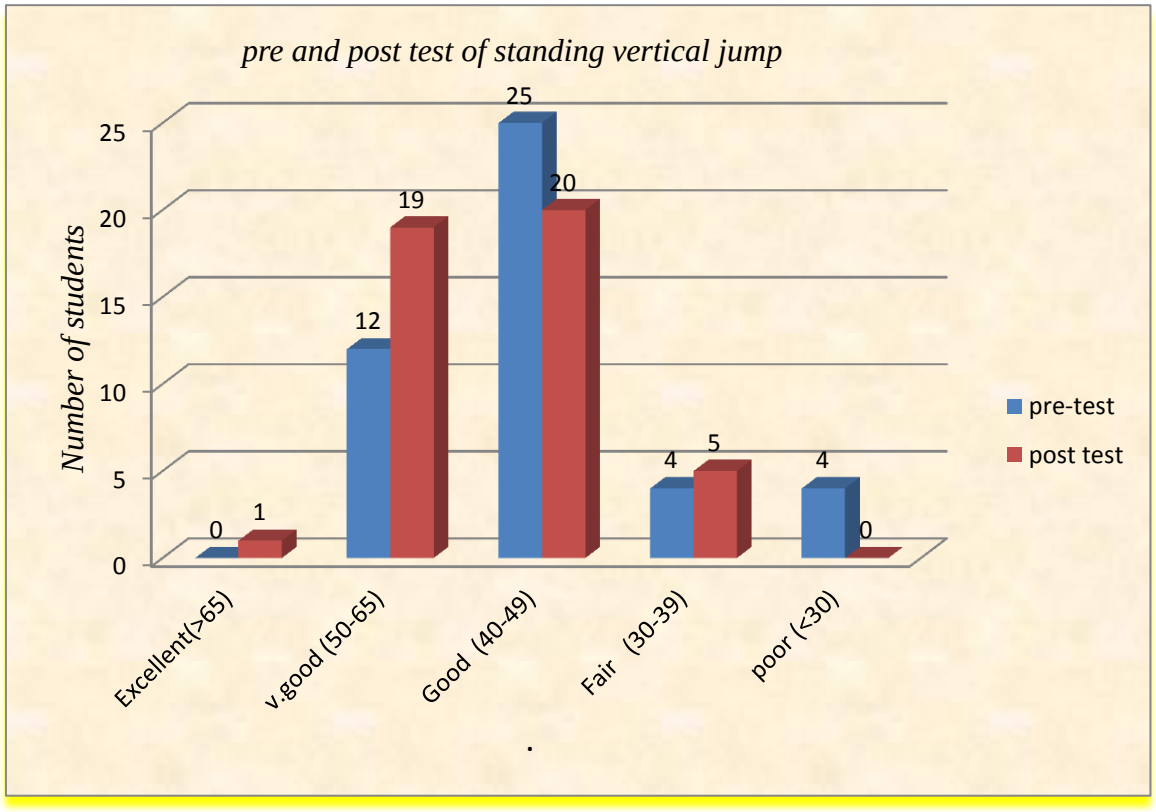



**Figure 3 Graphical presentation of power (Standing Vertical jump) pre and post test**

The above diagram (3) indicates that improvement was observed on standing vertical jump in all rating scales. Specifically the number of student before training in rating scale of excellent and very good were 0 and 12, after three month training their number increased to 1 and 19, respectively. In the same way numbers of students in the good rating scale were reduced after training compared to pre test, this indicates that some of the student became under very good rating scale. Similarly, there was a change in poor rating scale that is from 4 to 0. On the other hand number of student found in the rating

Scale of very good are more in number compared to in good rating scale, this might be due to slightly improvement up on two month of circuit training method.

**Table 10 Paired t-test one Sample for variances of power on lower extremities (Standing vertical jump by cm) of students before and after training at two different testing periods**

| Power | N | Degree of freedom | Mean | Mean Deference (MD) | Standard Deviation (SD) | t-value | p-value |
|---|---|---|---|---|---|---|---|
| Pre-test | 45 | 44 | 49.69 | 2.644 | 2.814 | -6.305 | .000 |
| Post-test | 45 | 44 | 48.33 | | | | |

Significant at 0.05 level of confidence

The statically analysis result indicated that (table 10) the pre and post-test result of students in power on standing vertical jump were given. Before giving circuit training of power, students have showed low improvement with total mean value 49.69 in standing vertical jump was observed and after the training was given with the total mean value of 48.33 and with the mean deference was 2.644 was observed. With this test result, the improvement observed before and after circuit training for two month was statistically tested by paired t-test.

The result indicated as Df=44, SD=2.814, t-value= -6.929, and p-value=.000 at ($p<0.05$) level of confidence. Hence, the result of the study indicates that, post test result of students after circuit training were significantly deference from pre -test mean after two month circuit training with respect to their power on lower extremities of standing vertical jump.

As suggested by (Bouchard.et al, 1993), Power is strictly the maximum rate of working of muscle, measured in single effort. The muscular power is sometimes taken as peak power developed on external device for long as five seconds. However, instead of improving power the appropriate training method is circuit training that was regularly performed.

### 4.5. Muscular Endurance (Pull – Up test)

There were different types of tests to assess upper muscular endurance. But the researcher was used pull- up test .The figure 4 shows that the improvements between ratings scale of pull-up before training and after circuit training.

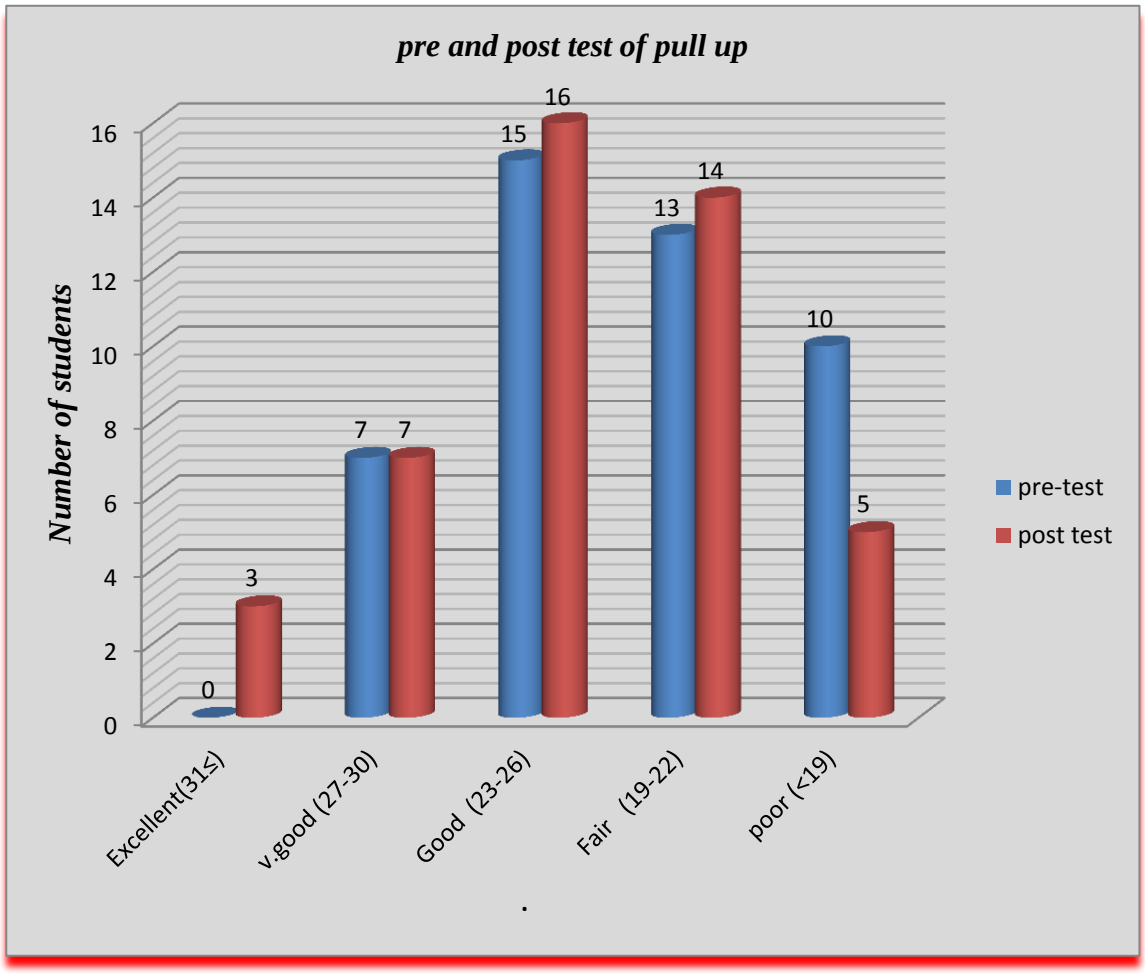



**Figure 4 Graphical presentation of Muscular Endurance (Pull –Up test)**

From the above diagram it has been observed that the mean difference in number of students on muscular endurance before and after circuit training method. When we observe the number of students in excellent it was enhanced from 0 to 3.Whereas no improvement was observed in very good rating scale after training. These could be some students who were in very good scale before training became at category of excellent after circuit training. In similar way number of students at poor rating scale was 10 at pre

test and reduced to 5 at post- test, indicates that some of the students became to fair or good rating scale.

**Table 11 Paired t-test one-Sample for Variances on Muscular Endurance (Pull-up) of students before and after training at two different testing periods**

| Muscular Endurance | N | Degree of freedom (Df) | Mean | Mean Deference | Standard Deviation (SD) | t-value | p-value |
|---|---|---|---|---|---|---|---|
| Pre-test | 45 | 44 | 21.98 | 1.689 | .319 | -5.292 | .000 |
| Post-test | 45 | 44 | 23.67 | | | | |

Significant at 0.05 level of confidence

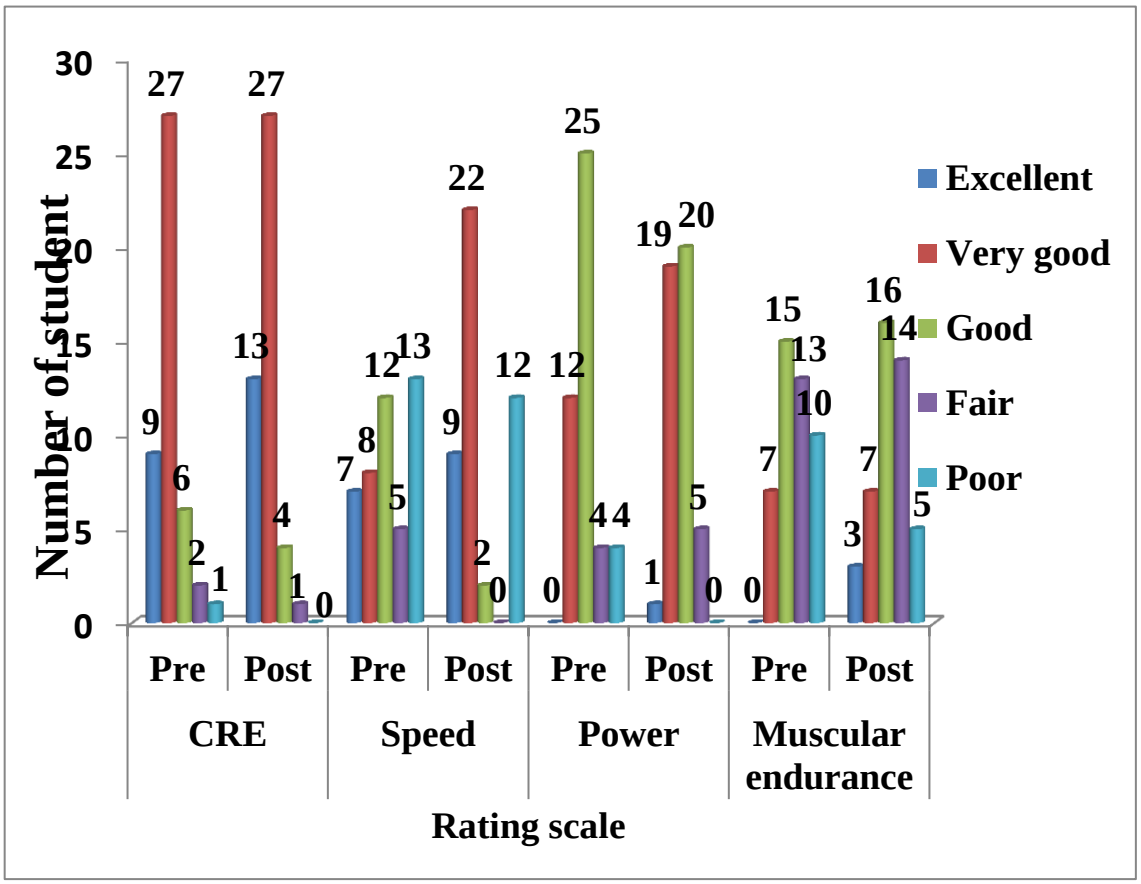
The above table (11) shows the paired t- test analysis of the Muscular Endurance (Pull-up) of students before and after circuit training at two different testing periods. The statically analysis result indicated that the pre and post-test result of students in muscular endurance on pull-up were given. Before giving circuit training (pre-test) of muscular endurance, students showed low improvement with total mean value 21.98 in muscular endurance was observed and after the training was given with the total mean value of 23.67 and with the mean deference of 1.689 was observed.

The result indicated as Df=44, SD=.319, t-value= -5.292, and P-value=.000 at ($p<0.05$) level of confidence. This indicates that there is a significant difference in Muscular endurance (Pull-up) of students before and after circuit training. As the students informally informed that some have weight lift training by themselves. This training might be helped them for their muscular endurance and additional circuit training given might support them to show significant change after two month of circuit training.

As suggested by Greenberg, et al (1994:P.25) , in physical education program each day during the warming up phase of each lesson students develop muscles endurance by participating in sets of abdominal exercises in increasing numbers as the time passes.

Many research studies conducted to investigate the ways to provide relief to people who suffer from back pain have demonstrated that improving the endurance of the abdominal muscles can decrease the incidence and severity of the pain.

**Figure 5: Graph which shows improvement status between the four dependent variables**




The above figure **5** shows the status of student improvement between the four physical fitness variables by rating scales. As it clearly presented that number of students more enhanced after training in speed among the four physical fitness variables. For example in the rating scales of very good there were only 8 students, while their number increased to 22 after training. Similarly in this variable number of students at pre test in rating scale of

faire were 5 but no student was observed after training in this rating scale. The same is true for good rating scale number of student at pre test was 12 and it was reduced to 2. This indicates that some of the student might be shifted to very good rating scale after circuit training. Similar improvement in number of student to speed was observed on power physical fitness variable. On the other hand no more improvement in number of student was in cardio respiratory endurance physical fitness variable. For example in the rating scale of very good the number of student at pre test was 27, the same number of students was observed after training. In similar manner little improvement was observed in excellent rating scale which is 9 to13. Similarly the number of students in the good rating scale at pre test was 6 and reduced to 4 at post test.

**Table 12 Correlation table among CRE, Speed, power and Muscular Endurance**

| Physical Fitness Variables | CRE | Speed | Power | Muscular Endurance |
|---|---|---|---|---|
| CRE | 1 | | | |
| Speed | 0.792263 | 1 | | |
| Power | 0.466714 | 0.180753 | 1 | |
| Muscular Endurance | -0.38448 | -0.65967 | 0.542978 | 1 |

As we observed from the above table, correlation was made among four variables namely CRE, speed, power and Endurance. The result shows that there was a strong positive correlation between Speed and CRE. Even if not strong, positive correlation was also observed between Power with CRE and Speed as well as between Muscular endurance and Power. However, negative correlation was found between Endurance and CRE as well as muscular endurance and speed.

## 4.6. Major Findings of the Study

As stated in chapter one of this paper, the study had four hypotheses that were proposed as major objectives of the study. The major findings of the study had been discussed one by one in this study under hypotheses.

In the first null hypothesis it was noted that, there is no a significance difference between the pre and post test effects of circuit training on cardio-respiratory endurance. The result revealed that there was significant difference; due to the P-value of CRE is .000 under the quasi- experimental treatment when compared to the pre-test with post test after two month circuit training. Therefore, the null hypothesis was failed to accept.

In the second null hypothesis it was noted that, there is no a significance difference between the pre and post test effects of circuit training on speed. The result showed that there was significant difference due to the P-value of speed is .000 between the pre-test and post test effect of circuit training after two month circuit training on speed. Therefore, the null hypothesis was failed to accept.

In the third null hypothesis it was mentioned that, there is no a significance difference between the pre and post test effects of circuit training on the development of power on lower extremities. The results revealed that, there was significant difference due to the P-value of power on lower extremities is .000 compared to the pre-test with post test after two month circuit training. Therefore, the null hypothesis was failed to accept.

In the fourth null hypothesis it was noted that, there is no a significance difference between the pre and post test effects of circuit training on muscular endurance of upper extremities. The result showed that, there was significant difference due to the P-value of muscular endurance is .000 after two month circuit training when compared to pre-test with post test result. Therefore, the null hypothesis was failed to accept.

# CHAPTER FIVE

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presented majors of the study following summary, conclusions and recommendations are presented.

## 5.1. Summary

The purpose of the study was to identify the effects of circuit training on the selected physical fitness components: Namely, Cardio respiratory endurance, speed, power on lower extremities and muscular endurance on upper extremities.

In order to identify the effect of circuit training, the subjects were allowed to participate in this training, after the collected questionnaires that identify the students' health status. Accordingly from a total of 50 male students of one section, forty five (45) healthy male students were selected from Melka Soda Preparatory School during the academic year of 2008 E.C for this study and 5 students are rejected due to different diseases.

The selected subject was under the quasi- experimental design of one group pre test (before training) and post test after two month of circuit training. The training period was two days per week for two month circuit training with duration of 40 minutes of one period. Physical fitness variables were statistically analyzed by using Paired t-test. In general the level of confidence is fixed at $<0.05$ to test the significance.

In general, the result hypotheses of this study showed that, there were significant difference on all variables of CRE, Speed, Power and muscular endurance on upper extremities of physical fitness variables due to the two month circuit training method during physical education practical class.

## 5.2. Conclusions

Based on the data collected and discussion made, the following conclusions were drawn. On the basis of the findings, the following conclusions were drawn

In order to improve the physical fitness of students, circuit training was usually suggested to improve the general physical fitness of students. However, lack of a teacher using this training method before intends to have low level of improvement on improvement. In this study, some exercises have been introduced into the circuit training.

In conclusion, the similar training effects of the circuit training enable teachers or coaches to develop the physical fitness of students or athletes with a wide range of different exercises.

It also suggests that circuit training is an efficient training method that is enjoyable, measurable, and generates immediate positive changes on the development of speed and muscular endurance fitness components.

Based on this study, two days a week of circuit training for two month has been significant deference on speed and muscular endurance and two days a week of circuit training has not been significant differences on cardio-respiratory endurance and power on lower extremities of physical fitness variables. Even if there was no significant deference on CRE and power after circuit training, there was a positive change on these variables as displayed graphically in chapter four.

## 5.3. Recommendations

The researcher suggested the following recommendations were made on the basis of the above findings of the study:

- Schools and stakeholder should have to organize inter- school competition to give chance for students to develop their skill.
- School principals and physical education teachers should give attention to circuit training method during practical class.
- The circuit training period should have to more than two days per week and more than two months for more significant result
- The present study is recommended to the coaches, trainers and physical educators to adopt this training to improve some selected physical fitness variables

- Similar research may work attempted to unselected physical fitness variable
- Other researchers may conduct with two groups of control group and quasi-experimental groups.

## References


Al-Abhar M (2001): Teaching and School Sports Activities. Faculty of Physical Education for Men, Holwan University

A. Kaminsky leonard (2005): Health related physical fitness assessment manual. P3.

Arnhein, Daniel D (1985): Modern Principles of Athletic Training, St. Louis: The Mosby College Publishing.

Barry L. Johnson and Jack K. Nelson (1969): Practical Measurement for Evaluation in Physical Education, (Minneapolis: Burges Publishing Company) p143.

Blattner, S. E. & Noble, L. (1979): Relative effects of circuit training on standing vertical jumping performance. Research Quarterly, 50. 583- 88.

Bob Davis, et al, 2005). Physical Education and the study of sport

Chu, D. A. (1992): Jumping into Plyometrics. Champaign, Illinois: Leisure Press

Coleman, S. (1999). The importance of physical activity to health and daily functioning

Coud .B, Royal J. S. Thomas .S (1993): Physical activity, fitness, and health. P.15

Fahey, et al, (1947): Fit &Well: Core concepts and labs in physical fitness and well. p.107

Fu, F. (1994): Health Fitness Parameters of Hong Kong School Children

Gezahegne A and Araya D (2006): Physical Education Student Text Grade 12, P.22

Harris, D. R. (1996): Fitness and Exercise Source book U.S.A.: Omni graphics, Inc.59

Hazel dine, R. (1 995): The Cordwood Press of Aerobic Fitness Training

Jerold S Greenberg, George B. Dintiman, Barbe Myers Oakes (1994): Physical Fitness and Wellness P.25

Kevin W.et al, (2000): Sport and physical education .2nd edition. P.94, 97, 101

L. Fox Edward (1984): Sports Physiology, (Japan: Saunders College Publishers,), p.401.

Luthanen P, Komi PV. (1978): Segmental contribution to forces in vertical jump. Euro J Apply Physiology.181-188 [PubMed]

Matveyer. L: Fundamentals of Sports Training(Moscow: Progress Publishers, 1981), p.11

Mullan N (1997): Health-related Fitness. Oxford: Reed Educational and Professional Publishing Ltd.

Norris, C. M. (1993): Weight Training Principles & Practice. London: A & C Iack (Publishers) Ltd.

Oudat, M., & Ghassab, I. (2007): Proposed Training Program Using the Circuit Training Method and its effects on the Development of Certain Physical Attributes in the Physical Education Lesson.

Pauletto, B. (1991): Strength Training for Coaches. Champaign, Illinois: Leisure Press

Powers, S. K., and E. T. Howley (2007): Exercise physiology (6th edition.). Boston: McGraw Hill.

Reddy, M., & Jyoti (2012): Comparison of Circuit Training Methods on Performance Variables, 2,221.

Rakowski and Mor (1992): Physical fitness and wellness .Cited by Jerrold S. Greenberg, George B. Dintiman, Barbe Myers Oakes:USA

Scholich, M. (1990): Circuit Training for All Sports: Methodology of Effective Fitness Training. Toronto: Sport Books Publisher.

Suresh C (2011): Doctor Research conducted on the effect of Aerobic training, Yogic training and detraining on health related physical fitness of college male students.

Watson, A.W.S. (1995): Physical Fitness and Athletic Performance. New York: Longman

Wesson et al (2000): Sport and Physical education. 2nd edition

Wilmore, et al (1999, 2008): Physiology of sport and exercise .3rd P.268 and 4th edition. p.243

Vira. A & Smirnova T (1995): Health Promotion and Exercise Training. Sport Medicine.

## APPENDIX – A

### Pre and post test result of CRE (12 Min running/Walking by meter)

| No | Name of students | Age | Pre- test | | | | | | Post –Test | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Result | Rating scales | | | | | | Rating scales | | | | |
| | | | | Excellent | V.good | Good | Fair | Poor | Result | Excellent | v.good | good | fair | Poor |
| 1 | | 20 | 2951 | ✓ | | | | | 3015 | ✓ | | | | |
| 2 | | 20 | 2730 | | ✓ | | | | 2845 | ✓ | | | | |
| 3 | | 20 | 2450 | | ✓ | | | | 2523 | | ✓ | | | |
| 4 | | 20 | 2866 | ✓ | | | | | 2901 | ✓ | | | | |
| 5 | | 21 | 2563 | | ✓ | | | | 2600 | | ✓ | | | |
| 6 | | 21 | 2716 | | ✓ | | | | 2802 | ✓ | | | | |
| 7 | | 19 | 2846 | | ✓ | | | | 2945 | | ✓ | | | |
| 8 | | 20 | 2442 | | ✓ | | | | 2542 | | ✓ | | | |
| 9 | | 19 | 2188 | | | | | ✓ | 2321 | | | | ✓ | |
| 10 | | 19 | 2534 | | | ✓ | | | 2543 | | | ✓ | | |
| 11 | | 21 | 2818 | ✓ | | | | | 2889 | ✓ | | | | |
| 12 | | 19 | 2886 | | ✓ | | | | 2912 | | ✓ | | | |
| 13 | | 19 | 2996 | | ✓ | | | | 3016 | ✓ | | | | |
| 14 | | 21 | 2544 | | ✓ | | | | 2528 | | ✓ | | | |
| 15 | | 20 | 2586 | | ✓ | | | | 2613 | | ✓ | | | |
| 16 | | 20 | 2633 | | ✓ | | | | 2731 | | ✓ | | | |
| 17 | | 20 | 2467 | | ✓ | | | | 2550 | | ✓ | | | |
| 18 | | 21 | 2645 | | ✓ | | | | 2716 | | ✓ | | | |
| 19 | | 20 | 2347 | | | ✓ | | | 2519 | | ✓ | | | |
| 20 | | 20 | 2698 | | ✓ | | | | 2715 | | ✓ | | | |
| 21 | | 22 | 2176 | | | | ✓ | | 2221 | | | ✓ | | |
| 22 | | 21 | 2756 | | ✓ | | | | 2813 | ✓ | | | | |
| 23 | | 22 | 2856 | ✓ | | | | | 2918 | ✓ | | | | |
| 24 | | 20 | 2567 | | ✓ | | | | 2578 | | ✓ | | | |
| 25 | | 20 | 2356 | | | ✓ | | | 2341 | | | ✓ | | |
| 26 | | 21 | 2764 | | ✓ | | | | 2674 | | ✓ | | | |
| 27 | | 21 | 2900 | ✓ | | | | | 3015 | ✓ | | | | |
| 28 | | 20 | 2346 | | | ✓ | | | 2456 | | ✓ | | | |
| 29 | | 22 | 2865 | ✓ | | | | | 2864 | ✓ | | | | |
| 30 | | 21 | 2476 | | ✓ | | | | 2546 | | ✓ | | | |
| 31 | | 20 | 2856 | ✓ | | | | | 2889 | ✓ | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | | 21 | 2645 | | ✓ | | | | 2700 | | ✓ | | | |
| 33 | | 20 | 2645 | | ✓ | | | | 2698 | | ✓ | | | |
| 34 | | 24 | 2342 | | | ✓ | | | 2499 | | ✓ | | | |
| 35 | | 18 | 2499 | | | | ✓ | | 2627 | | | ✓ | | |
| 36 | | 20 | 2500 | | ✓ | | | | 2521 | | ✓ | | | |
| 37 | | 20 | 2699 | | ✓ | | | | 2678 | | ✓ | | | |
| 38 | | 21 | 2657 | | ✓ | | | | 2723 | | ✓ | | | |
| 39 | | 22 | 2657 | | ✓ | | | | 2598 | | ✓ | | | |
| 40 | | 21 | 2856 | ✓ | | | | | 2989 | ✓ | | | | |
| 41 | | 20 | 2965 | ✓ | | | | | 3051 | ✓ | | | | |
| 42 | | 21 | 2587 | | ✓ | | | | 2597 | | ✓ | | | |
| 43 | | 20 | 2587 | | ✓ | | | | 2618 | | ✓ | | | |
| 44 | | 20 | 2546 | | ✓ | | | | 2648 | | ✓ | | | |
| 45 | | 21 | 2395 | | | ✓ | | | 2567 | | ✓ | | | |
| Total | 45 | | | 9 | 27 | 6 | 2 | 1 | | 13 | 27 | 4 | 1 | 0 |

# Appendix B

## Pre and Post Test Result of Speed (30m sprint running by second)

| No | Name of students | Age | Pre- test | | | | | | Post –Test | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Results | Rating scales | | | | | Results | Rating scales | | | | |
| | | | | Excellent | v. good | Good | Fair | Poor | | Excellent | v. good | good | Fair | Poor |
| 1 | | 20 | 4.2 | | ✓ | | | | 4.0 | | ✓ | | | |
| 2 | | 20 | 4.0 | | ✓ | | | | 4.0 | | ✓ | | | |
| 3 | | 20 | 4.2 | | ✓ | | | | 4.0 | | ✓ | | | |
| 4 | | 20 | 5.1 | | | | | ✓ | 4.8 | | | | | ✓ |
| 5 | | 21 | 4.9 | | | | | ✓ | 4.8 | | | | | ✓ |
| 6 | | 21 | 5.2 | | | | | ✓ | 4.8 | | | | | ✓ |
| 7 | | 19 | 5.5 | | | | | ✓ | 4.7 | | | | | ✓ |
| 8 | | 20 | 4.0 | | ✓ | | | | 4.0 | | ✓ | | | |
| 9 | | 19 | 5.0 | | | | | ✓ | 4.9 | | | | | ✓ |
| 10 | | 19 | 4.4 | | | ✓ | | | 4.0 | | ✓ | | | |
| 11 | | 21 | 4.0 | | ✓ | | | | 3.9 | ✓ | | | | |
| 12 | | 19 | 5.9 | | | | | ✓ | 5.5 | | | | | ✓ |
| 13 | | 19 | 3.9 | ✓ | | | | | 3.8 | ✓ | | | | |
| 14 | | 21 | 5.0 | | | | | ✓ | 4.7 | | | | | ✓ |
| 15 | | 20 | 4.2 | | ✓ | | | | 4.0 | | ✓ | | | |
| 16 | | 20 | 3.9 | ✓ | | | | | 3.9 | ✓ | | | | |
| 17 | | 20 | 4.6 | | | | ✓ | | 4.8 | | | | | ✓ |
| 18 | | 21 | 4.4 | | | ✓ | | | 4.0 | | ✓ | | | |
| 19 | | 20 | 4.3 | | | ✓ | | | 3.9 | ✓ | | | | |
| 20 | | 20 | 4.8 | | | | | ✓ | 4.3 | | | ✓ | | |
| 21 | | 22 | 3.9 | ✓ | | | | | 3.6 | ✓ | | | | |
| 22 | | 21 | 5.4 | | | | | ✓ | 4.8 | | | | | ✓ |
| 23 | | 22 | 5.9 | | | | | ✓ | 4.9 | | | | | ✓ |
| 24 | | 20 | 3.5 | ✓ | | | | | 3.4 | ✓ | | | | |
| 25 | | 20 | 4.3 | | | ✓ | | | 4.0 | | ✓ | | | |
| 26 | | 21 | 4.5 | | | | ✓ | | 4.1 | | ✓ | | | |
| 27 | | 21 | 3.8 | ✓ | | | | | 3.7 | ✓ | | | | |
| 28 | | 20 | 4.4 | | | ✓ | | | 4.0 | | ✓ | | | |
| 29 | | 22 | 4.1 | | ✓ | | | | 3.9 | ✓ | | | | |
| 30 | | 21 | 4.3 | | | ✓ | | | 4.0 | | ✓ | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | | 20 | 4.4 | | | ✓ | | | 4.1 | | ✓ | | | |
| 32 | | 21 | 3.8 | ✓ | | | | | 4.0 | | ✓ | | | |
| 33 | | 20 | 4.5 | | | | ✓ | | 4.1 | | ✓ | | | |
| 34 | | 24 | 4.3 | | | ✓ | | | 4.0 | | ✓ | | | |
| 35 | | 18 | 4.3 | | | ✓ | | | 4.1 | | ✓ | | | |
| 36 | | 20 | 4.4 | | | ✓ | | | 4.1 | | ✓ | | | |
| 37 | | 20 | 4.5 | | | | ✓ | | 4.0 | | ✓ | | | |
| 38 | | 21 | 4.3 | | | ✓ | | | 4.0 | | ✓ | | | |
| 39 | | 22 | 4.6 | | | | ✓ | | 4.1 | | ✓ | | | |
| 40 | | 21 | 4.2 | | ✓ | | | | 4.0 | | ✓ | | | |
| 41 | | 20 | 5.6 | | | | | ✓ | 4.6 | | | | | ✓ |
| 42 | | 21 | 5.1 | | | | | ✓ | 4.6 | | | | | ✓ |
| 43 | | 20 | 4.4 | | | ✓ | | | 4.0 | | ✓ | | | |
| 44 | | 20 | 4.9 | | | | | ✓ | 4.4 | | | ✓ | | |
| 45 | | 21 | 3.9 | ✓ | | | | | 3.9 | ✓ | | | | |
| Total | 45 | | | 7 | 8 | 12 | 5 | 13 | | 9 | 22 | 2 | 0 | 12 |

## APPENDIX-C

## Pre and post test result of Power (standing vertical jump by cm)

| No | Name of students | Age | Pre- test | | | | | | Post –Test | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Result | Rating scale | | | | | | Rating scale | | | | |
| | | | | Excellent | v.good | Good | Fair | poor | Result | Excellent | v.good | Good | Fair | Poor |
| 1 | | 20 | 62 | | ✓ | | | | 65 | | ✓ | | | |
| 2 | | 20 | 47 | | | ✓ | | | 49 | | ✓ | | | |
| 3 | | 20 | 42 | | | ✓ | | | 48 | | | ✓ | | |
| 4 | | 20 | 29 | | | | | ✓ | 32 | | | | ✓ | |
| 5 | | 21 | 40 | | | ✓ | | | 45 | | | ✓ | | |
| 6 | | 21 | 44 | | | ✓ | | | 42 | | | ✓ | | |
| 7 | | 19 | 38 | | | | ✓ | | 43 | | | ✓ | | |
| 8 | | 20 | 62 | | ✓ | | | | 65 | ✓ | | | | |
| 9 | | 19 | 35 | | | | ✓ | | 42 | | | ✓ | | |
| 10 | | 19 | 41 | | | ✓ | | | 45 | | | ✓ | | |
| 11 | | 21 | 49 | | | ✓ | | | 51 | | ✓ | | | |
| 12 | | 19 | 44 | | | ✓ | | | 42 | | | ✓ | | |
| 13 | | 19 | 42 | | | ✓ | | | 40 | | | ✓ | | |
| 14 | | 21 | 45 | | | ✓ | | | 50 | | ✓ | | | |
| 15 | | 20 | 43 | | | ✓ | | | 47 | | | ✓ | | |
| 16 | | 19 | 46 | | | ✓ | | | 51 | | ✓ | | | |
| 17 | | 20 | 48 | | | ✓ | | | 47 | | | ✓ | | |
| 18 | | 21 | 49 | | | ✓ | | | 51 | | ✓ | | | |
| 19 | | 20 | 26 | | | | | ✓ | 35 | | | | ✓ | |
| 20 | | 20 | 53 | | ✓ | | | | 57 | | ✓ | | | |
| 21 | | 22 | 28 | | | | | ✓ | 31 | | | | ✓ | |
| 22 | | 21 | 58 | | ✓ | | | | 60 | | ✓ | | | |
| 23 | | 22 | 48 | | | ✓ | | | 51 | | ✓ | | | |
| 24 | | 20 | 27 | | | | | ✓ | 35 | | | | ✓ | |
| 25 | | 19 | 49 | | | ✓ | | | 46 | | | ✓ | | |
| 26 | | 19 | 50 | | ✓ | | | | 48 | | | ✓ | | |
| 27 | | 21 | 54 | | ✓ | | | | 59 | | ✓ | | | |
| 28 | | 20 | 43 | | | ✓ | | | 46 | | | ✓ | | |
| 29 | | 22 | 42 | | | ✓ | | | 45 | | | ✓ | | |
| 30 | | 21 | 49 | | | ✓ | | | 48 | | | ✓ | | |
| 31 | | 20 | 57 | | ✓ | | | | 61 | | ✓ | | | |
| 32 | | 21 | 62 | | ✓ | | | | 64 | | ✓ | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | | 20 | 48 | | | ✓ | | | 53 | | ✓ | | | |
| 34 | | 19 | 54 | | ✓ | | | | 56 | | ✓ | | | |
| 35 | | 18 | 56 | | ✓ | | | | 58 | | ✓ | | | |
| 36 | | 19 | 58 | | ✓ | | | | 57 | | ✓ | | | |
| 37 | | 20 | 54 | | ✓ | | | | 56 | | ✓ | | | |
| 38 | | 21 | 48 | | | ✓ | | | 51 | | ✓ | | | |
| 39 | | 22 | 41` | | | ✓ | | | 42 | | | ✓ | | |
| 40 | | 19 | 42 | | | ✓ | | | 43 | | | ✓ | | |
| 41 | | 20 | 40 | | | ✓ | | | 42 | | | ✓ | | |
| 42 | | 21 | 39 | | | | ✓ | | 43 | | | ✓ | | |
| 43 | | 20 | 37 | | | | ✓ | | 35 | | | | ✓ | |
| 44 | | 20 | 45 | | | ✓ | | | 50 | | ✓ | | | |
| 45 | | 21 | 42 | | | ✓ | | | 48 | | | ✓ | | |
| Total | 45 | | | 0 | 12 | 25 | 4 | 4 | | 1 | 19 | 20 | 5 | 0 |

## APPENDIX-D

## Pre and post Test of Muscular Endurance (Pull- up test by repetition)

| No | Name of students | Age | Pre- test | | | | | | Post –Test | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Result | Rating scale | | | | | | Rating scale | | | | |
| | | | | Excellent | V.good | Good | Fair | poor | Result | Excellent | v.good | good | Fair | Poor |
| 1 | | 20 | 28 | | ✓ | | | | 31 | ✓ | | | | |
| 2 | | 20 | 26 | | | ✓ | | | 25 | | | ✓ | | |
| 3 | | 20 | 23 | | | ✓ | | | 27 | | ✓ | | | |
| 4 | | 20 | 19 | | | | ✓ | | 19 | | | | ✓ | |
| 5 | | 21 | 26 | | | ✓ | | | 26 | | | ✓ | | |
| 6 | | 21 | 28 | | ✓ | | | | 30 | | ✓ | | | |
| 7 | | 19 | 17 | | | | | ✓ | 22 | | | | ✓ | |
| 8 | | 20 | 25 | | | ✓ | | | 30 | | ✓ | | | |
| 9 | | 19 | 24 | | | ✓ | | | 26 | | | ✓ | | |
| 10 | | 19 | 15 | | | | | ✓ | 14 | | | | | ✓ |
| 11 | | 21 | 21 | | | | ✓ | | 25 | | | ✓ | | |
| 12 | | 19 | 20 | | | | ✓ | | 21 | | | | ✓ | |
| 13 | | 19 | 23 | | | ✓ | | | 25 | | | ✓ | | |
| 14 | | 21 | 19 | | | | ✓ | | 18 | | | | | ✓ |
| 15 | | 20 | 23 | | | ✓ | | | 24 | | | ✓ | | |
| 16 | | 19 | 19 | | | | ✓ | | 21 | | | | ✓ | |
| 17 | | 20 | 25 | | | ✓ | | | 24 | | | ✓ | | |
| 18 | | 21 | 16 | | | | | ✓ | 23 | | | ✓ | | |
| 19 | | 20 | 28 | | ✓ | | | | 29 | | ✓ | | | |
| 20 | | 20 | 21 | | | | ✓ | | 21 | | | | ✓ | |
| 21 | | 22 | 23 | | | ✓ | | | 24 | | | ✓ | | |
| 22 | | 21 | 22 | | | | ✓ | | 20 | | | | ✓ | |
| 23 | | 22 | 21 | | | | ✓ | | 21 | | | | ✓ | |
| 24 | | 20 | 20 | | | | ✓ | | 21 | | | | ✓ | |
| 25 | | 19 | 23 | | | ✓ | | | 26 | | | ✓ | | |
| 26 | | 19 | 29 | | ✓ | | | | 31 | ✓ | | | | |
| 27 | | 21 | 17 | | | | | ✓ | 21 | | | | ✓ | |
| 28 | | 20 | 25 | | | ✓ | | | 23 | | | ✓ | | |
| 29 | | 22 | 16 | | | | | ✓ | 19 | | | | ✓ | |
| 30 | | 21 | 26 | | | ✓ | | | 26 | | | ✓ | | |
| 31 | | 20 | 29 | | ✓ | | | | 32 | ✓ | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | | 21 | 23 | | | ✓ | | | 24 | | | ✓ | | |
| 33 | | 20 | 27 | | ✓ | | | | 29 | | ✓ | | | |
| 34 | | 19 | 16 | | | | | ✓ | 15 | | | | | ✓ |
| 35 | | 18 | 28 | | ✓ | | | | 30 | | ✓ | | | |
| 36 | | 19 | 21 | | | | ✓ | | 25 | | | ✓ | | |
| 37 | | 20 | 18 | | | | | ✓ | 22 | | | | ✓ | |
| 38 | | 21 | 17 | | | | | ✓ | 21 | | | | ✓ | |
| 39 | | 22 | 15 | | | | | ✓ | 16 | | | | | ✓ |
| 40 | | 19 | 22 | | | | ✓ | | 21 | | | | ✓ | |
| 41 | | 20 | 23 | | | ✓ | | | 24 | | | ✓ | | |
| 42 | | 21 | 21 | | | | ✓ | | 26 | | | ✓ | | |
| 43 | | 20 | 19 | | | | ✓ | | 22 | | | | ✓ | |
| 44 | | 20 | 18 | | | | | ✓ | 17 | | | | | ✓ |
| 45 | | 21 | 24 | | | ✓ | | | 28 | | ✓ | | | |
| Total | 45 | | | 0 | 7 | 15 | 13 | 10 | | 3 | 7 | 16 | 14 | 5 |

## APPENDIX -E

### Questionnaires prepared for students to identify health status

Put your answer from the two alternatives by using this symbol (√)

| No | Questions | Alternatives | |
|---|---|---|---|
| | | Yes | No |
| 1 | Do you have diabetes disease? | | |
| 2 | Do you have stroke disease? | | |
| 3 | Do you have hypertension disease? | | |
| 4 | Do you have lung disease? | | |
| 5 | Do you have cardiovascular disease? | | |
| 6 | Do you have kidney disease? | | |

Do you have any other reason why you should not do physical activity? Write on the space provided:

_____

_____

_____

## DECLARATION

“This thesis is my original work and has not been presented for a degree in any other university, and that all source of material used for the thesis have been duly acknowledged ‘‘

Candidate: Himam Ahimed Signature_____Date_____

This Thesis has been submitted for the examination with my approval as a University Advisor.

Advisor: Dr. Aschenaki Taddese Signature_____Date_____

Place –Addis Ababa University, Ethiopia

**September, 2016**

**Addis Ababa University, Ethiopia**