EFFECT OF CIRCUIT TRAINING ON HEALTH RELATED FITNESS COMPONENTS OF U-15 IN CASE OF ARUSI BALA PRIMARY SCHOOLS IN DAWURO ZONE ESSERA WOREDA,

SNNPR, ETHIOPIA

MEd THESIS

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DECEMBER, 2020

HARAMAYA UNIVERSITY, HARAMAYA

Effect of Circuit Training on Health Related Fitness Components of U-15 in Case of Arusi Bala Primary Schools in Dawuro Zone Essera Woreda, SNNPR, Ethiopia

A Thesis Submitted to the College of Sport Science Academy Department of Sport Science Postgraduate Program Directorate

HARAMAYA UNIVERSITY

In Partial Fulfillment of the Requirements for the Degree of

MASTER OF EDUCATION IN TEACHING PHYSICAL EDUCATION

Alemu Washara Bukate

December, 2020

Haramaya University, Haramaya

HARAMAYA UNIVERSITY

POSTGRADUATE PROGRAM DIRECTORATE

As Thesis Research Advisors, I hereby certify that we have read and evaluated this Thesis entitled **"Effect of Circuit Training on Health Related Fitness Components of U-15 in Case of Arusi Bala Primary Schools in Dawuro Zone Essera Woreda, SNNPR, Ethiopia"** prepared by Alemu Washara Bukate. I recommend that it can be submitted as fulfilling the Thesis requirements.

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DEDICATION

I dedicated this Thesis manuscript to my Mother W/ro Kalose Kalacho and my father Ato Washara Bukate and my uncle Ato Teferi Worku for their love and unrestricted encouragement they gave me not only to accomplish this Thesis, but also for every success in my life.

STATEMENT OF THE AUTHOR

By my signature below, I declare that this Thesis is my genuine work. I have followed all ethical and technical principles of scholarship in the preparation, data collection, data analysis and compilation of this Thesis. Any scholar matter and all source of material that is included in the Thesis have given recognition through situation. This Thesis has been submitted in partial fulfillment of the requirements for MEd degree at Haramaya University and is deposited at the University Library to be made available to borrowers under rules of the Library. I solemnly declare that this Thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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BIOGRAPHICAL SKETCH

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ACKNOWLEDGEMENTS

Above all, I would like to thank God for all he done to me. Secondly I would like to express my genuine and heart gratitude to my Major-Advisor Dr. Desta Enyew and Co-Advisor Dr. Shemelis Mekonnen for all their genuine, constrictive and valuable criticism, comments and advice from very beginning up to accomplishment this Thesis.

Thirdly, my heartfelt thanks to HU, my friends Tesfaye Tadesse and Grima Tigro, and also my families for all their financial and moral (eternal and long lasting psychological) supports and also encouragement for the successful accomplishment of this work.

Lastly, I want to pass thanks to Arusi Bala primary school principal, staff members, physical education teachers and students have generously assisted me in providing data or information that supports the preparation of my study.

ACRONYMS AND ABBREVATIONS

ACSM	American College of Sport Medicine
BMI	Body Mass Index
CAPP	Cadet Physical Fitness Program
CSPAPS	Comprehensive School Physical Activity Programs
CVE	Cardiovascular Endurance
DZEW	Dawuro Zone Essera Woreda
EHR	Exercising Heart Rate
EWARDO	Essera Woreda Agricultural and Rural Development Office
EWFEDO	Essera Woreda Finance and Economic Development Office
F-MARC	FIFA Medical Assessment and Research Center
IOM	Institute of Medicine
NASPE	National Association of Sport and Physical Education
PE	Physical Education
PGA	Physical activity Guideline for Americans
PGASR	Physical activity Guidelines Committee Scientific Report
PT	Pre Test
POT	Post Test
PU	Pushup test
RHR	Resting Heart Rate
SAR	Sit and Reach test
SNNPR	South Nation Nationality and People Regional state
SU	Sit-Up test
3ST	Three minute Step-up Test
U-15	Under 15
UNESCO	United Nation Educational, Scientific and Cultural Organization
USDHHS	United State Department of Health and Human Service
WHO	World Health Organization

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EFFECT OF CIRCUIT TRAINING ON HEALTH RELATED FITNESS COMPONENTS OF U-15 IN CASE OF ARUSI BALA PRIMARY SCHOOLS IN DAWURO ZONE ESSERA WOREDA, SNNPR, ETHIOPIA

ABSTRACT

This study attempted to explore effects of circuit training on health related physical fitness components of U-15in Arusi Bala primary schoolin Dawuro Zone Essera Woreda, SNNPR state. Simple randomly sampling technique was used to select 40 target populations from the selected cluster in school. The study was used quasi-experimental design from October 1/02/2019 to December 30/04/ 2019, 3 days per week for 3 months and 60 minutes prerecession. The pre and post tests were used for check the difference. The physical fitness variables selected for the study were: flexibility (sit and reach in millimeter), muscular strength (push-ups reps/60 seconds), muscular endurance (sit-ups reps/60 seconds), body composition (BMI) and cardiovascular endurance (3 minute step up test). Data were analyzed by using SPSS(ver20.0) paired samples t-test with pair wise comparison of means at 95% confidence interval. The mean of paired t-test result for both male and female inSAR test was 6.6 and 6.4 PT, and 17.73 and 20.8mm POT respectively; pushup was 9.41 and 4.55 PT,and 21.7 and 11.8 POTrespectively; sit up test was 9.86 and 6.67 PT, and 23.64 and 18.67 POT respectively; BMI test was 19.1 and 18.75 PT, and 21.42 and 21.03 POT respectively; RHR result was 142.13 and 148bpm PT; and 110.23 and 119.1bpm POT respectively; and EHR was 194.73 and 199.2bpm PT, and 154.82 and 159.67 POT respectively. This study confirmed that circuit training with active rest was significant to improve the all health related fitness variables. The study also illustrates that participants can be improved average level of fitness compared to the standard norm in moderate intensity.

***Key words*:** circuit training,*cardio respiratory endurance, muscular strength, muscular endurance, Flexibility.*

1. INTRRODUCTION

The introduction part of this Chapter includes background of the study, statement of the problem, the major research question that was answered after the successful completion of this study, scope of the study, significance of the study and objectives of the study are included.

1.1. Background of the Study

A number of studies suggest that physical activity patterns established during childhood and youth are important in laying the foundation for activity habits in the future (Malina R.M., 1996). Much of a child's activity will be achieved through short bouts rather than continuous activity (Department of Health and Aging. Feb 15, 2005**)**. For optimal benefits, at least 5% of the accumulated minutes should be in bouts of 15 minutes or more (NASPE, Feb 19, 2005). Children and youth should engage in a variety of different types and intensities of physical activity (Health Canada/Canadian Society for Exercise Physiology. Feb 15, 2005). Children should be encouraged to participate in a wide range of activities, including lifestyle activities, sports, aerobic activities, muscular strength and endurance activities, and flexibility activities (Saris et al., 2003). Children and youth should be actively encouraged to reduce the amount of time spent in sedentary activities. The legal definition of child generally refers to a minor, otherwise known as a person younger than the age of majority ([abc]"Child".TheFreeDictionary.Com. Jan 5, 2013).

Exercise is any bodily activity that enhances or maintains physical fitness and overall health and wellness (Kylasov A. and Gavrov S., 2011). It is performed for various reasons, to aid growth and improve strength, preventing aging, developing muscles and cardiovascular system, honing athletic skills, weight loss or maintenance, improving health (Mayo C. Nov 2, 2018). Physical activity guideline for school aged kids recommends that they get 1 hour or more of moderate to strong physical activity daily (PGA, 2008). Training means are various physical exercises and their objective, methods and procedures, which are used for the improvement, maintenance and recovery of performance capacity and performance readiness. Physical training is beneficial as long as it forces the body to adapt to the stress of the effort (Tudor O. Bompa, 1999).

1.2. Statement of the Problem

Physical fitness is nowadays considered as one of the most important health markers in childhood (Ortega et al., 2008). Consequently, in the last decades several countries have been promoting physical fitness improvement among young people in different ways (Department of Health and Human Services, 1990). In many circumstances, schools have been considered the best setting in which children with low fitness levels can be identified and a healthy lifestyle can be promoted (Ortega et al., 2008). Therefore, one of the main Spanish government strategies was focused on modifying school legislations in order to give health a more important role in the Educational System. Schools are mainly attempting to increase the pupils' health level by using measures such as the improvement of their physical fitness through physical education (PE) (Ministerio de Educación y Ciencia, 2006). It has been concluded that the health promotion policies and physical activity programs should be designed to improve physical fitness, where strength and cardiovascular endurance are the most important health-related physical fitness components (Ortega et al., 2008).

It is known that planning long-term fitness programs is the best way to improve these components (Donnelly et al., 2009). Nonetheless, in the PE setting these programs cannot last the whole course or a large part of it since many curricular contents must be developed in a school year (Ministerio de Educación y Ciencia, 2006). Consequently, in the PE setting the researcher need to find short-term programs that could be also effective for the increment of fitness. One of the methodologies that meet these criteria could be the circuit training (Dorgo et al., 2009; Granacher et al., 2011a; Granacher et al., 2011b). The circuit training effectively reduces the time devoted to training while allowing an adequate training volume to be achieved (Alcaraz Ramón et al., 2008). Moreover, it permits a greater motor engagement time (Lozano et al., 2009), which is a very important requirement for the success of a PE program. In addition, this methodology has multilevel effects on fitness, especially, in beginners (Alcaraz Ramón et al., 2008; Dorgo et al., 2009; Wong et al., 2008).

Other problem related to physical fitness is its expected decrease after a period of detraining. Several authors confirm that after 8 to 12 weeks of detraining children lose a significant part of the physical fitness gains obtained (Da Fontoura et al., 2004; Faigenbaum et al., 1996; Ingle et

al., 2006; Isaacs et al., 1994; Tsolakis et al., 2004). A possible solution for this problem should be the periodical introduction of short maintaining programs throughout the academic course. During these intervals, PE teachers should be able to develop other curricular contents and at the same time they could be improving the previous physical fitness gains. These programs should permit to keep the physical fitness level achieved without interfering in the normal course of the PE planning.

Consequently, the purpose of this study was investigated the effects of a circuit training on health-related fitness component of U-15 in case of Arusi Bala primary schools in Dawuro Zone Essera Woreda (DZEW) in a PE setting.

Based on the above statement, the researcher designed to answers the following research questions;

1. What are the main effects of circuit training onimproving health-related fitness component of U-15 in case of Arusi Bala primary schools?
2. Is there any difference between the levels of health-related fitness component of U-15 in ArusiBala primary school students compared with standard norms?
3. What is the possible solution to the problem of health-related fitness component in U-15?

1.3. Scope of the Study

This experimental study was focused only effects of circuit training on health-related fitness component of U-15. In this study the researcher included only the U-15 from the Arusi Bala primary schools in DZEW, but the other age level and students from other schools where not included on this study. Because, of different potential reasons like man power,economy and geographical settlement. Due to this, the number of the subjects limited to the research sample size in targeted cluster. The research was conducted on using simple randomly sampling in lottery method. The sample size of the target population is 40 (25%).

1.4. Significance of the Study

The main aim of this study was to analyze the effect of circuit training on health-related fitness (Muscle strength, muscular endurance, Body composition, cardio respiratory and Flexibility)

component of U-15 in case of Arusi Bala primary schools in DZEW with 30 second rest at between each station. The outcome of this research intended to signify the following importance:-

- It helps to give concepts for the next researchers and to give information for physical education curriculum designers.
- It helps other rural area with similar environmental conditions (lifestyle behaviors, personal attributes, physical and social environment) to improve their physical fitness level.
- It helps to know the fitness level of Arusi Bala primary school students in Essera Woreda.
- It helps to analyze the effects of circuit training on physical fitness variables with low, moderate and high intensity.
- It helps to enhance instruction of fitness concepts.
- Provide diagnosis of fitness needs for individual exercise prescription.
- It helps to facilitate fitness goal-setting.

1.5. Objective of the Study

1.5.1. General Objective

The general objective of this study was to investigate the effect of circuit training on health-related fitness component of U-15 in case of Arusi Bala primary school in DZEW in South Nation Nationality and People of Regional state (SNNPR).

1.5.2. Specific Objective

1. To assess main effect of circuit training on improving health related fitness component of U-15 in case of Arusi Bala primary school.
2. To assess the different level of health- related fitness component of U-15 in Arusi Bala primary school students with standard norms.
3. To examine the possible solution for the problem of health-related fitness component of U-15.

2. REVIEW OF RELATED LITERATURE

This chapter provides detail discussion on the theoretical perspective that should be used in this study. It deals with concept of physical fitness, meaning of circuit training, components of health-related physical fitness. That means health related such as cardio respiratory endurances, muscular strength, muscular endurance, and flexibility.

2.1. Concepts of Physical Fitness

Physical fitness is characterized by people's ability to carry out daily activities with vigor and alertness but without undue fatigue and with sufficient reserve to enjoy active leisure pursuits and to meet unforeseen emergencies (Caspersen et al. 1985, IOM, 2012). Physical fitness refers to the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure-time pursuits and meet unforeseen emergencies. In general, the only way someone can increase their level of physical fitness is by increasing their level of physical activity. Physical fitness has many domains; however, most people generally associate "fitness" with aerobic or cardio-respiratory fitness. Other important components of fitness include muscular strength, muscular endurance, balance, agility, flexibility, and body composition (PGACSR and USDHHS, 2018).

Physical fitness can broadly be defined as the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure-time pursuits as well as to meet unexpected emergencies. It is a set of attributes that people have or achieve that relate to the ability to perform physical activity. It has two types' health related physical fitness and skill-related physical fitness. Health-related physical fitness relates to functional health in which all students can improve their health status through daily physical activity. It is one of the few areas where all students can succeed regardless of ability levels and genetic limitations. It includes cardio respiratory endurance, muscular strength and endurance, flexibility and body composition. These components are usually associated with disease prevention, health promotion and typically the aspects of fitness considered most important to monitor. On the other hand, skill-related physical fitness refers to physical performance related to athletic ability or it is performance oriented and influenced by genetic traits and abilities. It includes agility, speed and power which

are important for the acquisition of motor skills and for participation in sports and recreational activities. Both types of physical fitness have been related to general health and well being in children (USDHHS, 1996 and Eiberg et al., 2005).

2.2. Circuit Training

There are four types of training methods such as resistance training, circuit training, polymetric training and continuous training. Circuit training method, was developed by R.E. Morgan and G.T. Adamson in 1953 at the university of Leeds England. Circuit training can be designed to develop strength, power, muscular endurance, speed, agility and neuromuscular coordination, flexibility and cardiovascular endurance. Circuit training combines a number of different components of training, thus total fitness is emphasized. It provides an interesting training environment for the athlete and there are established times and level to motivate the athlete to continue improving. It can be adapted within the time constrains of the individual. In circuit training progression in all activities is assured. Circuit training is an excellent way to simultaneously improve mobility and build strength and stamina. 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 trainees. 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).

2.2.1. The Methods of Developing Circuit Training Program

The circuit training format utilizes a group of 6 to 10 strength exercises that are completed one exercise after another. Each exercise is performed for a specified number of repetition or for a given time period before moving on to the next exercise. Circuit training is a type of interval training program which combines components of both strength training and cardio vascular training. It is often a set up of stations or 'circuits' which individuals will complete before moving onto the next. Within each circuit participants will perform exercises for a specific count or a specific time period before they venture to the next station. The goal of circuit training is to increase strength and agility at the same time as increasing fitness. Some studies have even found

that circuit training is the most efficient way to enhance cardiovascular training and muscle endurance (Vinayagamoorthi and A. Sakthivel Aug, 2014) 1 2A).

Follow these six simple steps to create the ultimate fat torching, muscle building circuit routines which are developed by Charlotte Hilton Andersen(hptt://www.shape.com/fitness/workouts/how-build-perfect-circuit-workout)**:**

Step 1 Select the time limit for your circuit training workout

Circuit training workouts are based around a set number of "station" that you repeat until your time runs out. So knowing how much time you have can help you determine how many circuits you will need to complete and how hard you will need to work. The shorter the circuit training work out, the harder you should be pushing. Anywhere from 10 to 45 minute is ideal for circuit training. Since you are alternating which body part you are working during each move, there's no need to rest between exercises. Just think: your arms get a break during squats, and your legs get a break during push-ups.

Step 2 Pick an upper body exercise

The trick with circuit training is to use whatever you have handy. If you are at the gym you have a wide range of options-but all you really need is your body. You can choose a different upper body move each around or simply repeat the same exercise every time if you want to keep things simple.

Step 3 Pick a lower body exercise

Just like you did with the upper body, choose exercises that will work each part of your lower body. You can change up the moves each around or keep them the same.

Step 4 Pick a compound exercise

Weight training is an excellent work out, but you will really get your heart rate up by adding in some total body movements to your circuit training plan.

Step 5 Choose a sprint for 1 minute

Research shows that short, fast sprints are the most effective way to torch fat-especially around your midsection. Pick any type of cardio you like to add to your circuit training workout and go all out of 1 minute.

Step 6 Rest for 1 minute

You have earned it. Let your heart rate come down and then to go back through the circuit as many times as you would like for complete workout.

2.2.2. Benefit of Circuit Training on Physical Fitness Variable

The circuit training method is one of the ways that take into account the individual differences, the trainees' 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; there by 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.

Study show that circuit training helps women to achieve to their goals and maintain them longer than other forms of exercise of diet. Claim from a health perspective is that this investigation clearly shows that performance of this circuit of exercise (Morgan and Anderson, 1961). This level of intensity elicited oxygen consumption value (39% to 51.5%of Vo_2max) that meet establish guidelines of America collage of sport medicine (ACSM) for the recommended intensity (40% to 85% of Vo_2max) of exercise for developing and maintaining cardio respiratory fitness (Klink, 2013). Thus this circuit not only provides a suitable muscular fitness stimulus but also helps to meet ACSM cardio vascular guidelines and the newly published dietary guidelines for America 2005 to physical activity. One disadvantage is that reduced station time will encourage the participant to lift heavier weight, which means they can achieve overload with smaller number of repetition, typically in the range of 25 to 50 depending on their training goals (Robert 2005).

Advantages of circuit training (Australian College of Sport and Fitness; Cert III- Module 2):

- May be easily structured to provide a whole body workout.
- Does not require expensive gym equipment.
- Participants normally work in small groups, allowing beginners to be guided by more experienced individuals, as well as benefiting from the supervision of the instructor.
- Can be adapted for any size workout area.
- Can be customized for specificity; easy to adapt to your sport

2.2.3. Points of Programming a Circuit Class

Typically a circuit is made up of eight to 12 stations. This number varies according to the design of the circuit. The program may be performed without equipment or using equipment such as exercise machines, hydraulic equipment, hand-held weights, elastic resistance, calisthenics or any combination.

Here is what you need to consider when planning circuit training class:

- Your clients' standards of fitness
- The fitness aims of those taking part
- Amount of time available, normally 45 - 60 minutes
- Confirm appropriate exercise area
- Time at each station (or how many reps/sets)
- Rest periods between stations
- Transition between stations i.e. instructor blows whistle or time limit set or number reps set
- Space and equipment that is available
- Motivational music, and suitable sound system
- Support materials i.e. instructional cards
- Time and opportunity to teach and demonstrate exercises
- How you will monitor the session

2.2.4. Types of Circuit Training Methods

2.2.4.1. General Fitness/Aerobic Circuits

General fitness/aerobic circuits are simply to raise work capacity, improve fitness, and can also be used as a recovery modality on days when the athlete is beat up and needs to back off. The

intensity of these circuits is low and the rest interval between movements is minimal, allowing the athlete to move from one exercise to the next at their own pace. The only time I assign a rest interval for this circuit is if we use resistance and the individual is performing 8-12 repetitions using a 15-20RM load, followed by 30-60sec rest (Patrick, 2006; Tempe, & AZ., 2009).

2.2.4.2. Strength Circuits

Strength circuits are focused on improving strength, just as the name implies. Usually I go to a superset of two main exercises with a mobility or core exercise in between them or I do a circuit of push, pull, legs, core. The important thing here is the rest interval, which so many do not obey. If you are able to perform this sort of work with no rest interval or very little rest then you probably need to place more weight on the bar and work towards getting more strength. Reps in this circuit are < or = 5 per set and the rest interval is anywhere from 3-5min. Rest can be active rest, which is why I use the mobility or core work in between; however, there are times when complete rest is going to be desired in order to allow for full recovery (Patrick, 2006; Tempe and AZ., 2009).

2.2.4.3. Lactic-Aerobic Circuits

Lactic aerobic circuits are used to try and improve the individual's ability to repeat their effort in an explosive task. You wouldn't really be at this type of circuit if the athlete does not have a well-developed work capacity to tolerate this sort of activity. However, you can scale back the intensity and perform aerobic plyometrics. Aerobic plyometrics can be good for preparing an athlete to develop a sport specific work capacity. These are similar to the lactic-aerobic circuits; however, the intensity of the jumping activities you choose is much lower (Patrick, 2006; Tempe and AZ, 2009).

2.2.4.4. Anaerobic-Glycolytic Circuits

These are what most people think about when they hear the word "circuit". These sorts of circuits have gained popularity recently with the various boot camps and cross fit type of training methods out there. Oftentimes people refer to these as "metabolic circuits" or "metabolic training". The intensity of these types of circuits can take their toll on the body and this type of work is not a great starting point for someone beginning training with a limited training

background. These can be timed sets of work or they can consist of lifting weights to failure or near failure in the 6-8 rep range. If the sets are timed they can be anywhere from 30sec to 2min. However, if the goal is to develop the anaerobic-glycolytic system then the intensity needs to be appropriately chosen for the given work duration (Patrick, 2006; Tempe and AZ, 2009).

2.2.4.5. Rest Intervals

The rest interval for the various circuits is essential! Too often coaches and athletes cut their rest interval short in order to try and "do more work" or just get things done in a faster period of time. If you want to properly develop some of these energy systems then the rest interval is an important rule to follow as it will ensure that you are able to put the greatest amount of effort into the work interval. There are times when doing things under fatigue and trying to repeat your effort in this manner are important, however, you should work up to this sort of training by first making sure that you can give 100% and slowly lowering the rest interval until you can repeat maximal or near maximal efforts with minimal rest (Patrick, 2006; Tempe and AZ, 2009).

2.2.5. Types of Circuit Training Activities

Circuit training should focus on each section of the body as indicated below>

- Upper body activity: Squat ups, bench dips, back extension, medicine ball, chest pass bench lift, press up
- Core and trunk activity: Sit ups (lower abdominals), stomach crutch (upper abdominals) back extension chest raise
- Lower body activity: Squat jumps, compass jump, stride jump step-ups, shuttle run, and
- Total body activity: Burgees, treadmill, squat thrust, skipping jogging (htt://www.brianmac.com.uk/)

2.2.6. Features of Circuit Training

Is the opinion that special attention should be given to individuals who are deficient in basic fitness elements, if Physical education is to contribute to the improvement of the physical fitness of our youth (Watt, 1960). The following are features of circuit training that make it adaptable to developmental program:-

A/ the students start off easily and is able to experience some degree of success early in the program.

B/ the student's one of a class, but isn't asked to do anything beyond his own capabilities each day.

C/ the student when ready, progresses to an individual circuit based on his maximum performance.

D/ the students' works inconspicuous among the other class members and free from continuous direction from the instructor.

E/ large number of students can work at the same time.

F/ the circuit selected should have a positive effect on muscular power, endurance, strength and cardio-respiratory endurance.

G/ the exercises are easily standardized, so that student's able to perform the same way each day.

H/ the student know exactly how he progress each day.

I/ circuit training is based on the work rate of the individual and employed the principle of "progressive loading".

2.2.7. The View Point of Circuit Training To Physical Fitness

The literature review reveals that there is a decline of the physical fitness components among the college students. The researcher, through his work within the education and training domains, finds a decline in the components of the physical fitness among students who are enrolled in the Faculty of Physical Fitness and Sports Science. The current study fills the gap in the professional literature. Therefore, the researcher applied a training program using the circuit training method to identify the improvement degree in the components of the physical fitness of the students. This was achieved by taking pre or post measurements of the tests that measured the physical fitness components (Hamoudat, 2008; Oudat & Ghassab, 2007; Al-Rashidi, 2006).

Circuit training enables large number of performers to train together by employing a circuit of consecutive exercises around which each performer progresses, performing an individually

derived dosage of exercise and timing his progress. Circuit training enables large numbers of performer, to train at the same time by employing a circuit of consecutively numbered exercises around which each performer progresses doing a prescribed allocation of work at each exercise, and checking his progress against the clock. Performing the prescribed exercised at each station before moving on to the next one. New requirements and new goals were established as desired when using this method. Participation in this circuit training program should have caused the girls to improve progressively. Circuit training became an important device in conditioning girls for participation in track and field activities as well as in other sports activities (Global Journals Inc. US, 2013).

2.3. Components of Physical Fitness

Physical Fitness is refers to a condition in which an individual has enough energy to avoid fatigues and enjoy life. Physical fitness is divided into health and skill related physical fitness. Skill related physical fitness is fitness types which enhance one's performance in sport settings. Health - related physical fitness is the ability to become and stay physically healthy. It also focuses on factors that promote optimum health and prevent the onset of disease and problems associated with in activity (NASPE, 2009).

2.3.1 Cardiovascular Endurance

Cardiovascular endurance (CVE) is one of the most important measures of overall health. A person’s level of CVE helps predict probability of disease, quality of life, and ability to react to acute physical and mental stress. For healthy individuals, higher cardiovascular endurance also indicates an elevated level of physical fitness (Corbett, 2009). Cardio respiratory fitness is condition in which the body's cardiovascular (circulatory) and respiratory systems function together, especially during or work, to ensure that adequate oxygen is supplied to the working muscles to produce energy. Cardio respiratory fitness is needed for prolonged, rhythmic use of the body's large muscle groups. A high level of cardio-respiratory fitness permits continuous physical activity without a decline in performance and allows for rapid recovery fatiguing physical activity. Aerobic exercise use large muscle group to increase heart rate. This causes faster and dipper breathing which maximizing the oxygen in the blood. There are many studies which prove that cardiovascular endurance improved after aerobic exercise (Probate et al., 1991).

2.3.2. Muscular Endurance

Muscular endurance refers to the ability of the muscle to work over an extended period of time without fatigue. Performing push-ups and sit ups or crunches for one minute is commonly used in fitness testing of muscular endurance. In training setting muscular strength and muscular endurance can go in line. According to the research conducted on the effects of strength training on endurance capacity of top level endurance athletes, strength training can lead to enhanced long-term and short-term endurance capacity both in well trained individuals and highly trained top-level endurance athletes, especially when high-volume, heavy-resistance strength training protocols are applied (Aagaard and Andersen, 2010).

2.3.3. Muscular Strength

Muscular strength refers to the maximum amount of force a muscle can exert against an opposing force. Fitness testing usually consists of one-time maximum lift using weights, bench press and leg press. Muscular strength and performance have direct relationship. According to the research result conducted on the skeletal muscle mass and muscle strength in relation to lower extremity performance of older men and women suggest that low muscle Strength, but not low muscle mass is associated with poor physical function (Paul et al., 2000).

2.3.4. Flexibility

Various components are required for an integrated approach to improving the effectiveness of flexibility training. Since a majority of the research isolates stretching, it is important to understand that flexibility is one component to maximizing performance and decreasing injury risk. The first step is proper assessment protocols. The human movement system works as an integrated kinetic chain and evaluating one isolated component of such may not determine the flexibility needs of the client overall. when evaluating the extensibility of the hamstring, Clark's study noted that the positioning of the pelvis played a role in the range of motion of the hamstring and in effect, stretching of the hip flexors increased the range of motion of the hips (Clark et al., 1999).

2.3.5. Body Composition

Regular physical exercises reduce the body fat percentage without the loss of the muscle as well as important effect on anthropometric and hematologic level of obese and overweight women and men (Evrim et al., 2010). Body Composition Changes for over fat or borderline over fat people, regular physical exercise reduces body mass and body fat. Increases in fat body mass also accompany a regular program of resistance training. Exercise only, or exercise combined with calorie restriction, reduces body fat more than fat lost with only dieting because exercise conserves the body's lean tissue mass (Ketch et al., 2011).

2.4. Regular Physical Activity

Exercise is a subcategory of physical activity which defined as a physical activity that is planned, structural repetitive and purposive in the sense that intended for improvement or maintenance of physical fitness. Modern exercise physiology, however, distinguishes between acute and chronic exercise, where acute exercise refers to a single bout of physical activity and chronic exercise to repeated performance of acute exercise. Chronic exercise is also known as habitual physical exercise, physical training or just training (Caspersen et al., 1985; Franklin, 2006).

2.5. Benefits of Physical Fitness for Children

Nowadays, it seems that children spend almost all their timing sitting in a classroom or in front of a screen. But it is important for children to be physical fit and active to improve their overall health. Here are 10 benefits of physical fitness for children according to (Matthew L. May 8, 2018):

A. Stronger bones.
B. Reduced risk of becoming overweight or obese.
C. Reduced risk of type 2 diabetes.
D. Lower blood pressure.
E. A healthier heart.
F. Reduced risk of cancer.
G. Better emotional health.

H. More energy.
I. Stronger muscles.
J. Stronger lungs

2.6. Principle of Physical Fitness Training Program

A good fitness training program requires sound leadership and effective management. Here are some of the principle that will help you build physical fitness program (CAPP: Feb 2018):

A. Set realistic goals for the unit based on each individual cadet's needs.
B. Determine training objectives that are specific and measurable.
C. Select activities and lessons that full-fill the training objectives.
D. Watch each cadet closely and correct improper techniques. Offer adaptations or extensions to keep all cadets appropriately challenged.
E. Create a training environment where each cadet is encouraged to perform to his or her maximum potential.
F. Add cadences, battle-cries, and motivational checks to get cadets into the spirit of rigorous exercises.

2.7. Age-appropriate Physical Activities for Children

Overall, physical fitness in children increases with increasing age. The age-related improvement in physical fitness is mainly influenced by growth and maturation that refer to the biological context of human development (Malina et al., 2004). Normal growth and maturation effect changes in components of physical fitness in children independent on a child's physical activity (Malina & Katzmarzyk, 2006). There are a variety of other factors that influence levels of physical fitness and many are outside of a person's control (environment, heredity and rate of maturation). As educators and parents consider how to help children develop the five health-related fitness components it is important to consider the age-appropriateness of activities. It is necessary to develop exercise prescriptions for both the elementary, middle grades, and secondary levels. The goal of the prescriptions is to increase the activity level of all students to at least 60 minutes per day by suggesting activities which students can engage in outside of the classroom. It is important to consider that fitness activities need to be made fun for children or

they will not want to participate. For most individuals, giving a direct command to go out and run two laps will not be an interesting activity in which to participate (Kassahun Aga, 2016).

Much of what we know about the cognitive effect of exercise comes from brain research on rodents, not humans. But some studies have been conducted on kids, and the results suggest that aerobic exercise can make children more focused and less impulsive. When kids have been challenged with cognitive tasks that requires lot of concentration and attention control, individual with higher aerobic fitness have performed with more accuracy, and sometimes faster reaction times (Moore et al., 2013; and Hillsdon et al., 2005).

2.7.1. Physical Activity Guideline for Children

The 2008 Physical Activity Guidelines for Americans (PGA) have recommend five points that children and youth ages 6 to 17 years participate in at least 60 minutes (1 hour) of physical activity every day of the week. They recommend the 60 minutes include based on (PGA, 2008)**:**

• **Aerobic Activity**: Most of the daily 60 minutes should be moderate-to-vigorous aerobic physical activity that makes children breathe hard and sweat. Children should include vigorous intensity aerobic activity on at least 3 days of the week.

• **Muscle-Strengthening Activity**: The 60 daily minutes should include muscle-strengthening activities on at least 3 days of the week

• **Bone-Strengthening Activity**: The 60 daily minutes should include bone-strengthening activities on at least 3 days of the week.

2.7.2. Basic Principles of Training Sessions

There are some basic principles that can be applied to all types of training. There consist of (Australian College of Sport and Fitness; Cert III- Module 2):

1. Warm-Up- it should be conducted prior to the main component of the program to prepare the body for the forthcoming activities both mentally and physically. Remember the warm up is part of the session with the client, so you must consider how long to spend on this, ensuring you have enough time to perform the conditioning phase and the cool down.

The warm can be completed in 3 stages:

a. General warm-up involving cardio or heart rate raising exercises

b. Flexibility and mobility training

c. Program or exercise specific warm up

2. Overload – for the body to adapt and improve, it needs to be stressed slightly over the amount that it can comfortably deal with. For example to improve the cardiovascular system, exercise that makes the heart work harder than it's used to will encourage it to adapt so it can cope with the additional stress. Likewise, to increase the muscular system exercise must stress the muscle more than normal daily activities. To build muscle, you need to use more resistance than your muscles are used to. This is important because the more you do, the more your body is capable of doing, so you should increase your workload to avoid plateaus.

3. Progression – to constantly encourage the body to adapt to the training needs and improvement in fitness to occur, it is important to progress or increase the demands of the fitness program for an individual. The fitness level of an individual will increase if the overload principle is followed; however, this will only be to the point at which the fitness level becomes comfortable.

4. Specificity - this principle means training should be specifically orientated around a goal or the client's needs. Therefore, if strength is the component requiring attention, the program should be designed around that goal (e.g. train with heavier weights closer to 1 RM (1 rep max). To lose weight, choose a variety of rep ranges to target different muscle fibers.

5. Rest and Recovery - rest days are just as important as workout days. It is during these rest periods that muscles grow and adapt. Therefore it is important to allow the body or body part time for this to occur, so allow for adequate rest or make sure the same muscle groups are not being worked 2 days in a row.

6. Cool-Down- The cool-down has the opposite effect to the warm-up - it aims to slowly return the body to normal resting conditions. It is most commonly achieved by performing a cardiovascular activity at a gentle and comfortable intensity which decreases in intensity as it progresses.

7. Reversibility - this principle suggests that the effects of training will be lost following a period of no activity or exercise. For example, a more efficient cardiovascular system following an exercise program will return to normal efficiency after a period of inactivity.

8. Individuality - this principle considers that each individual has a distinct and unique physiological make-up, and therefore training should complement this. For example some clients may be naturally strong, whereas others may be naturally fast, training programs so relate to these individual traits.

9. Adaptability - suggesting each individual adapts to fitness demands at different rates, this principle recommends a trainer should be aware that not all clients will progress and change and require overload a different rates.

2.8. The Role of Stockholder in Children Physical Activity Involvement

2.8.1. Parental and Peer or Friend

Parental and peer or friend support plays a key role in children's ability to achieve recommended levels of physical activity. Several studies provided evidence for the role family members and peers play in supporting physical activity among children and youth. Yet, there is a lack of nationally representative data in this area, which led to an incomplete grade this year as in the 2014 and 2016 Report Cards. Support from family and peers may increase children's ability to perform physical activity and help them overcome barriers to participation in physical activity. Two recent systematic reviews concluded that social support from parents, friends and family results in higher levels of physical activity for both children and youth **(**Yao CA. and Rhodes RE., 2015; and Mendonca et al., 2014**).** A review of studies examining the influence of parental support and modeling on physical activity reported mixed results. However, most studies showed that parental modeling had a small influence on child physical activity levels, and there were important differences by age with parental modeling being more strongly associated with young children's physical activity (Yao CA. and Rhodes RE., 2015).

2.8.2 School

Most children and youth spend large proportions of their time at schools, and it is recommended that they accrue at least 30 of their daily recommended 60 minutes of moderate-to-vigorous physical activity at school (Ding et al., 2011). To meet this goal, a whole-of-school approach to increasing physical activity at schools, often called Comprehensive School Physical Activity Programs (CSPAP), is recommended (CPAPESE, 2013, and National Cancer Institute, 2008**).**

CSPAPs involve extensive, collaborative efforts among all school personnel to provide students with opportunities to be physically active within a variety of contexts (e.g., PE, recess, and before-, during-, and after-school sport, dance, exercise, and play opportunities).

2.8.3. Community and Environment

Multiple aspects of the community and built environment are important to children's and youth's physical activity. Several studies have found that children and youth living in a high walk-able neighborhood, broadly defined as a community where it is safe and easy to walk and where pedestrian activity is encouraged (Raspberry et al., 2015), engaged in more physical activity than their peers who resided in a low-walk-able neighborhood (USDHHS, 2015). Being in a walk-able neighborhood can mean having sidewalks and destinations in walking distance (e.g., schools) and being safe from traffic and crime.

2.8.4. Physical Education Teachers

Almost every healthy student participates in compulsory PE during her school days (UNESCO, 2014). Therefore, increasing the amount of compulsory PE seems to be a unique measure for policymakers to counteract physical inactivity and the resulting health problems of children. PE presents the only direct channel that influences physical activity for all students. In contrast, indirect channels like subsidies for sports clubs or investments into sports infrastructure target mostly students who are already physically active.

2.9. Barriers of Children Physical Fitness

Environmental, economic and social factors, as well as perceptions about safety, accessibility and weather conditions, are thought to affect the opportunities for children and adolescents to be physically active *(*Biddle SJH et al, 2007*)*. Likewise, the influence of peers can encourage or discourage physical activity. Across Europe there are many interventions and approaches aimed at increasing physical activity by young people through supportive environments.

2.10. The View on Physical Fitness Assessment

Fitness testing has been a common component of most physical education programs, but it has not always been used effectively to promote health-related fitness. Early debate in the field led

some to question the utility of fitness assessments, but there is clear consensus by medical and public health experts concerning the importance of well-conducted fitness assessments in school physical education programming (IOM, 2012).

Physical fitness can be measured accurately through laboratory methods; however, due to the necessity for qualified technicians and sophisticated instruments, as well as the high costs and time constraints, it is still not feasible for laboratory tests to be conducted on the whole population in any particular location. On the contrary, field-based fitness tests are easy to administer, involve minimal equipment, have a low cost and can be utilized on a larger number of participants over a period of time (Romero et al., 2010). These test batteries are widely used for measuring and assessing physical fitness in children and adolescents. If used correctly, fitness assessments can enhance instruction of fitness concepts, provide diagnosis of fitness needs for individual exercise prescription, facilitate fitness goal-setting and self-monitoring skills, and promote fitness knowledge and self-testing skills. However, there are many factors other than physical activity that can influence a child‘s performance on physical fitness tests (e.g., maturation, heredity, predisposition or trainability and body composition).

Assessment of physical fitness test helps to plan where you are going; you have to know where you are. A quarterly fitness test will help cadets identify current fitness level for the personal goal setting and progress evaluation. No two cadets are alike in ability, but under the right leadership every cadet will give fitness training their fullest effort (CAPP, Feb 2018).

The results and experience gained from several European studies suggest that physical form is a key indicator of the health of children and adolescents (Ruiz et al., 2006a) and is a predictor of health in later life (Ruiz et al., 2009). Regular monitoring of the level of physical activity and physical fitness of the entire population should be considered a public health priority (World Health Organization, 2010). Teaching youth about physical fitness, its health benefits, and methods for developing each fitness component can help youth avoid health problems. In addition, it can help them to stay active throughout their lifetime (IOM, 2013). Establishing a healthy fitness profile early in life is easier than improving a low fitness profile that progressively develops as a result of an inactive adult lifestyle.

3. MATERALS AND METHODS

This chapter adopts the following procedure including description of study area, study material, treatment and study design, description of population and sampling method, inclusion and exclusion criteria, method and procedure of data collection, fitness test protocol, method of data analysis, data quality control and ethical consideration.

3.1. Description of the Study Area

This study was conducted in Dawuro Zone Essera Woreda, SNNPR. It is found at the Southern part of the Dawuro Zone. The Woreda is 575 km far away from Addis Ababa the capital city of our country Ethiopia through Shashemane road and 350 km from Hawassa, the regional capital city. The area is topographical undulating and rugged. It lies between 6^0 35′0″ to7^0 5′0″ North latitude and 36^0 35′0″'E to 37^0 15′0″ E longitude (EWARDO, 2017). Woreda lies in three agro-ecological regions such as Kolla region, which is within 500 and 1500 m.a.s.l; Woyna-dega within 1501 and 2500 m.a.s.l; and Dega at above 2500 m.a.s.l with an elevation ranging from 501 to 2600 m.a.s.l. Woreda covers a total area of 1043.1 square kilometer and 29 kebeles. The total size of population in 2016 (2009E.C) was reach to 91,231with male 44405, and 46826 are female populations (EWFEDO, 2017). This study was conducted on Essera Woreda Arusi Bala primary school. See the area map in page 62.

3.2. Study Material

The researcher was used the following equipments throughout the study in the field. These equipments are Stop watch, measuring tape, pen, paper, cone, flag, ropes, 12 inch box, ruler, record sheet and whistle.

3.3. Definition of Variables

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 trainees (Reddy & Jyoti, 2012).

Body composition: is refers to the proportion of fat and fat-free mass (muscle, bone and water) in the body (Health and wellness for life, 2010).

Health - related physical fitness- is the ability to become and stay physically healthy. It also focuses on factors that promote optimum health and prevent the onset of disease and problems associated with in activity (NASPE, 2009).

Muscular endurance: the ability of a muscle or muscle group to perform repeated contractions against a resistance over a period of time (Coulson & Archer, 2009).

Muscular strength- Muscular strength is the maximum amount of force a muscle or muscle group can generate (Coulson & Archer, 2009).

3.4. Treatments and Study Design

The study was focused on quasi-experimental study design within 12 weeks of circuit training in order to improve the health related components of the study target population without control group. Since the age of Arusi Bala primary schools were belongs to U-15, the experiment involves five groups (station). The program was given pre test to check the initial level of their physical fitness. Then, the target population was practiced in circuit training in low to moderate intensity level for three months to bring gradual change in physical fitness of children. After the three months the post test were given by the researcher to check the changes.

The training was given for three months within 3 days per week to improve health related fitness components of the young, duration of exercise program per a session would be 40-60 minute in order to practice each stations, intensity 40%-85%MHR (MHR=220-age of an individual), the exercise program days were Monday, Wednesday and Friday. The time of the training would be at 5:00pm-6:00pm for Monday, Wednesday and Friday in non consecutive session. In this study the program would be done with orientations, instruction and supervision by the researcher and assistants. The training sessions were included warming up, main body and cooling down.

The months of training schedule were October, November and December. The per-iodization of the schedule, three months were selected. In the selection the investigator depending on the exercise program includes monthly, weekly and training session plan (PGA, 2008). According to

PGA 8-12 week training program is essential to maximize individuals' ability that is why the investigator purposively used 12 weeks training program.

3.5. Source of Data

The researcher was used primary data sources according to the nature of the study. The primary data was taken from pre-test and post-tests measurements in the sampled population in the training program of the experiment.

3.6. Description of Population and Sampling Method

The study source of population was Essera Woreda Arusi Bala primary school students. The schools have the total of 335 students. The following table 1 Show the number of students, age level and sex.

Table 1: Number of population in Arusi Bala Primary school as following:

Name of schools	Sex	Age level			Total
		U-12	U-15	U-17 and above	
Arusi Bala primary school	Male	60	85	23	168
	Female	76	75	16	167
	Total	136	160	39	335

From the above population table, the researcher was selected U-15 years as the target population for using cluster random sampling method (Kothari, 2004:65). In cluster sampling the total population is divided into a number of relatively small subdivisions which are themselves clusters of still smaller units and then some of these clusters are randomly selected for inclusion in the overall sample. The researcher was focused in this age levels of Arusi Bala primary schools students. From 160 totals of target age group, the researcher was selected 40 students for experimental group by using simple randomly sampling in lottery method. The sample sizes of the target population satisfy 25 percentages.

3.7. Inclusion and Exclusion Criteria

The students from Arusi Bala primary schools with focused U-15 years was included as the study population after completing their health history and fitness status questionnaire that would help the researcher to obtain information on the health fitness status of the target participating for the research study.

According to target populations their health history questionnaire result students who have a medical condition restricted by the physician and recent physical injury and the target groups with any known cardiovascular disease, taking regular medication, psychiatric disorder and affected by other virus or bacterial would be excluded from the experimental trial. The current study populations who had their training program were excluded from the study. The students who would have special test program were out from this study.

3.8. Method and Procedure of Data Collection

3.8.1. Method of Data Collection

The researcher was used quantitative data collection method to collect data from the appropriate health related physical fitness components tests such as flexibility, muscular strength, muscular endurance, body composition and cardiovascular endurance. From the beginning, the ordered sets of questions were filled by the trainers to know the status of participants about their health and fitness to select the participants. Next, the researcher was conducted pre- test on the outlined variables, then the researcher want to continuous circuit training program and at the end of the 12 week trainings post tests were made. The fitness tests variables include body mass index test, push-up test, sit-up test, sit and reach test and 3 minute step up test. The data was recorded by the researcher and assistants collaboratively. A careful familiarization phase would be undertaken with each participant before the start of the study so that learning effects would be minimized.

3.8.2. Procedures of Data Collection

First the researcher was obtained the ethical clearance from Haramaya University and meet the participant of the study, during the familiarization session; participants were informed all procedures and familiarized with all performance measures to reduce the possibility of a learning

effect. Then, before the participants were going to circuit training the pre health related fitness variables test were given to them, recorded by the researcher and the assistance data recorder at the same time of day for each subject. At the end of the training the researcher was recorded post test data.

3.9. Fitness Test Protocol

The following fitness tests are the parameter of health related fitness variables was record for pre-test and post-tests of the study.

3.9.1. Test for Flexibility

Sit and reach test- The Purpose this test is designed to test the flexibility of the trunk, lower back and hamstring muscles.

Materials: ruler, box or step about 20cm high.

Procedure:- To perform this test researcher was followed the following procedures:

- Warm up for 5–10 minutes, using low-intensity aerobic activity, and then stretch your hamstrings and lower back.
- Sit with your legs fully extend and bottom of your feet flat against box about 20cm high.
- Extend your arms and hands forward as far as possible and hold for a count three.
- Distance before the edge are expressed as negative score, those beyond the edge are expressed as positive score.
- Participants remove their shoes and the subjects sat with their feet approximately hip-wide against the testing box. They kept their knees extended and placed the right hand over the left, and slowly reached forward as far as they could by sliding their hands along the measuring board. They perform the test 3 times and the researcher record the best measurement (Pedro et al., 2009). The average score for boys is between +0 to +5cm and girls is +1 to +10cm (Ashok C., 2008).

Score: a standard meter rule was placed on the sit-and-reach box for each test, with the reading of 23 cm in line with the heel position of each test. Reaches short of the toes were recorded as negative forward reach scores, and reaches beyond the toes were recorded as positive forward reach scores. The forward reach scores were recorded in centimeters to the nearest 0.5 cm using the scale on the box.

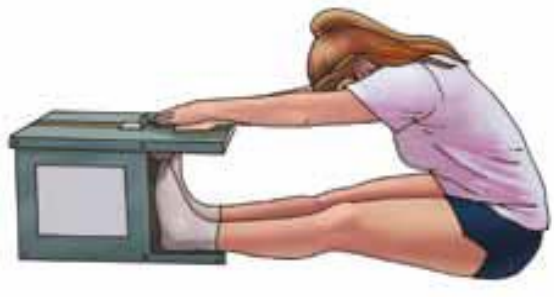

Figure 1: sit and reach test sample

3.9.2. Tests for Muscular Strength

Push-up test: The Purpose of push-up test is a basic fitness test used by coaches, trainers and athletes to assess upper body (arm, shoulder and chest muscles) to monitor progress during strength and fitness training.

Materials: Whistle, stop watch and mat.

Scoring:- is the number of repetition of push-up per minute.

Procedure:-To perform this test researcher was followed the following procedures:

- Support the body in push-up position from the toe for the men, but the women have the additional option of using the "bent knee" position instead of the toe.

- Lower the bodies until the arms bend 90 degree and the upper arm are parallel to the floor.

- Do push-up repeatedly by lowering the body until the arms bend 90 degree and the upper arms are parallel to the floor.

- Count the number of push-up you are able to perform for one minute.

3.9.3. Tests for Muscular Endurance

Sit-up Test: The purpose of this test is to evaluate abdominal muscular endurance of the abdominals and hip-flexors, important in back support and core stability.

Materials:- stopwatch and mat.

Procedure:-To perform this test researcher was followed the following procedures:

- The subject lies on a cushioned, flat, clean surface with knees flexed, usually at 90 degrees.
- A partner may assist by anchoring the feet to the ground.
- The hand may be placed by the side of the head, the arms crossed over the chest and reaching out in front.
- The subject raises the trunk in a smooth motion, keeping the arms in position, curling up the desired amount.
- The trunk is lowered back to the floor so that the shoulder blades or upper back touch the floor.
- A common method of performing a sit up fitness test is to record the maximum numbers of sit ups in a certain time period (Davis, 2000).

Figure 2: sit-up test sample

3.9. 4. Test for Body Composition

Body mass index: The body composition fitness area targets the various factors that contribute to an individual's total weight (percent of muscle, bone, organ, and fat content). The body mass index, which is commonly referred to as the BMI, is not an estimate of body fat. Instead, it provides information on the appropriateness of an athlete's weight relative to his or her height.

The body mass index is not the recommended body composition test particularly for some athletes with high muscle mass (ACSM, 1995).

$$BMI = \frac{weight - Kg}{height - m^2}$$

3.9.5. Test for Cardiovascular Endurance

3-minute Step test: Purpose this test is to determine the state of your cardiovascular endurance and the recovery rate of the heart after exercise.

Equipment:- 12-inch box or step, stop watch and whistle.

Scoring:- your scoring is the number of heart beats per minute, measured for 1 minute after completion of the step test.

Procedure:-To perform this test researcher was followed the following procedures:

- Warm-up prior to the test, and after finishing be sure to cool down.
- Ask someone with a stopwatch to time you.
- Step up and down on box for three minutes at a rate of twenty four steps per minute.
- One step consists of four beats; that is; up with the left foot, up with the right foot, down with the left foot down with the right foot.
- Stop at exactly three minute and immediately sit in a chair. The active part of the test here is completed.
- Begins counting your pulse for fifteen seconds after the exercise ends and multiple by 4. So use one as close to 12 inches as possible, otherwise results will be skewed. Set the metronome to 96 beats per minute and make sure you can hear the beat.

3.10. Reliability of Data

The reliability of data was assured by instruments reliability and testers competency. In addition, to get consistent results from the different testing periods, the test conditions such as surface, equipment remain the same. The tests were conducted on similar weather conditions by the same testing personnel at the same time of day.

Reliability was established by the test re-test processes. Subjects were tested on selected variables. Three repeated measurement of individuals on the same test was done to determine reliability. The instruments such as stopwatch, centimeter, second were used for this study. All instruments were in good working condition and standardized enough to serve the purpose of the study.

3.11. Methods of Data Analysis

The researcher was gathered data from parameters of health related physical fitness tests. The gathered data would be analyzed, interpreted and tabulated into meaning full idea using descriptive statically form. Descriptive analysis is the method for describing the characteristics of the sample and major study variables was display in the form of mean, standard deviation and diagrammatic representation such as table. Then, the data would be coded and organized for analysis. After that, the coded or organized idea was interpreted by using statistical package software (SPSS) version 20.0 and the paired T-test was used to summarize the change between PT and POT training result of children in circuit training program. Level of significance was < 0.05%.

3.12. Parameters to be measured by Physical Fitness Tests

The parameters to be measured would be flexibility, muscular strength, muscular endurance, body composition and cardiovascular endurance, using the selected fitness tests and with carefully calibrated digital materials. To reduce the mistakes which can be occurred during data collection and to collect the appropriate data the assistant fitness test recorders were trained by the researcher.

3.13. Data Quality Control

The researcher was used the assistance to collect the necessary data from trainees, trainers and from stakeholder to avoid the information gaps. The assistance provided the training program to collect data from selected exercise to measure and evaluate the standards instrumental materials. During data collection only the standard materials would be kept to quality of data and the selected tests would be given with in planned months and weeks to code the data.

3.14. Ethical Considerations

The researcher was followed the Haramaya university postgraduate research guide line methods to deliver the participants motivate to provide the information about the study to conduct and the study also include all parts from preliminary to appendix as well as training session respected to maintain and. The Ethical standard requires that the researcher should not impose the participant in a situation where they might be at risk of physical or physiological harm as a result of their participation.

4. RESULTS AND DISCUSSIONS

4.1. Overview

This chapter deals with the analysis of data collected from the target population under study. The purpose of this study was to find out effect of circuit training on health related fitness components of U-15. To achieve the objectives of the study 40 students were randomly selected as subjects. They were assigned only in experimental group. The training was conducted for three consecutive months and 3 non constitutive days per a week in low to moderate intensity. The variables selected for this study were: a, physical fitness variables, (sit and reach test for flexibility, push up test for muscular strength, sit up test for muscular endurance, BMI test for body composition and three minute step up test for CVE. Pre and post tests were conducted for all 40 subjects on every selected variable and the data were recorded. The collected data were analyzed by paired sample T-test using Statistical Package for Social Sciences (SPSS) version twenty (V20). The results for each variable were presented in tables as discussed below.

4.2. Demographic Characteristics of the Study Participants

A total of 40 individuals, who were positively responded to the advertisement made. All selected individuals are Arusi Bala primary school students completed low to moderate intensity circuit training program. From the total number of the study target population; no one was lost motivation to follow up training program properly and no one was dropped out. 100% of the study target population; follow up training properly. Almost all participants were beginners for physical exercise.

Table 2: Paired Samples Statistics Result for Weight of Male and Female U-15

Sex	Variables	Mean ±SD		N	MD	Sign.(2-tailed)
		PT	POT			
Male	Weight	39.14±4.67	44.54±4.98	22	5.41	.000
Female	Weight	36.8±4.43	41.5±4.2	18	4.72	.000

Data are Mean ± SD, PT=pre test, POT=post test, N=number of participant, MD= mean difference and SD= standard deviation.

Table 2 showed weight of both male and female participants. The mean value of participant's weight was 39.14, 36.8 pre-test, and 44.54, 41.5 post-test of male and female respectively. The body weight of the target participant both sex showed slight increment after 12 weeks of circuit training for target group with the mean difference of 5.41and 4.72. So, the mean body weight was increased by 5.41 and 4.72 it shows the circuit training was better way in U-15 students to gain the body weight. The training affects both sexes to gain effective weight in moderate intensity. But, the height is not much increment on the exercise.

4.3. Paired T-Test Result Analysis of Health Related Components of U-15

Table 3: Paired Samples Statistics Results for both Sex SAR, PU and SU Variables of U-15

Sex	Variables	Mean ± SD		N	MD	Sign.
		PT	POT			
Male	SAR(mm)	6.6±1.3	17.73±2.05	22	11.13	.000
	PU	9.41±1.53	21.7±3.2	22	12.29	.000
	SU	9.86±1.24	23.64±3.17	22	13.78	.000
Female	SAR(mm)	6.4±1.03	20.8±1.99	18	14.4	.000
	PU	4.55±0.85	11.8±1.48	18	7.25	.000
	SU	6.67±1.5	18.67±3.64	18	12.000	.000

The values are in the form of Mean ±SD; PT= pre test, N=number of participants, MD=mean difference, SD=standard deviation, SAR=sit and reach test, PU=pushup test and SU=Sit-Up test.

According to above table 3 showed the health related components of male and female pre test and post test results. The table indicated variable of sit and reach test 6.6, 6.4 pre-test and 17.73, 20.8 post test result of both male and female respectively. The mean difference of sit and reach test of them was 11.13and 14.4. This showed there was a significant change on the flexibility of U-15 students as result of selected 12 weeks circuit training exercise in moderate intensity. It means average increment with compared to standard norm.

From the above table the pushup test of both male and female were 9.41 and 4.55 pre test, and 21.7 and 11.8 post test value respectively. The mean difference of both sex pushup tests was 12.29 and 7.25. This showed there was a significant change of muscular strength of U-15

students as result of selected 12 weeks circuit training exercise in moderate intensity. It means average increment with compared to standard norm. From the above table the sit-up test of both male and female were 9.86 and 6.67pre test, and 23.64 and 18.67 post test. The mean difference of male and female sit up test was 13.78 and 12 respectively. This stated that there was the significant change or average muscular endurance of U-15 students as result of selected 12 weeks circuit training exercise in moderate intensity with standard norm.

Table 4: Paired Samples Statistics Results for Both Sex BMI, RHR and EHR Variables of U-15

Sex	Variables	Mean ± SD		N	MD	Sign.(2-tailed)
		PT	POT			
Male	BMI	19.1±0.88	21.42±0.84	22	2.33	.000
	RHR	142.13±5.7	110.23±5.97	22	-31.90	.000
	EHR	194.73±7.4	154.82±8.15	22	-39.91	.000
Female	BMI	18.75±0.79	21.03±0.95	18	2.28	.000
	RHR	148.0±4.4	119.1±5.14	18	-28.9	.000
	EHR	199.2±7.9	159.67±8.55	18	-39.53	.000

The values are in the form of Mean ± SD; PT= pre test, POT=post test, N=number of participants, MD=mean difference, SD=standard deviation, BMI=body mass index, RHR=resting heart rate and EHR=exercise heart rate.

According to table 4 stated the results of variables of BMI, RHR and EHR for both male and female PT and POT mean value. From table 4 showed, the mean result of BMI test 19.1 and 18.75 PT, and the POT 21.42 and 21.03 for male and female respectively. The mean difference of both male and female was 2.33 and 2.28. This showed that there was slightly significant change in the body composition of U-15 as result of selected 12 weeks circuit training exercise in moderate intensity.

From the above table 4 the mean result of RHR was 142.13 and 148.0 beat/min PT, and also the POT 110.23 and 119.1 beat/min for male and female respectively. The mean difference of RHR for male and female was decreased by 31.90 and 28.9. These results indicated that there were progressive decreases in resting heart rate of the participant. This shows that the selected circuit training exercise of step up test have significant change on the decrement of RHR of the student. These means RHR is thought to be an important inclusion in the equation as it decrease as children become fitter. The results for the study revealed that aerobic exercise had a significant effect in the improvement of physiological variables such as resting pulse rate andbreathe holding time. This means the effect of 3ST was big factor on cardiovascular endurance of U-15.

And also, from the above table 4 the mean result of EHR was 194.73 and 199.2 beat/min pre test, and also post test 154.82 and 159.67 beat/min for both male and female respectively. The mean difference of EHR for both male and female was decreased by 39.91 and 39.53. This finding showed that there was significant improvement on the cardiovascular endurance of the study subjects after 12 weeks. A few months of aerobic training lowers the resting heart rate by 10 to 15 beats per minute (bpm). It also lowers the heart rate for a given workload because, there cardiac muscles become developed. For example, a slow jog may produce a heart rate of 165 beats per minute before training and 140 beats per minute after a few months of training. The trained heart is a stronger, more efficient pump capable of delivering the required blood and oxygen with fewer beats (Highered.mcgraw-hill.com, 2013). So, the cardiovascular endurance in childhood and adolescence is strong predictor of central and overall adiposity later in life (Ruiz et al. 2009).

General, 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. Circuit training is a fertile field for the development of the educational aspects (Reddy & Jyoti, 2012). Parental and peer or friend support plays a key role in children's ability to achieve recommended levels of physical activity. Support from family and peers may increase children's ability to perform physical activity and help them overcome barriers to participation in physical activity. Two recent systematic reviews concluded that social support from parents, friends and family results in higher levels of physical activity for both children and youth **(**Yao CA. and Rhodes RE., 2015; and Mendonca et al., 2014**).** Several studies have found that children and youth living in a high

walk-able neighborhood, broadly defined as a community where it is safe and easy to walk and where pedestrian activity is encouraged (Raspberry et al., 2015).

4.4. Discussion

This study assessed and tried to investigate effects of circuit training on health related fitness variables like flexibility, muscular strength, muscular endurance, body composition and cardiovascular endurance of U-15 in case of Arusi Bala primary school students. While when we assess this training on all variables of health related and skill related fitness variables so many materials was limited. Such as: balanced diet and modern materials in that rural area shortage of human power like only one sport teacher in one school, lack of financial payment for assistant teacher and the like.

The major findings that depend on the research questions for this investigation were the increment or the improvement of all health related fitness variables such as: flexibility, muscular strength, muscular endurance, body composition and cardiovascular endurance. There are a lot of exercises that develop health related fitness of participants (Appendix Table 1, 2 and 3). For this study SAR test was used to measure flexibility; a number of modified push-ups per 60 seconds was used to measures muscular strength; a number of sit ups per 60 seconds was used to measure muscular endurance; BMI was used to measure body composition while three minute step-up test was used to measure cardio respiratory endurance experimental groups. The analysis of data was done through paired t-test to see the difference of pre-post result. The level of significance was set at 0.05.

As the tests result indicated that there was significant improvement in performance from pre-test to post test on experimental groups due to the circuit training program in 12weeks. The tests results showed that statistically significance enhancement observed in the participants' fitness level. Circuit training provides strenuous work entirely suited to an individual's specific needs, existing capacity and rate of adjustment to progressive vigorous exercises. The finding of this study was in agreement with who conducted the study on the effects of 12 weeks low resistance training on cardio respiratory endurance and muscular fitness on ninety health sedentary adults and found the training group significantly improved cardio respiratory endurance (Kaikkonen *et al.,* 2000).

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

The purpose of this study was to find out effect of circuit training on health related fitness components of U-15 in case of Arusi Bala primary school students. One of the main objectives of the researcher at these finding levels is to make the pupils active as long as possible during the classes. To achieve the purpose of the study 40 students were selected from Arusi Bala primary school students. The selected subjects were U-15 years old.

The circuit training programs was given 3 times none consecutive days per week for 12 consecutive weeks with 60 minute duration and moderate intensity for the experimental groups. The health related physical fitness variables for the study were flexibility, muscular strength, muscular endurance, body composition and cardiovascular endurance. The pre and post tests were given to all participants. The collected data were analyzed by SPSS version 20 with significance level of <0.05%. The paired sample t-test was used for this study. Final result of the study summarized and demonstrated that the result of pre test to post test showed improvement in all flexibility, muscular strength, muscular endurance, body composition and cardiovascular endurance of the athletes.

Generally the results obtained from this study showed that there was significant improvement in health related physical fitness variables due to the effect of circuit training. The result of this study proved that there was significant improvement in most of selected variables such as flexibility, muscular strength, muscular endurance, body composition and cardiovascular endurance slight change on body composition due to participation in moderate intensity in circuit training. The stockholders of target participant were parents and peers, school, community or environment and physical education teachers.

5.2. Conclusions

Based on the major finding of the study the following points are stated as conclusions:

- The result of the study showed that the 12 consecutive week's circuit training brings significant improvement on all health related physical fitness variables of U-15.
- Circuit training significantly improved flexibility, muscular strength, muscular endurance, and cardiovascular endurance of experimental group of the subject.
- Circuit training had slight effects on the body composition and weight gain.
- A child's who had lived a high walk-able environment where it is safe and easy to walk than their peers who resided in a low walk-able environment.
- The stockholders played key role in the participation of target participant involvement on the prepared circuit training program.
- Young child in the first or second grade level do not to participate in the same type of muscular strength and endurance training as a senior in high school.
- Participants can be improved average level of fitness compared to the standard norm in moderate intensity.

5.3. Recommendations

Considering the major findings and conclusions of the study, it is important to put (state) the following points as recommendations:

- In Circuits training the pupils can easily reach the minimum motor engagement time at the same time they execute many types of exercises.
- As educators and parents consider how to help children develop the five health-related fitness components it is important to consider the age-appropriateness of activities.
- The parental, peers' and friends, school and physical education teacherstake a great role in the participation of children's increasing children's ability to perform physical activity and help them to overcome barriers to participation in physical activity.
- The young children's participate in moderate intensity with circuit training program is most curtail to develop all health related fitness component.

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7. APPENDIXES

APPENDIX-A: Health history and physical readiness questionnaires

This questionnaire was designed to obtain information on the health status and physical readiness of the target participants for this thesis study. The information was kept strictly confidential.

For Athletes: please read the following question carefully and indicate your correct response to each question by encircling it on the choice letter given

1. Do you have a recent physical injury such as bone, muscle and joint which will be aggravated by physical exercise? A. Yes B. No

If yes indicate the type of injury that you had_____

2. Do you have suffered with heart condition? A. Yes B. No

3. Identify any medical problems that you had

A. Cardiovascular C. Respiratory E. None

B. neuromuscular D. metabolic

4. Have you ever felt pain in your chest when you do physical exercise? A. Yes B. No

5. Are you taking any prescription medicines recently? A. Yes B. No

6. Have you ever suffered from shortness of breath at rest or with mild exercise?

A. Yes B. No

7. Is there any history of Coronary Heart Disease within your family? A. Yes B. No

8. Do you ever feel feint, have spells of dizziness or have you ever lost consciousness?

A. Yes B. No

I hereby state that I have read, understood and answered honestly the questions above. I also state that I wish to participate in circuit training program.

Subject's full Name: _____ Trainer's Name: _____

Subject's Signature: _____ Trainer's Signature: _____

Date:_____ Date: _____

Source (Canadian Journal of Sport Science 1992)

APPENDIX-B: Consent to participate voluntarily in this research study

Researcher Name: **Alemu Washara Bukate**

Supervisor Name: **Desta Enyew (PhD) and Shemelis Mekonnen (PhD)**

Thesis title: - Effect of Circuit Training on Health Related Fitness Component of U-15 in Case of Arusi Bala Primary Schools in Dawuro Zone Essera Woreda, SNNPR, Ethiopia.

You were being asked to participate in this study as described below. All this like research study carried out were governed by the regulation for research on human beings. These regulations require that the researcher was obtained a signed agreement (consent) from you to participate in this research project. The researcher was explained to you in detail the purpose of the project, the procedure to be used, the potential benefits and the possible risk of participation in this study. You were asked the researcher any questions that you may have about the study. The basic explanation of the project was summarized below.

After discussion, if you was agreed to participate in the study, please sign this form in the presence of the researcher. You may discontinue at any time from the study if choose to do so.

1. Purpose and procedure

The purpose of this research project was to investigate the effect of circuit training on health-related Fitness Variables of U-15 years. The subjects to be involved in this study were forty (40) in numbers from Arusi Bala primary schools and participation on this study was required to perform a certain test to measure the physical fitness variables.

2. Risk and the safeguards

The risks of this research study were small, while administering the tests and during test you may experience localized muscle fatigue in your thigh, you might feel some muscle soreness and fatigue during the tests. But we do not expect any unusual risks as a direct result of the study, if any unexpected physical injury occurs, appropriate first aid was provided, but no financial compensations was given.

3. Confidentiality

The information obtained about you was kept in confidence, although you were free to release it to your own trainer. The information was used only for scientific purpose without identifying you as an individual.

4. Contact Address:

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I certify I have read and fully understand the above project. I willingly consented to participate

Name of subject: _____

Signature of subject: _____

Address: _____

Date: _____

I certify that I have explained fully to the above subject the nature, the purpose, the potential benefits and the possible risks involved in this research study.

Date: _____

Signature of the investigator: _____

APPENDIX-C: Description of the Study Design

The research was done in Arusi Bala primary school student in Essera Woreda, for this study forty (40) students U-15 were selected by simple randomly sampling in lottery method. The sampled population underwent 12 weeks training program in order to see the effect of circuit training for U-15.

Gender and age of the subject- the researcher selects both male and female students, due to the problem of the improving health related fitness variables (flexibility, muscular endurance and muscular strength cardio vascular endurance and body composition) school students. So, to see the effect of this study significantly age level students were selected. The researcher interest was to develop the study on the effect of circuit training in physical education practical class for U-15. The selection of age was based on the average age of primary school students is U-15. So, the investigator was selected 40(25%) sample size students with U-15 by using simple randomly sampling in lottery method.

While selecting the age, gender and sample size of the study populations they underwent 3 months (12 weeks) per year that is October, November and December in 2019. The training days per week were 3 days that are Monday, Wednesday and Friday at 5:00pm-6:00pm in the afternoon after class. The schedule was performed in five (5) stations.

The researcher was took pre test to know the change, and post test to know the progress of training and the dependent variables for this study were flexibility, muscular strength, cardiovascular endurance, body composition and muscular endurance independent variable is also circuit training. The tests used for the study were sit and reach test, push up test, sit up test, body mass index and 3-min Step test respectively.

APPENDIX-D: Description of Training schedule for the three months

The main goal of this study training plan schedule was to develop health related physical fitness variables of U-15 in Arusi Bala primary school students through 12 weeks circuit training intervention. The schedule was prepared with time frame, intensity and frequency of exercises within five (5) stations.

The following table includes different types of circuit training which was performed by the subjects within 12 weeks in Five (5) stations in order to improve their health related fitness variables. The exercises involved in this study were warming up exercise, running, jogging, walking, and circuit exercise like sit up, push up, three minute step, brisk walking, Stationary bicycle, stair climbing, deep stretch, BMI, Squat thrust, toe touch, frog jump, right angle push up, sprinting, sit and reach and finally cooling down exercise which was helped to develop athletes' fitness level. Also FITT (Frequency, Intensity, Time and Type of Exercise) principle of training was applied in the schedule;

1. **Frequency of training**: the repetition of exercise in one set. The training schedule was completed in 3 days per week that was Monday, Wednesday and Friday at afternoon.

2. **Intensity of training**: is how hard the body exercising or how much energy is expended when exercising. In this study the researcher was used moderate to adapt the exercise to high intensity for increasing load in the consecutive three months. There are ways to measure intensity of training;

* Heart rate - Heart rate can be an indicator of the challenge to the cardiovascular system that the exercise represents.

* Vo2max- the amount of oxygen consumed by the body during exercise

Exercise is categorized into three different intensity levels. These levels include **Low** (40-50% MHR), **Moderate** (50-65% MHR), and **Vigorous** (65-85% MHR) for aerobic exercise and were measured by the metabolic equivalent of task. The effects of exercise are different at each intensity level (i.e. training effect). Recommendations to lead a healthy lifestyle vary for individuals based on age, weight, and existing activity levels. "Published guidelines for healthy adults state is that 20-60 minutes of medium intensity continuous or intermittent aerobic activity 3-5 times per week is needed for developing and maintaining fitness"(ACSM, 1990).

Table 1: Training Schedule for First Month (October, 2019) in Low Intensity (40-50 MHR %)

Weeks	Days	Types of Exercise	Time (min)	Rep	Set	Rest/ sec	Total duration
1	Monday, Wednesday and Friday	**Warming up:** light stretch, walking, jogging and running	12				60 min
		Main part:	36				
		3 min step up	9	3	2	30	
		push up,	9	5	2	30	
		sit up,	9	5	2	30	
		sit and reach,	9	1	2	30	
		Cooling down: stretching, jogging and walking	10				
2	Monday, Wednesday and Friday	**Warming up:** jumping jacks, jogging and running	13				60 min
		Main part:	35				
		Squat thrust,	7	5	2	30	
		toe touch,	7	7	3	60	
		push up,	7	5	3	60	
		sit up,	7	5	3	60	
		Brisk walk	7	8	2	30	
		Cooling down: stretching, jogging and walking	8				
3	Monday, Wednesday and Friday	**Warming up:** aerobic dance, walking, and running	12				60 min
		Main part:	36				
		Frog jump	9	5	2	30	
		Sit up	9	5	2	30	
		Sit and reach	9	1	2	30	
		curl up	9	5	2	30	
		Cooling down: on spot running, stretching and walking	10				
4	Monday, Wednesday and Friday	**Warming up:** light stretch, aerobic dance, walking, jogging and running	12				60 min
		Main part:	36				
		one mile run	9	1	2	30	
		toe touch	9	5	2	30	
		push up	9	5	2	30	
		Stationary bicycle	9		2	30	
		Cooling down: stretching, jogging and walking	10				

The above training schedule would be performed every week of the month of October 2019

Table 2: Training Schedule for Second Month(November, 2019) in Moderate Intensity (50-65 MHR %)

Weeks	Days	Types of Exercise	Time (min)	Rep	Set	Rest/ sec	Total duration
1	Monday, Wednesday and Friday	**Warming up:** Aerobic dance, Rope jump and running	12				60 min
		Main part:	36				
		sit up	9	6	2	30	
		right angle push up	9	6	2	30	
		push up	9	6	2	30	
		sit and reach,	9	1	2	30	
		Cooling down: stretching, jogging and walking	10				
2	Monday, Wednesday and Friday	**Warming up:** light stretch, walking, jogging and running	13				60 min
		Main part:	35				
		deep stretch	7		2	30	
		toe touch,	7	6	3	60	
		push up,	7	6	3	60	
		Stair climbing	7	7	3	60	
		Brisk walk	7	7	2	30	
		Cooling down: spot running and walking	8				
3	Monday, Wednesday and Friday	**Warming up:** on spot running, jogging and running	12				60 min
		Main part:	36				
		Sprinting	9	2	2	30	
		toe touch	9	6	2	30	
		push up	9	6	2	30	
		sit up	9	6	2	30	
		Cooling down: stretching, jogging and walking	10				
4	Monday, Wednesday and Friday	**Warming up:** walking, running and aerobic dance	12				60 min
		Main part:	36				
		90^0 arm support	9	2	2	30	
		sit and reach	9	1	2	30	
		curl up	9	7	2	30	
		step up	9	3	2	30	
		Cooling down: stretching, jogging and walking	10				

The above training schedule would be performed every week of the month November 2019

Table 3: Training schedule for Third Month(December, 2019)in Moderate Intensity (50-65 MHR %)

Weeks	Days	Types of Exercise	Time (min)	Rep	Set	Rest/ sec	Total duration
1	Monday, Wednesday and Friday	**Warming up:** aerobic dance, jogging and running	10				60 min
		Main part:	36				
		hoping shuttles	9	5	3	60	
		push up,	9	9	3	60	
		sit up,	9	9	3	60	
		step up	9	6	3	60	
		Cooling down: stretching, jogging and walking	10				
2	Monday, Wednesday and Friday	**Warming up:** light stretch, walking, jogging and running	12				60 min
		Main part:	35				
		Squat jump	7	7	3	60	
		toe touch,	7	7	3	60	
		push up,	7	9	3	60	
		20 meter shuttle run	7	6	3	60	
		Brisk walk	7	7	3	60	
		Cooling down: rope jumping, jogging and walking	8				
3	Monday, Wednesday and Friday	**Warming up:** light stretch, hoping, jogging and running	12				60 min
		Main part:	36				
		press up	9	7	3	60	
		Sit up	9	9	3	60	
		Sit and reach	9	1	3	60	
		curl up	9	9	3	60	
		Cooling down: stretching, jogging and walking	8				
4	Monday, Wednesday and Friday	**Warming up:** light stretch, walking and jogging	12				60 min
		Main part:	36				
		10 yards sprinting	9	6	3	60	
		3 min step up	9	9	3	60	
		push up	9	9	3	60	
		Stationary bicycle	9	6	3	60	
		Cooling down: stretching, jogging and walking	8				

The above training schedule would be performed every week of the month of Dec, 2019.

Appendix- E: Row data record sheet

Table 4: Row Data Recorded Sheet for Experimental Group for U-15

Code	Sex	Age	W	H	SAR(mm)		PU(1minute)		SU(1minute)	
					PT	POT	PT	POT	PT	POT
S_1	M	15	43	1.49	6	18	10	23	11	28
S_2	F	15	42	1.43	7	18	5	13	8	22
S_3	M	14	38	1.40	5	16	8	20	10	23
S_4	F	15	42	1.48	6	23	4	11	9	23
S_5	M	14	39	1.47	6	19	9	21	9	24
S_6	F	13	30	1.27	8	19	3	10	6	14
S_7	M	13	34	1.32	8	17	7	17	8	20
S_8	M	13	35	1.36	7	19	8	18	9	19
S_9	F	15	41	1.45	5	21	6	14	8	24
S_{10}	M	15	44	1.52	5	17	11	24	12	26
S_{11}	F	14	36	1.39	6	21	5	12	7	18
S_{12}	M	14	38	1.45	9	20	10	22	11	24
S_{13}	F	14	37	1.41	7	22	5	11	6	17
S_{14}	M	13	34	1.35	6	20	9	19	10	21
S_{15}	M	13	35	1.33	5	16	7	19	8	21
S_{16}	F	13	31	1.34	8	24	4	9	4	15
S_{17}	M	15	45	1.54	7	20	12	26	11	27
S_{18}	F	15	43	1.49	6	22	5	13	8	24
S_{19}	M	14	41	1.46	5	15	10	21	9	22
S_{20}	F	14	37	1.42	5	18	4	12	6	18
S_{21}	M	15	46	1.55	8	14	12	27	11	28
S_{22}	F	14	36	1.40	7	19	5	12	6	16
S_{23}	M	13	35	1.32	8	14	8	18	9	19
S_{24}	F	13	30	1.34	7	21	3	10	4	15
S_{25}	M	15	45	1.50	5	15	11	25	11	27
S_{26}	M	14	39	1.50	8	20	9	22	10	23
S_{27}	F	15	42	1.51	8	23	6	14	9	23
S_{28}	M	14	40	1.46	6	17	8	20	9	24
S_{29}	F	14	35	1.37	6	17	4	11	7	17
S_{30}	M	14	40	1.44	7	20	9	22	11	22
S_{31}	F	13	31	1.28	6	23	4	10	5	14
S_{32}	M	13	30	1.30	6	19	9	17	8	20
S_{33}	F	15	42	1.47	7	20	5	14	8	24
S_{34}	M	15	45	1.50	9	17	10	26	12	29
S_{35}	F	14	35	1.36	5	21	5	12	6	18
S_{36}	M	15	44	1.48	7	19	12	28	10	28
S_{37}	M	14	39	1.43	5	18	10	22	9	24
S_{38}	F	14	36	1.39	6	20	4	12	7	16
S_{39}	M	13	32	1.35	7	20	8	20	9	21
S_{40}	F	14	36	1.38	5	22	5	12	6	18

Source:-Study subject

Table 5: Row Data Recorded Sheet for Experimental Group for U-15

Code	Sex	Age	BMI						3ST			
			PT			POT			PT		POT	
			W	H	BMI	W	H	BMI	RHR	HER	RHR	HER
S_1	M	15	43	1.49	19.65	51	1.49	21.8	132	186	100	140
S_2	F	15	42	1.43	19.55	48	1.43	21.33	144	188	114	152
S_3	M	14	38	1.40	19.39	44	1.40	22.45	146	198	114	158
S_4	F	15	42	1.48	19.17	47	1.48	21.45	140	190	112	146
S_5	M	14	39	1.47	18.51	46	1.47	21.3	148	192	116	154
S_6	F	13	30	1.27	19.83	36	1.27	23.8	156	216	124	168
S_7	M	13	34	1.32	19.51	39	1.32	22.4	148	206	112	162
S_8	M	13	35	1.36	18.92	40	1.36	21.63	144	208	118	160
S_9	F	15	41	1.45	19.5	45	1.47	20.83	150	194	110	148
S_{10}	M	15	44	1.52	19.5	49	1.52	21.21	133	190	108	148
S_{11}	F	14	36	1.39	18.63	42	1.39	21.74	148	202	118	168
S_{12}	M	14	38	1.45	18.1	43	1.45	20.45	144	198	112	156
S_{13}	F	14	37	1.41	18.6	42	1.41	21.1	152	196	122	158
S_{14}	M	13	34	1.35	18.65	39	1.35	21.4	150	200	116	168
S_{15}	M	13	35	1.33	19.8	40	1.33	22.61	148	206	114	166
S_{16}	F	13	31	1.34	17.26	37	1.34	20.61	152	208	128	172
S_{17}	M	15	45	1.54	19.31	52	1.54	21.37	136	184	104	144
S_{18}	F	15	43	1.49	19.37	46	1.49	20.72	144	190	116	150
S_{19}	M	14	41	1.46	19.23	46	1.46	21.58	142	190	108	160
S_{20}	F	14	37	1.42	18.35	40	1.42	19.84	148	196	120	162
S_{21}	M	15	46	1.55	19	52	1.55	20.57	134	186	102	146
S_{22}	F	14	36	1.40	18.37	41	1.40	20.92	144	198	124	160
S_{23}	M	13	35	1.32	20.1	39	1.32	22.3	144	202	120	162
S_{24}	F	13	30	1.34	16.7	35	1.34	19.5	148	212	124	166
S_{25}	M	15	45	1.50	20.4	50	1.50	22.2	137	188	101	148
S_{26}	M	14	39	1.50	17.33	44	1.50	19.5	142	196	112	156
S_{27}	F	15	42	1.51	19.3	48	1.51	21.05	146	192	112	148
S_{28}	M	14	40	1.46	18.76	44	1.46	20.64	143	198	108	160
S_{29}	F	14	35	1.37	18.65	39	1.37	20.8	150	200	122	168
S_{30}	M	14	40	1.44	19.3	45	1.44	21.7	140	192	110	158
S_{31}	F	13	31	1.28	18.92	36	1.28	22	156	208	122	168
S_{32}	M	13	30	1.30	17.75	37	1.31	21.56	146	198	116	164
S_{33}	F	15	42	1.47	19.43	45	1.47	20.82	142	194	114	150
S_{34}	M	15	45	1.50	20.9	51	1.50	22.66	136	186	102	142
S_{35}	F	14	35	1.36	18.92	40	1.36	21.62	146	204	118	166
S_{36}	M	15	44	1.48	19.4	49	1.48	20.66	138	184	104	144
S_{37}	M	14	39	1.43	19.07	43	1.43	21.03	144	196	116	152
S_{38}	F	14	36	1.39	18.63	40	1.39	20.7	148	200	124	164
S_{39}	M	13	32	1.35	17.56	37	1.35	20.3	152	200	112	158
S_{40}	F	14	36	1.38	18.35	40	1.38	19.84	150	198	120	160

Source:-Study subject

APPENDIX-F: Paired Sample T-test Value

Table 6: Paired Samples T-Test Values for both Sex U-15 Record of Weight

Sex	Variables	Tests	Paired Difference				t-value	Df	Sign.(2-tailed)
			MD	SDD	95% Confidence interval of the difference				
					Lower	Upper			
Male	Weight	Post-Pre	5.41	1.05	5.9	4.941	24.1	21	.000
Female	Weight	Post-Pre	4.72	1.07	5.25	4.2	1.2	17	.000

MD=mean difference, SDD=standard deviation difference, df=degree of freedom, sign.=significance

Table 7: Paired Samples T-Test Values for both Male and Female U-15 Recorded Result

Sex	Variables	Tests	Paired Difference				T	Df	Sign.(2-tailed)
			MD	SDD	95% confidence interval of the Difference				
					Lower	Upper			
Male	SAR	Post-Pre	11.13	2.21	12.11	10.15	23.63	21	.000
	PU	Post-Pre	12.29	2.00	13.16	11.40	28.72	21	.000
	SU	Post-Pre	13.78	2.40	14.83	12.71	27.0	21	.000
Female	SAR	Post-Pre	14.40	2.12	15.44	13.33	28.82	17	.000
	PU	Post-Pre	7.25	0.95	7.70	6.75	32.5	17	.000
	SU	Post-Pre	12.00	2.50	13.24	10.75	20.40	17	.000

MD=mean difference, SDD=standard deviation difference, df=degree of freedom, sign.=significance, SAR=sit and reach test, PU=pushup test, SU=Sit-Up test

Table 8: Paired Samples T-Test Values for both Male and Female U-15 Recorded

Sex	Variables	Tests	Paired Difference				T	Df	Sign.(2-tailed)
			MD	SDD	95% confidence interval of the Difference				
					Lower	Upper			
Male	BMI	Post-Pre	2.33	0.584	2.6	2.1	18.68	21	.000
	RHR	Post-Pre	-31.90	3.8	30.23	33.69	39.50	21	.000
	EHR	Post-Pre	-39.91	4.38	37.96	41.85	42.70	21	.000
Female	BMI	Post-Pre	2.28	0.76	2.66	1.90	12.7s	17	.000
	RHR	Post-Pre	-28.90	4.50	26.64	31.13	27.20	17	.000
	EHR	Post-Pre	-39.53	4.73	37.20	41.91	35.50	17	.000

MD=mean difference, SDD=standard deviation difference, df=degree of freedom, sign.=significance, BMI=Body Mass Index, RHR=Resting Heart Rate, EHR=Exercising Heart Rate

APPENDIX-G: Standards and Norm values for Young

The international health-related physical fitness award or qualifying standards or norms for children under age of U-15

Table 9: Parameter used to Test Flexibility

Performance	Test	Sit and Reach test : measured in per centimeter									
	Sex	Male					Female				
	Age	11	12	13	14	15	11	12	13	14	15
Excellent		>23	>20	>20	>29	>29	>22	>23	>27	>26	>27
Above average		18	16	16	23	22	18	19	22	20	21
Average		13	12	12	17	15	14	15	17	14	15
Below average		8	8	8	11	8	10	11	12	8	9
Poor		<7	<7	<7	<7	<10	<9	<10	<11	<7	<8

Source: Milaim Berisha, Murat Çilli. Normative values for physical fitness in children aged 11-17 in Kosovo. Pedagogic, psychology, medical-biological problems of physical training and sports, 2018; 22(1):17–27. doi:10.15561/18189172.2018.0103

Table 10: Parameter used to Test Muscular Strength

Performance level	Test	Push-up test: numbers of repetition per one minute									
	Sex	Male					Female				
	Age	11	12	13	14	15	11	12	13	14	15
Excellent		>15	>20	>25	>29	>36	>15	>15	>15	>15	>15
Above average		12	16	20	24	29	12	12	12	12	9
Average		9	12	15	19	22	9	9	9	9	8
Below average		6	8	10	14	15	6	6	6	6	7
Poor		<4	<7	<9	<13	<14	<5	<5	<5	<5	<6

Source: Milaim Berisha, Murat Çilli. Normative values for physical fitness in children aged 11-17 in Kosovo. Pedagogic, psychology, medical-biological problems of physical training and sports, 2018; 22(1):17–27. doi:10.15561/18189172.2018.0103

Table 11: Parameter used to Test Muscular Endurance

Performance level	Test	Sit-up test: numbers of repetition per one minute									
	Sex	Male					Female				
	Age	11	12	13	14	15	11	12	13	14	15
Excellent		>26	>28	>26	>28	>34	>17	>27	>21	>22	>27
Above average		22	24	23	25	30	15	23	19	20	24
Average		18	20	20	22	26	13	19	17	18	21
Below average		14	16	17	19	22	11	15	15	16	18
Poor		<13	<15	<16	<18	<21	<10	<14	<14	<15	<17

Source: Milaim Berisha, Murat Çilli. Normative values for physical fitness in children aged 11-17 in Kosovo. Pedagogic, psychology, medical-biological problems of physical training and sports, 2018; 22(1):17–27. doi:10.15561/18189172.2018.0103

Table 12: Parameter used to Test Body composition

Performance level	Test	Body mass index test: measured in weight in kg per height in meter square									
	Sex	Male					Female				
	Age	11	12	13	14	15	11	12	13	14	15
Excellent		>18.6	>23.1	>25.7	>23.4	>25.2	>21.5	>23.4	>22.9	>22.8	>26.2
Above average		17.4	20.7	22.7	20.9	21.9	18.9	20.5	20.3	20.3	23.3
Average		16.2	18.3	19.7	18.4	18.6	16.3	17.6	17.7	17.8	20.4
Below average		15	15.9	16.7	15.9	15.3	13.7	14.7	15.1	15.3	17.5
Poor		<14.9	<15.8	<16.6	<15.8	<15.2	<13.6	<14.6	<15	<15.2	<17.4

Source: Milaim Berisha, Murat Çilli. Normative values for physical fitness in children aged 11-17 in Kosovo. Pedagogic, psychology, medical-biological problems of physical training and sports, 2018; 22(1):17–27. doi:10.15561/18189172.2018.0103

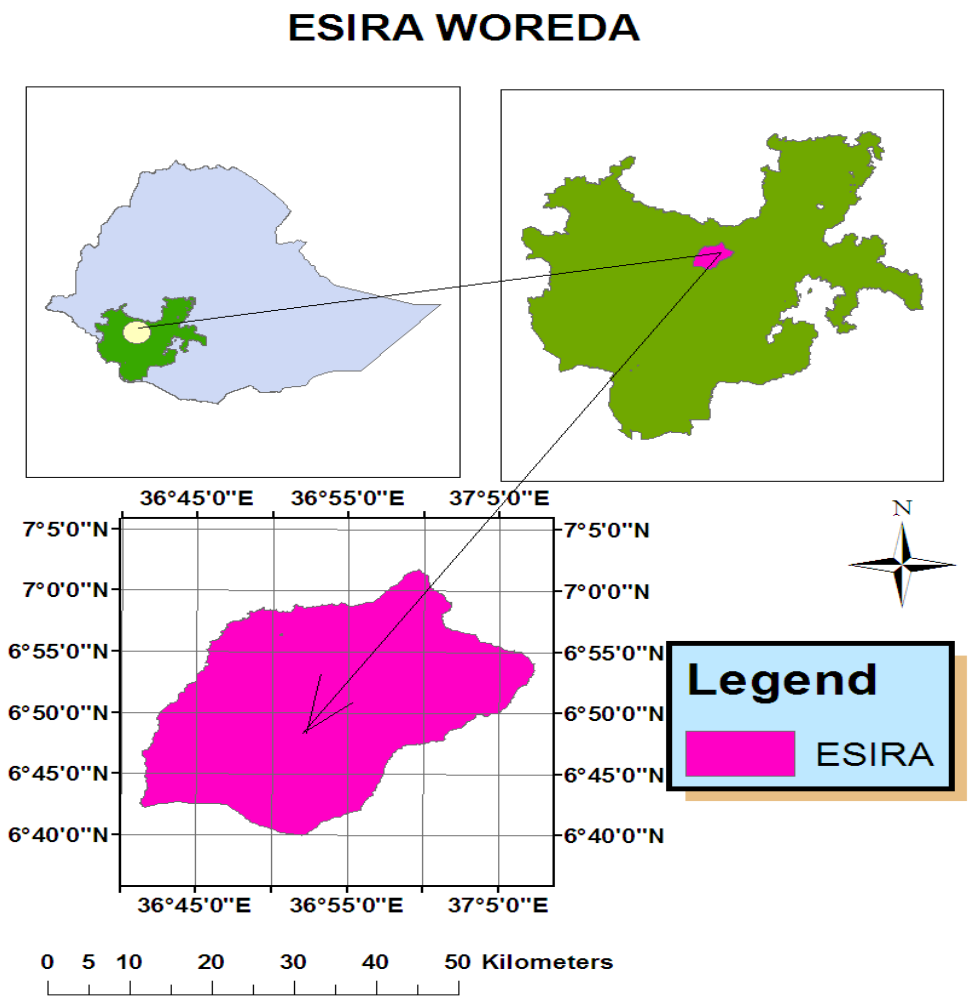
Table 13: Parameter used to Test Cardiovascular endurance

Performance level	Test	3 minute step-up test : numbers of repetition per 3 minute									
	Sex	Male					Female				
	Age	11	12	13	14	15	11	12	13	14	15
Excellent (95)		>77.8	>81.8	>78.9	>81.8	>83.3	>71.4	>78.9	>76.3	>73.8	>73.8
Above average(75-90)		66.2-72.6	66.2-76.3	65.2-73.8	66.2-75	67.2-77.6	62.5-69.2	60.0-71.4	60.0-69.2	59.2-67.2	58.4-68.2
Average(50)		60.0	56.3	56.3	57.7	58.4	57.3	52.3	52.3	51.1	51.7
Below average(10-25)		48.4-53.6	45.9-50.6	45.5-50.0	46.9-51.7	46.9-51.1	47.4-51.1	43.7-47.4	43.7-47.4	43.3-46.9	43.7-46.9
Poor		<46.3	<43.9	<42.9	<44.2	<45.3	<45.9	<42.0	<42.1	<41.3	<41.7

Source: L.M.Y. Chung et al., /Health 6(2014) 33-43

APPENDEX-H: Map of study area

Figure1. Map of the Study Area Site



Source: Essera Woreda Agricultural and Natural Resource Management office, 2017