



**WALLAGA UNIVERSITY**  
**SCHOOL OF GRADUATE STUDIES**

**EXPLORING THE EFFECTS OF 8-WEEKS PLYOMETRIC  
TRAINING ON SOME SELECTED PHYSICAL FITNESS  
VARIABLES OF U-17 MALE FOOTBALL PROJECT  
PLAYERS OF MATTU CITY**

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF  
WALLAGA UNIVERSITY COLLEGE OF NATURAL SCIENCE  
DEPARTMENT OF SPORT SCIENCE IN PARTIAL FULFILLMENT FOR  
THE REQUIREMENTS MASTERS OF SCIENCE (MSC) DEGREE IN  
FOOTBALL COACHING

**BY: DAGIMTASFAYE**

**ADVISOR: Mr. EDOSA JABESA (ASS. PRO)**

MAY 2025  
NEKEMTE, ETHIOPIA

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**APPROVAL SHEET**  
**WALLAGA UNIVERSITY**  
**SCHOOL OF GRADUATE STUDIES**

**Approval sheet for submitting Final proposal**

As a member of the examining board of final MSc Open defense we certify that we has read and evaluated this thesis prepared by **Dagim Tasfaye** under our guidance, which is entitled **“Exploring the effects of 8-weeks Plyometric training on some selected physical fitness variables of U-17 male football project players of Mattu city.** It has final format, consistent and acceptable. Hence, we recommended that the thesis has accepted as it fulfilled the University and Department style requirements for the degree of Master in football coaching.

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## **STATEMENT OF CERTIFICATE**

I hereby certify that all the corrections and recommendations suggested by the board examiners are incorporated into the final thesis entitled “Exploring The Effects Of 8-Weeks Plyometric Training On Some Selected Physical Fitness Variables Of U-17 Male Football Project Players Of Mattu City” by Dagim Tasfaye.

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## **DEDICATION**

I would like to dedicate this thesis to my Wife, and friends who supported the accomplishment of my dream of receiving my Master's Degree.

## **STATEMENT OF THE AUTHOR**

I here by declared that this thesis is my original work and has not been presented for a degree in any other university. It has been submitted in partial fulfilment of the requirements for the degree of Master in football coaching in Wallaga University. In addition, that all sources of materials used for the thesis has been duly acknowledged.

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## **BIOGRAPHICAL SKETCH**

The author Dagim Tasfaye was born on September 02, 1994, G.C in Ido Wara Wale at Dale Sadi Woreda of Kellem Wallaga Zone. He started his Elementary school at Ido Wara Wale primary school, Secondary at Dalle Secondary school, and preparatory School at Dalle Sadi preparatory School. He completed high school 2013 G.C. Then, he joined Mattu University, Department of sport science in 2014 G.C and graduated with BSc Degree in sport science on July 02, 2016 G.C.

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## **ABBREVIATIONS AND ACRONYMS**

|              |                                                     |
|--------------|-----------------------------------------------------|
| <b>ACSM:</b> | American College of Sports Medicine                 |
| <b>CG:</b>   | Control group                                       |
| <b>EG:</b>   | Experimental group                                  |
| <b>FIFA:</b> | Federation of International de Football Association |
| <b>FT:</b>   | Field-running tests                                 |
| <b>Ho:</b>   | Null Hypothesis                                     |
| <b>IT:</b>   | Internal training load                              |
| <b>La:</b>   | Lactate concentration                               |
| <b>LE:</b>   | Lower extremity                                     |
| <b>POT:</b>  | Post Test                                           |
| <b>PT:</b>   | Pre-test                                            |
| <b>SPSS:</b> | Statistical Package for Social Sciences software    |
| <b>SSC:</b>  | Stretch shortening cycle                            |
| <b>U-17:</b> | Under Seventeen                                     |
| <b>UE:</b>   | Upper extremity                                     |
| <b>VJ:</b>   | Vertical Jump Test                                  |

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## **ABSTRACT**

*Plyometric training is an important training program in improving physical fitness and physiological parameters of football player's skills. The main purpose of the study was exploring the effects of 8-weeks Plyometric training on some selected physical fitness variables of U-17 male football project players of Mattu city. To achieve the objective of this study, the researcher used quantitative type of research approach and true experimental research design. For this study, 30 football male project players was selected as a sample of the study. The participants were selected by Census method, assign in to two equal groups experimental, and control groups by simple random sampling technique. Each group has (N=15) participants. The experimental group participated in Plyometric training program for 3 days per week for 8-weeks. However, the control group did not participate in training program design. For this study the tests are conducted for both groups. The selected fitness variables are Strength, speed and Power. The data collected from the study subjects were analyzed by SPSS version 23 software by ANCOVA with level of significant at 0.05. In addition, significance difference was used at  $P < 0.05$  level of confidence. After 8 weeks of Plyometric training the result of Experimental group participant's by strength (0.006), speed (0.000) and power (0.000) were changed significantly ( $p < 0.05$ ). This study concludes that Plyometric training was significantly better in improving the physical fitness variables football skills of male football players. However, there was no significant difference and improvement recorded on CG. The researcher recommends that, Coaches and personal trainers should be required to incorporate Plyometric exercise into their regular routine. This research was used as an input and experiment of research results if choosing similar problems as the object of research.*

**Key Words:** -Plyometric, strength, power, and speed.

# **CHAPTER ONE**

## **1. INTRODUCTION**

This chapter describes background of the study, statement of the problem, objectives of the study, significance of the study, hypothesis, significance, delimitation, limitations, operational definition of terms and organizational of the study.

### **1.1 Background of the study**

Football is one of the most popular ball games, which is widely played and followed by a high number of supporters all over the world at a professional (Lemecha & Taddese,, 2021) .In modern football, physical fitness and Physiological parameters are one of the most important effects in indicating success for football players. It is also a high level skill sport that all bio motor abilities are affected that need aerobic and anaerobic strength and which includes skill related physical fitness like speed, agility, strength, and power (Muluye & Biyadglegn, 2020)

Football is presently the most popular sport throughout the world in terms of spectators and participants. Because of this large number of people use their leisure time, and participate in football activity. It is one of those rare games, which demands not only speed but also agility, strength, power, aerobic capacity and endurance along with skill (Reilly & Williams, 2003.) Football is the most popular game in the world (Bell, Brooks, Matthews, & Charles, (2009)). A popular type of training exercise is Plyometric training. This type of training uses jumping exercises to involve the neuromuscular system in rapid force development and improved use of tissue elasticity to improve power, rate of force development, and the ability to absorb force. Plyometric are merely a part of an overall strength training and conditioning program that includes strength, speed, agility, aerobic and anaerobic training, flexibility training, and proper nutrition. Plyometric have a purpose, which is usually described as power and speed training (Lehnert & Lamrova, (2009).)

Plyometric training, also known as jump training, a type of exercises focuses on generating explosive power by rapidly stretching and contracting muscle. Plyometric training refers to exercises involving jumping, hopping, skipping, running, cycling, or brisk walking, jumping rope, hopping, lunges, jumping lunges, Skater jump, tuck jumps, and Vertical Jumps; that are

characterized by eccentric contractions of the muscle tendon unit immediately followed by concentric contractions, which is also referred to as the stretch shortening cycle (Ababe, 2020). This training focuses on learning to move from a muscle extension to a contraction in a rapid or "explosive" manner, such as in specialized repeated jumping (Lamecha & Taddase, 2021).

Conceptually, Plyometric training has characterized by the operation of the stretch-shortening cycle (SSC), which is the mechanism underlying the tissue response contractile and elastic elements and pointed out that their different length shortening behavior, was vital in movements. Moreover, the power/strength produced during the initial phase of the stretch-shortening cycle positively influences neuromuscular control and joint stabilization (Mikulic, (2010)). Plyometric training exercise improve explosive power, muscular strength, speed and quickness, agility, neuromuscular coordination, vertical jump performance, leg strength, muscular power, increase joint awareness and enhance football skill performances of the players. Plyometric training is widely used in conditioning, power training and in prevention and rehabilitation of injuries in some sports (Mengesh, Rani, & Molla, 2015)

Physical fitness has divided into two components: Health-related and Skill-related components. The Health-related components of physical fitness are cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition. The skill-related components of physical fitness are speed, power, agility, coordination, balance, and reaction time. The United States president's Council on physical fitness and sports defined the terms physical fitness as the ability to carry out daily task with vigor and alertness, without undue fatigue, with ample energy to enjoy leisure time pursuits and to meet unforeseen emergencies (Charles, Gregory, & William, 2006)

## **1.2 Statement of the problem**

Football is a sport requiring high-intensity, intermittent effort, hence the importance of aerobic or anaerobic endurance and explosive speed. Power, Agility and strength are unique. Players who have some physical weakness that hinders them to achieve the desired goal such as to participate in different competitions and to be a winner (SAMUEL K. , 2022)

Plyometric training has many advantages for the improvement of athletes over in various sport events including soccer. Plyometric training exercise improve explosive power, muscular strength, speed and quickness agility, neuromuscular coordination, vertical jump performance, leg strength, muscular power, increase joint awareness and enhance soccer skill performances of the athletes (Roop chand M et al.2010).

The basic benefit of Plyometric training is that it can improve muscular strength and power, increase speed and agility, improve coordination and balance, reduce injury risk, increase caloric burn, improve bone health, time efficiency and mental toughness which can translate into better performance in sports and other physical activities.

The Purpose of the study are exploring the effects of 8-week Plyometric training program on some selected physical fitness variables of U-17 male football project players of Mattu city. Specifically, the study finds to determine whether this type of training can enhance various aspects of physical fitness variables of football players. There is limited evidence on how these benefits changed specifically to U-17 male football players. These are practical knowledge gap.

The specific practical knowledge gap of the study aims to address lack of understanding of Plyometric training on the physical fitness variables of male football project players in Mattu city. The study exploring how this type of training program can improve the players' performance of muscle strength, speed, power, Aerobic exercises and body composition.

Although, Current research does not address exploring the effects of 8-week Plyometric training of physical fitness (such as strength, speed and power) in U-17 male football project players of Mattu city, Ilu Aba Bor zone, Oromia Region, Ethiopia. Consequently, an updated review and research is needed in these areas.

The aims of the study are to fill practical knowledge gap by assessing 8-week Plyometric training to U-17 male football project players in Mattu city by selected physical fitness variables. Therefore, the researcher was interested to investigate the effect of Plyometric training on some selected physical fitness variables of U-17 male football project players in Mattu city.

### 1.3 Hypothesis

In this study, the following hypotheses has formulated for test:-

- ❖ **H<sub>1.1</sub>**. 8-weeks Plyometric training has significant effect on Strength performance of male football project Players.
- ❖ **H<sub>0.1</sub>**. 8-weeks Plyometric training has no significant effect on Strength performance of football project Players
- ❖ **H<sub>1.2</sub>**. 8-weeks Plyometric training has significant effect on speed performance of male football project Players.
- ❖ **H<sub>0.2</sub>**. 8-weeks Plyometric training has no significant effect on speed performance of football project Players
- ❖ **H<sub>1.3</sub>**. 8-weeks of Plyometric training has significant effect on Power performance of male football project Players
- ❖ **H<sub>0.3</sub>**. 8-weeks Plyometric training has no significant effect on Power performance of football project Players

### 1.4 Objective of the study

#### 1.4.1 General Objective

The general objective of this study was exploring the effects of 8-weeks Plyometric training program on some selected physical fitness variables of U-17 male football project players of Mattu city, Ilu Aba Bor Zone.

#### 1.4.2 Specific objectives

To meet the above general objective, the specific objective of this study would be;-

- ❖ To evaluate the effect of 8-weeks Plyometric training on the performance of strength male football project players.
- ❖ To diagnosing the effect of 8-weeks Plyometric training on the speed performance of male football project players
- ❖ To identify the effect of 8-weeks Plyometric training on the power performance of male football project players.

### **1.5. Significance of the study**

The purposes of the research are to increase knowledge and find out a solution for any problem that happened. The result of the study was help to provide analysis on benefits of performing Plyometric Training bring. In addition, this study could be significant in many ways for the improvement of some selected physical fitness variables. Therefore, this study has the significant effect to improve strength, speed and power of players.

- The present study help players to be aware the impact of Plyometric training on physical fitness variables.
- The finding of the study enables players to improve their current selected physical fitness variables.
- It may help coaches and sport scientists to design more effective training programs and science based strategies for the further improvement of players' skill, and positive image of the sport
- The study helps coaches, fitness trainers and other sport.
- And also helps specialists and researchers to conduct further studies on the area

### **1.6 Delimitation of the study**

The study was delimited exploring the effects of 8-week Plyometric training on some selected physical fitness variables of U-17 male football players. The selected dependent physical fitness variables include only strength, speed and power. The independent variable was Plyometric trainings with different types of exercises. The area coverage in this study also delimited.

So, that this study was conducted in Oromia region, Ilu Aba Bor zone, Mattu town, U-17 male football project players of Mattu city. Based on manageability participants for this study would selected only in Mattu city, U-17 male football project players. The amount are 30 players only.

To measure the some selected physical fitness variables the researcher are used only field tests administer. The tests used in this study would be, to identify the performance level of lower body strength by wall-sit test, speed by 30-meter sprint run, explosive lower body power by vertical jump test. The designed Plyometric training was, restricted to a total of 8-

weeks training program (February and March), only three (3) days per week with sixty (60)-minutes duration per session. This study only applied on male football project players.

### 1.7 Limitations of the study

This study has subjected to the limitations that were not under the control of the researcher and might affect the test results were like:

- ✚ Shortage of reference materials
- ✚ The natural problems such as air resistance, temperature during training and testing period have influences for the entire process of the research.
- ✚ Player's previous experience about Plyometric training in regular bases.
- ✚ It was also not possible to control the regularity, punctuality and sincerity of the subject participating on the experiment as all the players were day scholars

### 1.8 Operational definition of terms

**Explosive power:** is the ability to exert maximum muscular contraction instantly in some explosive movement (Yakup et.al, 2017, P 17).

**Muscular strength:** According to (Insel & Roth, Core concepts in health, Stanford University; McGraw Hill., 2002) muscular strength is the ability of the muscle to exert force and it is the amount of force a muscle can produce with a single maximum effort.

**Physical fitness training:** is a conditioning training, which improves the player's physical fitness abilities such as body composition, endurance, speed, agility, flexibility.

**Plyometric training:** refers to an effective mode of training as it enhances motor learning and neuron muscular efficiency and reactivity to increase the rate of producing force training (Lehnert & Lamrova, (2009).)

**Power:** is the ability to transfer energy swiftly in to force and it is an explosive strength (DESTAW, 2019)

**Project:** is serious and long-term tasks are carefully planned in order to enhance football player's performance level.

**Speed:** refers to a person's ability to move fast or to cover a distance in a short period According to (Cronin & Hanson, (2005)).

## **1.9 Organization of the Study**

This experimental research organized in five chapters. In the first chapter presented the background to this study, statement of the problem, general objective of the study, specific objective of the study, research hypotheses, significance of the study, delimitation of the study, limitation of the study, operational definitions of key terms and organization of the study was also described in detail. Chapter two concentrates on a review of related literature. The third chapter of this study explained the research methods that included the description of the study area, the research approach, research design, study population, sample and sampling techniques, source of data, data collection instrument, inclusion and exclusion criteria, method and procedure of data collection, training protocol, method of data analysis, ethical consideration. The fourth chapter was deals with the analysis of data results, interpretation, presentation, and discussion of the study. The last chapter consist the summary, conclusion and recommendation of the study based on the results and findings

## **CHAPTER TWO**

### **2. REVIEW OF RELATED LITRATURE**

#### **2.1. THE CONCEPTS OF FOOTBALL**

Football is referring as soccer in the world and it is a high-energy athletic team sport in this modern age. The number of countries of FIFA members even outnumber the members of United Nations Organizations another undeniable proof of the game's popularity. Since 1900 football is the integral part of the greatest sports show in the world Olympics. The game has been follow in a feverish fashion in Europe, especially in England for centuries. In fact, the game attracted different sections of men and women throughout the world. The first recorded game took place as early as A.D. 217 in the town of Derby in England. This particular game was once part of a grand festival that was celebrate by the local folk after the victory over the invading Romans (SISAY, 2020)

Football is played in two main forms; firstly, as a 90-minute game with a 15-minute half time rest period. Player's fitness level and strength plays is a significant part in the game, however a high skill level on the ball and good knowledge of the game are also necessary. The simplicity of football requires the intense physical requirements to succeed in the sport. Further, playing football by an hour will make a player better, but it is the focused and specialized training, directed at every segment of the player's necessary skill set, that will take a good player to the next level of ability and accomplishment (Morris; 1981).

The physical aspects of the game include speed, acceleration, explosiveness, agility, balance, body control, particularly in jumping and heading the ball, leg strength and endurance. The development of each of these physical capabilities must be included into the training required to build the individual technical components of play. Soccer players, training aims to improve technical, tactical, psychological, and physical qualities. During a soccer match, players perform different types of exercise such as running, kicking, jumping, and tackling.

Football beginners have the impulse to collect the ball in their hands and make a run for it instead of kicking it. This new and irritating 'tactic' led on to the birth of the game now known as rugby. The true followers of the sport of football decided to put down some rules to let football remain football.

The London Football Association was formed in 1863 with the very intent of distinguishing football from its variants. The broad emphasized except goalkeeper, the other players were to keep their hands off the Football. This led to it getting the rather official sounding name of "Association Football". Association football or Associated Football soon progressed the way for a more abbreviated and called "football". The FIFA founded at the turn of the 20th century (1904) governs all the international games.

Football is presently the most popular sport throughout the world in terms of spectators and participants because of this large number of people use their leisure time, and participate in football activity. It is one of those rare games, which demands not only speed but also agility, strength, power, and endurance along with skill (Reilly & Williams, 2003.) Football is a game that requires combined fitness qualities of strength, speed, agility, and endurance. The objective of playing the game is to score more goals than the opposing team. Goals scored by getting a ball across the goal line under the crossbar and between the goal posts. A soccer team consists of 11 individuals all of which must undertake specific roles and associated functions in each specific position in order to make a successful team (Hughes. 2012).

## **2.2 Historical Background of Football in the World**

According to (Elsey & Pugliese, (2017).) Football has a long history. The first known version of Football called kick ball with feet invented by Chinese Emperor Huang Ti in 1697 B.C. A thousand years later, the Japanese started playing kemaria, a game was copied from tsu-chu (kicking ball with feet). Football is the most popular game in the world (Bell, Brooks, Matthews, & Charles, (2009)). According to FIFA data, more than 265 million people practice this sport and around one billion interact in some way (FIFA., (2007)). The growth of clubs internationally has led to the creation of a large business with many associated dimensions that have made it a benchmark for the commercialization of sport only comparable to the Olympic Games (Desbordes, (2007)). If we take into account that the Olympic Game are held every four years and totally of 41 sports are involved, we can get an idea of the dimension of current football (Cleland, (2015)). From a global perspective, we currently find 128.983 professional players, spread across 3.903 clubs, 6 confederations and 211 national federations that make football the sport par excellence worldwide (FIFA, (2019).)

Football is a widely popular sport with nearly 300 million people playing worldwide. Football is the most popular game in the world (Nolell & Marcal, 2021). Football is about eleven players on the pitch at one time but these eleven individuals have different needs with regard to fitness. For example, external midfield player could take forty high-speed sprints in one game while a holding midfield player might only manage twelve high-speed sprints in a game.

The coach and the sports scientists can design training which tolerates the demand of game. To succeed in elite football players require a high level of physical fitness to cope with the demands of the game. According to Federation of International de Football Association(FIFA) data, more than 265 million people practice this sport and around one billion interact in some way (Marcal, 2021)

Football is becoming one of the income sources among the sources of income in the world contributing millions of dollars to flow in world investment. In many European and Latin countries, football sport is becoming the main sources of their foreign currencies. The globally increasing popularity and recreational value of football sport is enforcing various investors to invest their resources on the area.

Football is a high-intensity, multi-dimensional sport that is physically, mentally, technically demanding and conditioning has become an integral part of football training. Indeed, counter attacks and high pressure defending are key parts of the high-tempo, modern-day game, and attaining high levels of fitness is critical to succeeding. Players today are quicker, stronger and greater stamina than ever before. In fact, one of major differences between top class and low-class players are the amount of high intensity actions they perform during a game (Abebe, The Effect of 8 Weeks Plyometric Training on Some Selected PhysicalFitness Development in The Case of Gojjam Debre Markos TownAmhara National League Male Football Club Players, 2020)

### **2.3The History of Football in the Africa**

Since football introduction into Africa by colonial settlers, teachers, missionaries and soldiers in the 1860s, the sport has become the most popular game on the African continent. For this reason, football in the particular context of Africa has become bigger than the sum of its players, scores, and spectators; it is an important lens for understanding relatively complex dynamics of African society. The upsurge of football in Africa even in poverty and war ravaged areas, means that Africans have adapted the game to varying environmental and socioeconomic conditions. Because of limited public spending in sports and sports facilities in the colonial and postcolonial era, soccer fields in much of the continent are in poor shape and therefore unsuitable for players to safely practice their craft.

African players learn their football skills without boots and in crowded and dusty conditions while kicking around a bundle of rags. They gain scoring precision by shooting the self-made balls through makeshift goalposts or a motor tire rim hanging on a pole.(Armstrong, 2004)

Playing for an overseas football club remains the dream of many an African footballer, with many of them now playing in the relatively lucrative European leagues. For such players, football brings economic security and many symbolic rewards including raising the international profile of the players and their home countries. Moreover, ‘retired’ international African players often reengage with domestic African leagues offering them much needed financial support, coaching expertise, and role models that provide the much needed motivation to nurture and prepare young players for what is otherwise a seemingly unattainable international football career. However, football researchers have argued that the rosy picture that is often painting about the overseas African footballer is generally at odds with the lived experiences of many such players, especially the young ones.

The popularity of football in Africa also means that its reach has very few boundaries. It is present even in some of the most politically unstable parts or highly militarized regions of the continent. More recently, football has become a new networking tool not only among poor youths but also among the educated adult working classes in some African urban settings. Popularly known as ‘social football casual games are organized and played between informal networks of relatively wealthy urban male elites there by providing a venues for social exchange, relaxation, networking, business discussions, and social drinking. The marriage of

football and alcohol previously distinct forms of recreation among urban elites is an emerging way of asserting class, social status and prestige. The FIFA 2010 World Cup in South Africa is a case in point.

The enormous outpouring of emotion across Africa on 15 May 2004 following the Republic of South Africa's successful bid to host the 2010 World Cup, illustrates the kind of enormous euphoria that the sport can elicit in the continent (Alegi., 2008). According to (Pannenberg, 2010), the world football is the most popular sport in Africa. Millions of supporters are available in each country, hundreds of thousands of players, many clubs and countless competitions and tournaments at all possible levels.

## **2.4. The History of Football in Ethiopia**

Football is one of the most popular ball games which is widely played and followed by a high number of supporters all over the Ethiopia at a professional level (Acar, Yapicioglu, & Arikan, (2008)), And also one of the interesting and important sports in Ethiopia. Correspondingly, football is one of the most popular sports in the country with player numbers increasing annually at an explosive rate but it is unregistered number. This day Ethiopia built the first youth sport academy of its kind in the nation to increase professional players. In this respect, the role of such kind of youth academy is vital in the long-term development of football players.

However, opening sport academies is not guaranty to produce talented football players unless the measurements of physiology available in the academy. In football, there are multidimensional demands of physiology. The reason behind is players are required to repeatedly run, jog, accelerate, sprint, jump and decelerate. Football players in different playing position have different physiological characteristic.

According to (Hafta Maryam Kebede 2018) FIFA (Amendment law of the game) Football was introducing by foreigners who resided in Addis Ababa during 1924 or 1916 etc. These communities Armenian, Indian, Greeks, and Italians formed community teams and held Tournaments at Janhay Meda. The sport found its way shortly in to the compounds of the Menelik II and Tafari Mekonen school were teams were formed and matches. This school computation initiated the youth to choose football predominantly. Other the computations were used to a matches of game courts in their weekend. The referees were the tournaments

were hot train in the rules and way of gravitating. The referee were activating match by raining on a house back were the ball is kicked it at it rolls towards them.

As football continues in such away no good football were come to being from Menelick II and Teferi Mekonen School. Goalkeepers were not allowing holding the ball with their hands instead; they kick as it rolls towards them. However, there were no any football material help for them, for there reason most of the players were playing with base foot with the contribution of each football player within a few periods of time, they full filled the necessary material and matched repeatedly with Armin and Greek communities.

According to J.S Blatter (1996) Federation International De Football Association (Amendment of law of the game, p33) this school phase of early soccer player comes to close in May 1936 lat to the fascist invention. During the acceptance, the Italian form their own team in Addis Ababa and other town and eager. Ethiopian falls had to satisfy their desires and love for the game by watching the Italian play from side out ground fields. In 1953 the Ethiopian national team towards varies European countries were if in countered different teams, out of the 20 games held in Greece, Yugoslavia, Sweden and Australia won 4, lost 13 and drew three. The federation was limited to walk only in Addis Ababa. Since 1948, the federation meeting head passed decision to extend its work on other regions of Ethiopia. The federation is known as the Ethiopian football federation, and then the shoa football team becomes a member of the Ethiopian football in 1951, Eritrea and Hararge in 1952,

Gondere in 1963, Gojjam, and Gammo Gofa in 1969 Bale in 1970 and Ilu Aba Bor in 1972 become member of the Ethiopian football federation. Ethiopian become a member of the African football federation in 1952 the third African country next to Egypt and Sudan to register with the federation. The sent her first representative to FIFA at the 1968 meeting in Sweden. In the 1965 FIFA congress with in condone the secretary of the Ethiopian football federation Ato Yidnekachew was elect member of FIFA executive committee five holdings one of the two stets reserved for African countries. When the African football confederation was founded:-Khartoum in 1965 there only foundation of countries, Egypt, Sudan and Ethiopia. However, the Egyptian football federation was only 13 years old at the time and on the process of being organized it. ([Amendment of law of thegame1996 p35]

## **2.5 Concept of Plyometric training**

Plyometric training is a quick, powerful movement involving an eccentric contraction followed immediately by an explosive concentric contraction. This is accomplished through the stretch-shortening cycle or an eccentric-concentric coupling phase. The eccentric concentric coupling phase is also referred to as the integrated performance paradigm (which states that in order to move with precision, forces must be loaded (eccentrically), stabilized (isometrically) and then unloaded/accelerated (concentrically). Plyometric exercise stimulates the body's proprioceptive and elastic properties to generate maximum force output in a minimum amount of time (Brady, 1992). Plyometric training is an effective mode of training as it enhances motor learning and neuromuscular efficiency promoting the excitability, sensitivity, and reactivity of the neuromuscular system to increase the rate of force production (power), motor-unit recruitment, firing frequency (rate coding), and synchronization (Jack, (2013).

Plyometric, virtually all of the things required during athletic events involve one's ability to exert force in a rapid manner. This ability to exert force can be in the form of jumping, hopping, and changes of direction. Improving one's ability to exert force in a rapid manner can have a positive influence on sports performance. Prior to improving one's ability to exert force rapidly, it is important that athletes can absorb force during various movements. Improving absorption of force involves an adequate strength base and strong and elastic connective tissue. Plyometric training is considered to enhance the muscle's ability to utilize the Stretch-shortening cycle (SSC). SSC is an eccentric contraction (where the muscle and tendon lengthens under contraction), which is immediately followed by a concentric contraction (Asadi, Hamid, & Warren, (2016).)

Beginning with the ancient Greeks, coaches and athletes have sought methods and techniques for improving speed and strength. Speed and strength combined is power, and power is essential in performing most sport skills, whether the tennis serve or the clean and jerk. Although specific exercises designed to enhance quick, explosive movements have been taught for some time, only in the last decade has a system emerged which emphasizes "explosive-reactive" power training.

This new systems of athletic training is known as Plyometric training. The origin of the term Plyometric is thought to be deriving from the Greek word "pleythyein." meaning to augment or to increase, or from the Greek root words "plio" and "metric," meaning more and measure, respectively(Chu, Myer, Allen, & Chu, 1999 , 1981,2001).

Today Plyometric training refers to exercises characterized by powerful muscular contractions in response to rapid, dynamic loading or stretching of the involved muscles. Plyometric movements are performing in a wide spectrum of football in which power is useful. For example, consider the football lineman coming out of the stance, the volleyball player jumping up high above the net to block the return, the high jumper at take-off, and the baseball batter swinging at a pitch. The football player shooting the ball and then quickly jumping back up to get the rebound or tip-in can benefit from Plyometric. The platform diver who needs more height at the take-off can enhance performance through Plyometric. The tennis player or the baseball outfielder who needs to move more quickly to the ball to make the play will also benefit from Plyometric training. Most sports can be play more skillfully when athletes have the power that combines strength and speed. Plyometric is one of the best ways to develop explosive power for sports (Radcliffe & Farentinos, (2012))

## **2.6 Plyometric training**

Plyometric training is the term now applies to exercises that have their roots in Europe, where they first known simply as jump training (Baechle, 1994). Plyometric training can take many forms, including jump training for the lower extremities and medicine ball exercises for the upper extremities. Jump training exercises classified according to the relative demands they placed on the athlete. All the exercises are progressive in nature, with a range of low to high intensity in each type of exercise. The classification of exercises is jumps in place; standing jumps; multiple hops and jumps, bounding, box drills and depth jumps. The ability to apply force rapidly (reactive force) is the major goal of Plyometric training. Plyometric are use to apply an over load to the muscles with speed, strength as a goal. The speed, strength ability was known as power. Plyometric should not be considering an end in itself, but as part of an overall program (stretching, running, strength training nutrition, etc). After an athlete has begun a proper strength and conditioning program, Plyometric are used to develop speed–strength (K D. R., 2016)

### **2.6.1 Characteristics of Plyometric training**

Plyometric exercise includes practicing Plyometric activities to strengthen tissues and train nerve cells to arouse a selected pattern of shortening therefore the muscle generates as strong a contraction as possible within the shortest amount of some time. According to (K D. R., 2016), Plyometric training is somewhat exclusively applied to extensor of the legs, and consists of a brisk lengthening of the active extensor muscles (eccentric contraction) directly followed by a maximal concentric contraction. It contains of a quick stretching of a muscle (eccentric action) directly followed by a concentric or shortening action of the identical muscles. All types of Plyometric movement occur during three consecutive phases: the first phase consists primarily of stretching or eccentric muscle activity, which is marking by a high concentration of elastic muscle energy. The second phase is known as the amortization phase this phase starts at the end eccentric action and ends with the starting of the concentric muscle action. Eventually the third phase, the last word phase of contraction, which is primarily manifested because the jump hit or throws (Ari & Çolakoğlu, (2017))

### **2.6.2 Phases of Plyometric training**

Both lower extremity (LE) and upper extremity (UE) sports use the Plyometric concept as part of functional movement patterns and skill when performing the sport. Plyometric training utilizes the stretch-shortening cycle (SSC) by using a lengthening movement that is quickly following by a shortening movement (Ebben, (2005)).

There are three distinct phases involved in Plyometric training including the eccentric or loading phase, the amortization, or transition phase and the concentric run-loading phase (Chmielewski, (2006). )

#### **2.6.2.1 The eccentric phase**

The first stage of a Plyometric movement is the eccentric phase, but it also called the deceleration, loading, yielding the counter movement, or cocking the phase. This phase increases muscle spindle activity by pre-stretching the muscle before the activation. A slower eccentric phase prevents taking optimum advantage of my tonic reflex (Kosova, Beyhan, & Kosova, (2022)).

### **2.6.2.2 The amortization phase**

According to (Cherni, Hammami, & Jelid, (2021)), this phase involves dynamic stabilization and also the time between the tip of the eccentric contraction (the loading or deceleration phase) and also the initiation of the concentric contraction and a rapid switch from an eccentric contraction to a concentric contraction results in a more powerful response.

### **2.6.2.3 The concentric phase**

According to (Carvalho & Abade, (2014)) this phase called that active muscle switching from a rapid eccentric muscle action to a rapid concentric muscle action or from a rapid deceleration to a rapid acceleration helps the players or the athletes to try to different movements. In addition, other researcher put their idea let we try to see each of them. The concentric phase (or unloading phase) occurs immediately after the amortization phase and involves a concentric contraction leading to enhanced muscular performance following the eccentric phase of muscular contraction this happens secondary to boost summation and re-utilization of elastic mechanical energy, muscle potentiating, and contribution of the myotatic reflex.

## **2.7 Physical Fitness and Components of Physical Fitness**

Physical fitness is an ability to meet the ordinary, as well as unusual demands of daily life safely and effectively without being overly fatigued. Simply it is the body's ability to function effectively and efficiently, and contributes the total quality of life.

The totally fit person has a healthy and happy outlook towards life. Fitness is the young man's absolute necessity. It breeds self-reliance and keeps man mentally alert. Physical fitness is essential for human beings to adjust well with his environment as his mind and body are in complete harmony. Physical fitness are categorized into two components: They are Health-related and Skill-related.

The health-related components of physical fitness are cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition. The skill-related components of physical fitness are speed, power, agility, coordination, balance, and reaction time.

Physical fitness components come from the American College of Sports Medicine (ACSM), the largest sports medicine, exercise science organization in the world, and widely accepted as the standard for information and reference in sports medicine. Crossfit.com is an online fitness community that has become extremely popular for its daily workouts based on a concept of functional movements that are constantly varied and performed at high intensity (Williams & Wilkins, 2009)

### **2.7.1 Health Related Physical Fitness**

Health related fitness components are those which focuses on optimum health benefits and prevents the onset of disease and problems associated with insufficient movement. According to (Garzón, 2009) health related physical fitness includes those components of physical fitness that have shown to be more clearly relate to health status and it could relate to well-being and happiness. In addition to improving quality of life, health-related fitness: increases muscle tone, decreases susceptibility to injuries and illness, improves bone mineral density, reduces risk of osteoporosis, improves posture, increases efficiency of the respiratory and circulatory systems, decreases risk of cardiovascular disease and stroke, improves blood pressure, decreases risk of diabetes and some cancers, improves self-esteem and self-confidence, decreases body fat and improves metabolism; and increases energy level and academic achievement.(Education V. D., Health related fitness testing guidelines., 2006). According to (Sunni, (1996)) the following five components of health related fitness are: cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition.

#### **2.7.1.1. Cardio-Respiratory Fitness**

It is a measure of the hearts ability to pump oxygen-rich blood to the working muscles during exercise. It is also measure of muscles ability to take up and use the delivered oxygen to produce the energy needed to continue exercising. In practical terms, cardio respiratory endurance type exercise includes, jogging, distance running, cycling, swimming, rope skipping and others. Cardio respiratory fitness lowers the risk of heart disease and increased longevity, reduce the risk of type II diabetes, lower blood pressure, and increase bone density in weight-bearing bones (Bouchard, R. J., T., & J. R., 1990).

### **2.7.1.2. Muscular strength**

According to (Insel & Roth, Core concepts in health, Stanford University; McGraw Hill., 2002) muscular strength is the ability of the muscle to exert force and it is the amount of force a muscle can produce with a single maximum effort. Strong, powerful muscles are important for the smooth and easy performance of everyday activities, such as carrying groceries, lifting boxes, and climbing stairs, as well as for emergencies. They help keep the skeleton in proper alignment, preventing back and leg pain and providing the support necessary for good posture and it can be develop by training with weights or by using the weight of the body for resistance during callisthenic exercises such as push-ups and sit-ups. Strength is specific in nature and for true assessment, it would be necessary to test each major muscle group of the body. Lab and field tests are similar and involve the assessment of one repetition maximum (the maximum amount of resistance you can overcome one time). Strength can also be assessed using dynamometers. In the absence of the above measurement, we can also use field tests such as wall sit test. In this case, we simply hold in the correct position as much as possible and record the time in seconds (SIMACHEW, 2021)

### **2.7.1.3. Flexibility**

Flexibility is the range of motion available at a joint. Flexibility is useful in preventing some types of muscle tendon injuries and may be useful in reducing low back pain. The many benefits of increased flexibility include increased joint mobility, resistance to muscle injury, prevention of low back problems, efficient body movement, and good posture, which results in improved personal appearance. Flexibility is measure by “sit-and-reach” test (Clark B, 1989)

### **2.7.1.4. Muscular Endurance**

Muscular endurance is the ability of a muscle to perform an activity for a long period of time without fatigue. Muscular endurance is specific in nature. For true assessment of muscular endurance, it would be necessary to test each major muscle group of the body. The specific muscle group being tested can perform lab and field tests of muscular endurance are similar and are base on the number of repetition (example: repetitions of push-ups or abdominal curls).

Muscular endurance is important in sports, such as football (repeated running and kicking), tennis (repeated swinging of the arm to hit the ball) and swimming (repeated the stroke). Muscular endurance can develop through push-up, sit-up, rope skipping, jogging, and others.(Lee I, 1997). Muscular endurance is the ability to sustain a given level of muscle tension to hold a muscle contraction for a long period, or to contract a muscle repeatedly. Muscular endurance is important for good posture, injury prevention, and physical demands of everyday life and enhances performance in sports and work. Like muscular strength, muscular endurance developed by stressing the muscles with a greater load (weight) than they are used to (Insel & Roth, Core concepts in health, Stanford University; McGraw Hill., 2002)

#### **2.7.1.5. Body Composition**

Body Composition is the body's relative proportion of fat tissue to lean tissue. Lean tissue includes muscle, bone, skin, internal organs and body water whereas fatty tissue includes those composed of body fat (subcutaneous fat) as well as internal essential fat surrounding organs. Body composition will typically be displayed either as a percentage of fat (body fat percentage or % fat) or as a percentage of lean body mass (LBM). Those with optimal body composition are typically healthier, move more easily and efficiently and in general feel better than those with less-than ideal body composition feel. Achieving a more optimal body composition goes a long way toward improving quality of life and overall wellness (Welborn T, 2003)

In terms of health, fat is the main point of interest and everything else is termed lean body tissue. The amount of fat we carry varies from person to person and healthy averages vary with gender and age. Being over fat or under fat can result in health concerns. A healthy amount of fat for a man is between 15 and 18% and for women is higher at 20-25%. An optimal ratio of fat to lean mass is an indication of fitness, and the right types of exercises will help you decrease body fat and increase or maintain muscle mass (Head Quarters Department of the US Army, 1998).

There are standards to determine the levels of body fat that individuals should possess. It is essential to maintain a minimal amount of body fat (percent body fat) for good health, but an excess level as well as a very low body fat level can cause serious health risk. The proper way to determine recommended weight is by finding out what percent of total body weight is fat and what amount is lean tissue. Body composition can be assessed through several techniques. According to (Hoeger & Hoeger, 1999) fitness gram provides three test options to estimate body composition: Skin folds Measurements, Bioelectric Impedance Analyzer, and Body Mass Index.

### **2.7.2 Skill or performance related physical fitness**

According to (W., 2029) has pointed out that skill-related physical fitness is components of fitness that have a relationship with enhanced performance in athletic activities. Skill-related fitness abilities increases one's ability to perform in various activities and only has an indirect connection with health. The skill-related components of physical fitness are considered to agility, balance, coordination, power, speed, and reaction time and mostly developed with Plyometric training.

#### **2.7.2.1. Speed**

According to (Cronin & Hanson, (2005)) Speed refers to a person's ability to move fast or to cover a distance in a short period. When speed combined with strength, it provides power. Running a fast break basketball, moving a racquet fast through hitting zone to hit the ball harder in racquet game, sprinting in short sprint running and fast reaction in soccer needs speed. Speed can be improved by increasing a player's power by using training like counter movement jumps, bounding speed and squat jumps are effective Plyometric exercises for improving speed. According to (McEachen & Mackenzie, (2004)), Pointed out speed enables a player to move from one point to another with faster response time. It has been shown that to improve speed each athlete needs to work on acceleration, starting ability, stride rate, speed endurance, and stride length. Most sports require acceleration from a static state or when transitioning between movements, straight-line speed is still a valuable asset that athletes should focus on when testing and training for sports.

According to (Jay, Mark, & Editors, (1961)), It makes more sense for these athletes to focus their attention on training to accelerate. Acceleration is the rate of change in velocity, so this phase of sprinting is critical for changing directions as rapidly and efficiently as possible. Among athletes, a 30-meter dash is often use to measure speed.

### **2.7.2.2 Power**

Power is a combination of strength and speed as well as a measurement of an ability to exert force at higher speeds, which is develop by Plyometric exercises. According to (Shea &Pfeiffe, (1999)) pointed out that power is the capacity to do a given amount of work as rapidly as possible. It includes the elements of strength and speed. Speed is the ability to apply force rapidly when snatching, cleaning, throwing or sprinting. These elements are the result of Plyometric exercises, Power is consider to a combination of strength and speed. It has also defined as the ability to exert muscle force quickly for the reason some consider it to a combination of skill and health related physical fitness. Some examples of power include putting the shot and vertical jumping. There are, however, many different types of power and total assessment would require many different tests are the ability to transfer energy swiftly in to force and it is an explosive strength (DESTAW, 2019)

**Table 1.Summary of physical fitness variables**

| <b>Health related fitness</b> | <b>Skill related fitness</b> | <b>Sport</b> |
|-------------------------------|------------------------------|--------------|
| <b>Body composition</b>       | Agility                      | Team         |
| <b>Cardiovascular fitness</b> | Balance                      | Individual   |
| <b>Flexibility</b>            | Coordination                 | Lifetime     |
| <b>Muscular endurance</b>     | Power                        | Other        |
| <b>Muscle strength</b>        | Speed                        |              |
|                               | Reaction time                |              |

### **2.8. Plyometric exercise for physical fitness variables**

Regular aerobic exercise, running, cycling, or brisk walking,, jumping rope, hopping, lunges, jumping lunges, Skater jump, tuck jumps, Vertical Jumps, High knees, Sid-to-Sid Hops, Forward- backward hops, Single leg Sid-to-Sid Hops Skipping, Box drills, and bounding speed. Double Leg Hop, Explosive Step Up, Jumping Jacks, Jumping Squat, Lateral Jump, and Running in Spot(Patir, Sen, & Santos, 2021)

## **2.9. Effects of Plyometric Training on Physical variables**

A vertical jump, sprint performance and wall sit tests are commonly use within this study and applied settings to investigate the effects of Plyometric training on physical fitness of football player. However, effective contextual improvement with Plyometric training requires knowledge about the intervention and the kind of athletes targeted. Physical improvements have important implications on team sports, as players perform numerous explosive movements like kicking, Tackling, jumping, turning, sprinting, and changing pace and directions during the match Thus, Plyometric drills usually involve stopping, starting and changing directions in an explosive manner (Stojanovi & Jovanovi, (2012)).

The capacity to improve performance in athletes and recreationally trained individuals is the primary goal of sport performance professionals. Plyometric training is rank among the most frequently used methods for the development of the above-mentioned profiles in team sport games. Several research studies have confirmed that can Plyometric training enhance muscle strength and power. Additionally, numerous studies have discovered positive effects of short term Plyometric training on jumping performance in football and other team sport game (Renfro, (1999)).

It has been report that Plyometric training induces specific neural adaptations such as increased activation of motor units and less muscle hypertrophy than typically observed after heavy resistance strength training. Conceptually, Plyometric training is characterized by the operation of the stretch-shortening cycle that develops during the transition from a rapid eccentric muscle contraction (deceleration or a negative phase) to a rapid concentric muscle contraction (acceleration or a positive phase)(SAMUEL K. , 2022).

### **2.9.1 Effect of Plyometric training on strength**

The effect of Plyometric training on strength are it will be increase Lower body strength of football players , which is require for kicking, jumping, tackling, twisting, and turning. It also forms the inspiration for explosive speed. Upper body strength is required for shielding the ball, holding off opponents, throw-ins and contributes to overall power and explosiveness. Regular football playing builds strength by using the whole body allows us to try to see different author's ideas on the Effect of Plyometric training on strength.

Effects of Plyometric training on lower extremity strength are characterized in various populations, and in an exceedingly recent Meta-analysis, a conclusion was made that PT Improved one repetition maximum measured in isometric or slow velocity contractions in leg muscles (Miller, M.G., & Gilders, 2018)

According to (Bullard, 2002) On different researches “Plyometric training, when used with Periodization strength program, can contribute to improvements in vertical jump performance, acceleration, leg strength, muscular power, increased joint awareness, and overall the researchers put their ideas about the importance of Plyometric training they put different positive ideas as mentioned on the above. The Plyometric method is used as an honest method for the event of explosive strength. The Plyometric movement of the athlete dominates it during exercise. Marullo (1999) state that “Plyometric is speed-strength training, a mix of strength and speed”

### **2.9.2 Effect of Plyometric training on speed**

According to (Siddhi, (2017)) the effect of Plyometric training program on speed of football players, and Plyometric training is popular among individual involve in dynamic sports and Plyometric exercises like jumping, hopping, skipping, and bounding are executed with a goal to extend dynamic muscular performance Plyometric are techniques utilized by athletes altogether sorts of sports to extend strength and explosiveness. Movement speed or the shifting of a body in space may be a function determined by numerous factors (motor coordination, external conditions, strength, muscle endurance, the stretch short cycle, relaxation skills, reaction skills and speed which incorporates response time and movement time). Nevertheless, just speed, like an action with none additions has nothing in common with the speed necessary to perform complex movements in sport. (Siff, 2000), in many definitions and studies on speed abilities, the connection between speed and the occurrence of force, strength, flexibility, precision, or balance are emphasized. First speed is largely the results of force functioning on mass. Second, speed usually represents movement with a relentless speed frequency. Body movement (be it a personality's body or the other kind) with constant speed frequency requires enough motor force to equal out the forces which oppose movement. (Khodami, Nikseresht, & Khoshnam, (2014))

Speed is the ability to perform a movement within a short period of time (Neiman., (1995)) . Speed training is an important Football related skill related component of physical fitness, which enables a player to move from one point to another with faster response time. It has been shown that to improve speed each athlete needs to work on acceleration, starting ability, stride rate, speed endurance, and stride length.(Çimenli, . 2016).Speed as how fast a body is moving or the distance that covered divided by the time it takes to cover that distance. Speed is the ability to cover a set distance quickly, and is explosive in nature. Speed is vital for a number of activities in sport and exercise, especially sprinting and jumping activities. Speed is the ability to move the body or body parts through a required range of motion in the fastest possible time. Speed comprises of reaction time, acceleration, maximum speed and speed endurance. It is also important for certain positions in team-based sports, such as football. Speed defined several different ways. Several types of speed have demonstrated in the game of football. There are three different types of football speed: sprint speed, quickness and technical speed (SAMUEL, 2022)

### **2.9.3 The effect of Plyometric training on power**

Plyometric is critical for the event of the neuromuscular reflexes, stretch reflexes, explosive power, and ballistic movements(Chu D. A., (1998)) . Additionally, to this idea (Potteiger, Carper, & Lockwood, (2003))stated that Plyometric is also a variety of training methodology that may increase power output and explosiveness. “Today the football is becoming more dynamic and so the facility has become an important aspect of condition for football players of all ages. Exercises are of high-intensity, explosive muscular contractions combining strength and speed for acquisitions of benefits in power”. (Reilly T. , (2007))Discussed the contribution of Plyometric exercises on the facility of the players as follows “Plyometric exercises are often used during the late preseason period or within the season, so on maintain or develop further muscular power”.

Many researchers agreed about the effect of Plyometric training on the power of athletes they stated that Plyometric is taken under consideration by a high-intensity conditioning program. “It consists of explosive exercises that require muscles to adapt rapidly from eccentric to concentric contractions. Muscles, when stretched during an eccentric contraction, store P.E. for an awfully brief period of sometime”.

In addition, “Plyometric exercises use explosive movements to develop muscular power, the pliability to come back up with an outsized amount of force quickly. Plyometric training acts on both the muscular tend nous and neurological levels to increase an athlete's power output without necessarily increasing their maximum strength”. (Thomas & Mark, 2009). Plyometric exercises are suitable for improving various measures and components of muscle power like vertical jumping ability, speed, and acceleration).The ability to generate high levels of muscular power is an important attribute of football players. Football Players are required to have high levels of muscular power in order to effectively perform the tackling, lifting, pushing and pulling tasks that occur during a match. VJ is used to assess the power of leg or strength of leg, which is a significant fitness component testing in sedentary population as well as in athletes Plyometric training can improve the jumping power of athletes (MUBAREK, 2021)

## **CHAPTER THREE**

### **3. MATERIALS AND METHODS**

#### **3.1. INTRODUCTION**

This chapter describes the study area, Research Design, Population of the study, Sample size and Sampling Techniques, Source of Data, Variables of the study, Data Gathering Instruments, Experimental approach to the problem, Protocol of physical fitness and physiological test, Method of Data Analysis, Inclusion and Exclusion, Reliability and validity of data, Reliability of test and Ethical Issue and Ethical Consideration.

#### **3.2. Geographical Location of the Study Area**

The study has conducted in Mattu City, located in Mattu Woreda, Ilu Aba Bor Zone of the Oromia Region in Ethiopia. Ilu Aba Bor is a zone in the Oromia region, named after the former province of Ilu Aba Bor. This zone is located in the southwestern part of Ethiopia. The capital Mattu city is approximately 600 kilometers southwest of Addis Ababa.

Ilu Aba Bor Zone is bordered by several regions: to the south by the Southern Nations, Nationalities, and Peoples Region, to the southwest by the Gambela Region, to the west by the Kellem Wallaga Zone, to the north by the West Wallaga Zone, to the northwest by the East Wallaga Zone, and to the east by Buno Bedele Zone. The capital city of the zone is

Mattu.

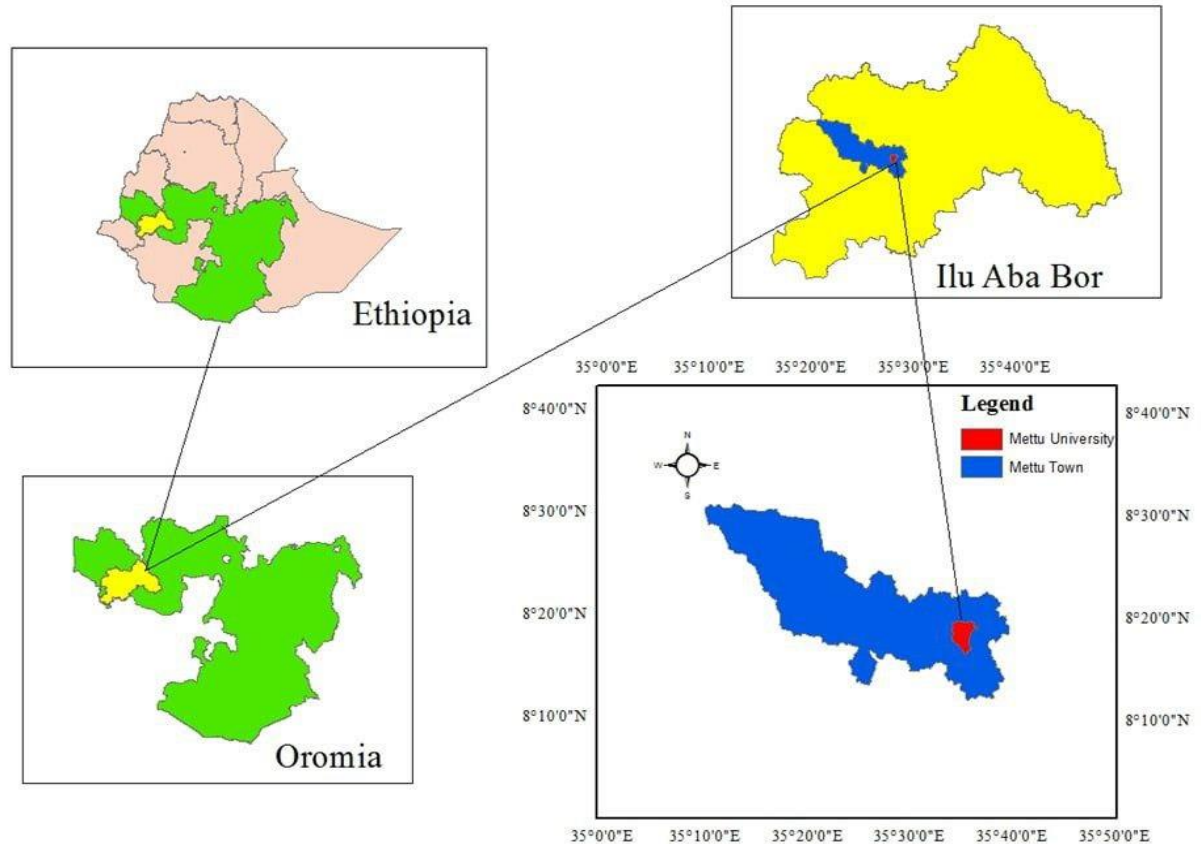


Figure 1. Mattu Town, Ilu Aba Bor Zone, Oromia, Ethiopia. Source, GIS software, (2023)

### 3.3. Research Design

This study focused on exploring the effects of 8-weeks Plyometric training on some selected physical fitness variables of U-17 male football project players. Depending on the nature and appropriateness of the pre and posttest data, the study was used true experimental research design. Since it helped to measure, examine, assess, evaluate and analyze the effect of Plyometric training on some selected physical fitness variables. The research approach in this study was quantitative type of research approach. The participant was divided into two equal groups. They are experimental group (EG) and control group (CG) in which each group consists of fifteen. The experimental group underwent Plyometric training for 8-weeks and control group was not engaged in any training other than their routine football training.

Both groups participated or involved in pre and posttest to identify the effects of 8-weeks Plyometric training on some selected physical fitness variables of male football project players.

The independent variable in this study was the 8-weeks Plyometric training, while the dependent variables included (lower body strength, speed and leg explosive power). By manipulate the treatment on the independent variable to seen the changed on the dependent variables. Pre and posttest has given to the experimental groups and control groups.

**Table 2. The study design layout**

| <b>Treatments</b>       | <b>Plyometric training</b>            |
|-------------------------|---------------------------------------|
| <b>Total duration</b>   | 8-weeks                               |
| <b>Frequency</b>        | 3days/week                            |
| <b>Duration</b>         | 60 minutes                            |
| <b>Intensity</b>        | Low to high                           |
| <b>Exercise days</b>    | Tuesday, Thursday, Saturday afternoon |
| <b>Time of training</b> | Afternoon (11:20-12:20)               |

### **3.4. Population of the study**

In Mattu town, there are many football project teams. However, the study population was players of U-17 male football project players. Therefore, the target population for this study was male football project players who found at Mattu city. The total numbers of players found at this team project are 30. All are males and the populations are small in number.

### **3.5. Study Participants**

The source of the population was Mattu City U-17 Male Football project players training center. The players were come from different family background and all the participants are physically active on regular basis.

### 3.6. Sample size and Sampling Techniques

From the population study, the researcher has selected U-17 age categories by using the census method. Based on their minimum number, the researcher decides to use all 30 players on this age category as a sample.

The study was categorized 30 players in to parallel groups and used a simple random sampling technique to select the samples for the experimental and control groups. From the 30 male football project players, 15 players are in the experimental and the left 15 players are control group.

**Table 3. Population, sample size and sample techniques**

| No | Category           | Population | Sample | Sampling Technique               |
|----|--------------------|------------|--------|----------------------------------|
| 1  | U-17 players       | 30         | All 30 | Census method                    |
| 2  | Experimental group |            | 15     | Simple random sampling technique |
| 3  | Control group      |            | 15     | Simple random sampling technique |

### 3.7. Source of Data

The data has collected by primary source of data from pretest (PT) and posttest (PoT). The measurements are on the field at the beginning and at the end of the training program.

#### 3.7.1. Primary source of data

The primary data were collected by administering field tests for experimental and control groups as pre and post-tests, before and after 8-weeks of Plyometric training. The data has recorded with the help of assistances. Data collectors are received information from the participants.

### 3.8. Variables of the study

#### ❖ Dependent variables:

##### a) Selected physical fitness: - Strength, Speed and Power

- The physical fitness dependent variables Strength measured by Wall sit test, speed measured by 30-meter sprint and Power measured by vertical jump

 **Independent variables:** - Eight (8) week Plyometric Training. The 8- weeks Plyometric Training exercises include: Regular aerobic exercise, running, cycling, or brisk walking, jumping rope, hopping, lunges, jumping lunges, Skater jump, tuck jumps, Vertical Jumps, High knees, Sid-to-Sid Hops, Forward- backward hops, Single leg Sid-to-Sid Hops Skipping, Box drills, and bounding speed, Double Leg Hop, Explosive Step Up, Jumping Jacks, Jumping Squat, Lateral Jump, and Running in Spot (Patir, Sen, & Santos, 2021)

### 3.9. Data Gathering Instruments

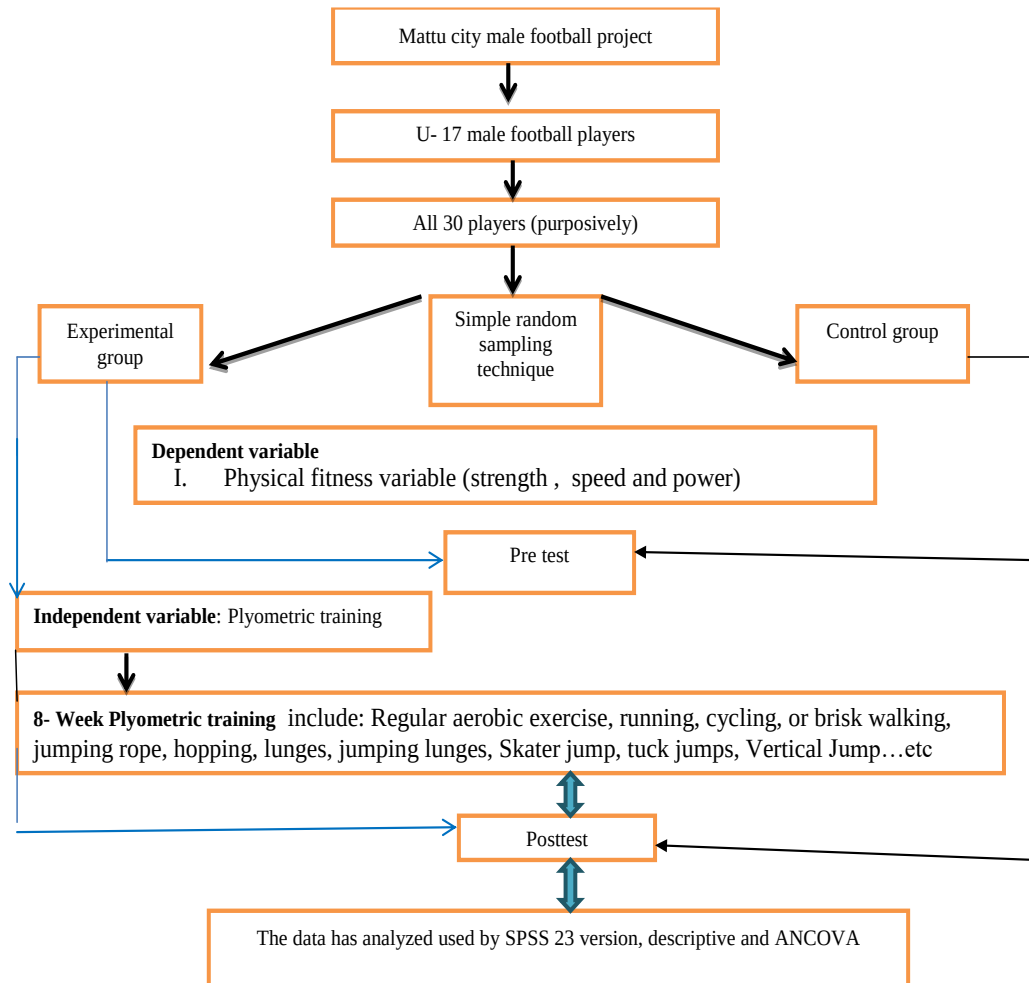
The data collected by quantitative data through the appropriate some selected physical fitness test measured by Wall-sit test for lower body strength, 30-Meter sprint test for speed and vertical jump test for power to both pre and post training. Prior to starting the tests, the questionnaires were, prepared with the aim of identifying whether they are free from any diseases and injury that was use as one selection procedure. The objectives of this study are to collect data, analyze, present and interpret it to make the expect findings being fruitful.

### 3.10. Experimental Materials

The study was used the following equipments throughout the study in the field. These equipments are Stopwatch, meter, pen, paper, marking cones, flag, chalk and whistle. Based on the availability and possibility of the instruments, the selected variables were tests by the following test measurements.

**Table 4.Measurement variables, test tools and their unit of measurements**

| <b>No</b> | <b>Measurement of variable</b> | <b>Test</b>         | <b>Unit to measure</b> | <b>Sets</b> | <b>Repetitions</b> |
|-----------|--------------------------------|---------------------|------------------------|-------------|--------------------|
| 1         | Lower Body Strength            | Wall Sit            | Second                 | 2-3 set     | 3                  |
| 2         | Speed                          | 30m Sprint Run Test | Second                 | 2-3 set     | 3                  |
| 3         | Power                          | Vertical Jump       | Centimeters or meter   | 2-3 set     | 3                  |



**Figure 2. Research work break down**

### 3.10.1 Experimental approach to the problem

A true experimental research design was used to exploring the effects of 8-weeks Plyometric training on some selected physical fitness variables of U-17 male football project players. Thirty participants assigned to experimental and control group by cluster. Before and after 8-weeks Plyometric training program of experimental and control groups, pre-tests and post-tests of Wall-sit test for lower body strength, 30-Meter Sprint Test for speed and vertical jump test for power.

## **Test Procedures:**

After five to ten minutes warming up the experimental group done Plyometric exercise for 8-weeks three days per week for sixty minute in each day. After calibrated instruments lower body strength, speed, power, aerobic capacity and body fat percentage performance was measured on isolated three days separated. Due to test conducted on separated days, all assessment administered at the same time of a day. After done the Plyometric exercise, they also perform cooling down exercise.

## **Testing Order**

The test are conducted as the following order:

- ✚ Wall Sit Test for lower body strength
- ✚ 30-Meter Sprint Test for speed
- ✚ Vertical Jump Test for power

## **3.11. Protocol of physical fitness and physiological test**

### **Guidelines**

- ✚ Prior to each day of training session, the participants had do warming up five to ten minutes.
- ✚ The experimental group underwent its training program in addition to daily routine according to the schedule.
- ✚ Duration of training sessions in all the days of training was one hour and the training employed three days per week.
- ✚ The eight-week Plyometric training protocol are presented on the appendix page.
- ✚ The subjects underwent their training program under continuous and strict supervision of the researcher.
- ✚ Age, sex, initial fitness level, nutrition, weather condition and their life styles considered when conducting training. Hence, frequency, intensity and durations of training programs based on these factors.
- ✚ The goal of this program was to enhance physiological and physical capacities of soccer athletes.

The following physical fitness variables tests was selected and the Changed were recorded especially before and after 8-weeks Plyometric training. All of the tests and measures conducted in the following manner.

### **3.11.1. Measurement of strength**

#### **Wall Sit Test**

In this case, the researcher simply hold in the corrected position as much as possible, and recorded the time (by seconds).According to (Barfield, (2008).)

#### **The objectives of Wall Sit Test are**

- ✚ Physical fitness assessments were used to evaluated an individual's muscular strength endurance, specifically in the legs and core muscle
- ✚ To observe the event of the players extensor muscle strength endurance

**Scoring:** the average of three trial scores has recorded to the nearest minutes

#### **Required resources**

To undertake this may require: -Warm dry location gymnasium, Smooth wall, Stopwatch and Assistant.

#### **The way to conduct the test**

- ✚ Stand comfy on each foot together with their back against a swish wall.
- ✚ Slide their back off the wall to assume the position shown within the diagram.
- ✚ There is to be a 90° angle at the hip and knee when they are prepare.
- ✚ Lift one foot 5cm off the bottom.
- ✚ The assistant starts the timer.
- ✚ The watch is stop after they place their foot back on the bottom.
- ✚ Take a rest so repeat the take a look at with the opposite leg.



**SOURCE: OWN SURVEY 2025**

**Figure 3.Wall sit test**

### **3.11.2. Measurement of speed**

#### **Procedures for Conducting the 30-Meter Sprint Speed Test**

The sprint speed test was utilizing to diagnosed speed potential within the football players. Players ran on 30 m decided zone with maximal sprint and the time of ran is registered by standardized stopwatch in terms of seconds. The members repeat the test twice and the foremost suitable result has recorded. According to 30m sprint speed test (van de Hoef, Brauers, Smeden, & Backx, 2020)

#### **Objectives of the 30-Meter Speed Test**

The objective of 30 Meters speed test is to observe the event of the player's ability to effectively and, with efficiency accelerate from a standing begin or from beginning blocks to most speed

#### **Required Resources**

To conduct this test the study worker was need: - 400 meter track with a 30 meter marked section on the straight, Stopwatch, Data recording forms, Pen and Two assistants

## How to conduct the test

The study includes three x 30-Meter runs from a standing begun or from beginning blocks and with a full recovery between every run. The assistant ought to record the time for the contestant to finish the 30 Meter or foremost suitable results are recorded.



**SOURCE: OWN SURVEY 2025**

**Figure 4. Sprint Run Test**

### 3.11.3 .Measurement of power

#### Vertical jump test

Vertical jump test was evaluated each subject after a proper warm up. A two-handed reach was use to displaced the maximum number of points possible from a flat-footed, standing position. After the stand and reach, a countermovement jump has performed to displace the highest reachable strip. Participants performance was consider as the difference between the heights of the highest point moved during a vertical jump and standing reach (Muluye & Biyadglegn, 2020))

According to (Barfield, (2008).) Vertical jump performance was measure to assess the explosive strength of the subjects' lower body. Subjects performed three trails and the highest trials recorded.

#### The Purpose of Vertical Jump test

The purpose of Vertical Jump test was to assess the event of the player's high jump performance, to assess the leg muscle power of subjects, and monitor the development of the athlete's elastic leg strength.

## Equipment Required

To conduct the Vertical Jump Test, the following equipment was necessary: The equipment's like: - Wall, Tape measure (meter), Chalk, Data recording forms and Pen.

## Procedures for Conducting the Vertical Jump Test

To conduct the vertical jump test, it is necessary to follow the following steps:

- The player conducts warming up exercise for five to 10 minutes.
- The player catches chalks at the end of their fingertips.
- The player stands side on to the wall, keeping both feet remaining on the ground, raises their hands upward, reaches up as high as possible with one hand and marks the wall by the chalk on their fingers (M1).
- The player from a static position jumps as high as possible and marks the wall with the chalk on his fingers (M2)
- The researcher measures and records the distance between M1 and M2
- Participants trials three times

**Scoring:** The test scored has assessed by taking the range of the static position recorded from the highest jump (M2) as well as the initial (M1) possible jumping recorded.



**SOURCE: OWN SURVEY 2025**

**Figure 5 vertical jump tests**

### **3.12. Method of Data Analysis**

The method of data analysis for this study, the researcher used descriptive statistics were reported as means and standard deviations (SD). Although the collected data at pretest and posttest on some selected physical fitness variables are analyzed by using Analysis of Covariance (ANCOVA) to show differences after 8 weeks of training intervention in experimental and control groups. The data was collected through field tests and analyzed by using computerize Statistical Package for Social Sciences software (SPSS) 23 version.

### **3.13. Inclusion and Exclusion**

Male participants who fulfilled the health history questionnaires and whose age are U-17 would be the part of the project based on their participation in the sport team and would be part of the study. However, female project players and another age is not participant in the study.

### **3.14. Reliability and validity of data**

To get consistent result, testing personnel, testing period, place and instruments has kept the same for all participants are validity. To ensure reliability, test and retest method executed. In between test and retest, complete recovery has given to all subjects.

### **3.15. Reliability of test**

Test retest ensures reliability of the test. The subjects from both groups for the selected physical fitness and physiological variables measured or tested three times and the average has taken.

### **3.16. Testers' competency**

The investigator conducted all physical fitness and physiological tests and measures. One coach (male) from Mattu city project got training on tests and measurements then assisted the investigator. Data concerning physical fitness and physiological variables has collected by football player's expertise in the area.

### **3.17. Ethical Issue and Ethical Consideration**

In this study, the ethical issue properly addressed to the participants. Therefore, the coach and players volunteered to participate in the study during training, during testing and other activities. The privacy of the participant and confidentiality are strictly observes and maintains throughout in the study. In addition, the written consent document, which included description of the testing, training procedures are informed to the coach and the players. The study had conducted in accordance with University rules, the code of conduct, and policies concerning research ethics.

## CHAPTER FOUR

### 4. RESULT AND DISCUSSION

#### 4.1 INTRODUCTION

This chapter presenting, Analyzing and discussed the data collected from pre and post test results of Wall-sit test for lower body strength, 30-Meter Sprint Test for speed and vertical jump test for power. The purpose of study was to explore the effects of 8-weeks Plyometric training on some selected physical fitness variables of U-17 male football project players. Pre and posttest has conducted to all thirty participants and the score has recorded. The collected data has analyzed by ANCOVA, which are used to compare the difference between pre and post-test result and compare two groups. The researcher had used true experimental research method. The data was collected through field tests and analyzed by using computerize Statistical Package for Social Sciences software (SPSS) 23 version.

#### 4.2 Demographic Characteristics of the Study Participants

The researcher has selected the total 30 male football project players for the study. From thirty players, 15 of them were experimental and 15 of them has selected for control group.

**Table 5. Age, Weight, Height of Experimental and Control groups participants**

| Descriptive Statistics for Experimental group |    |         |         |         |                |
|-----------------------------------------------|----|---------|---------|---------|----------------|
|                                               | N  | Minimum | Maximum | Mean    | Std. Deviation |
| Age                                           | 15 | 15.00   | 17.00   | 15.8000 | .67612         |
| Weight                                        | 15 | 41.00   | 60.00   | 51.2667 | 6.49689        |
| Height                                        | 15 | 1.50    | 1.65    | 1.5593  | .04415         |

| Descriptive Statistics for Control group |    |         |         |         |                |
|------------------------------------------|----|---------|---------|---------|----------------|
|                                          | N  | Minimum | Maximum | Mean    | Std. Deviation |
| Age                                      | 15 | 15.00   | 17.00   | 15.6000 | .73679         |
| Weight                                   | 15 | 44.00   | 56.00   | 51.6667 | 3.03942        |
| Height                                   | 15 | 1.48    | 1.65    | 1.5680  | .04989         |

**Key:** N= number of players and SD= standard deviation

Table 5 demonstrated the general characteristics of the study participants regarding age, weight and height training of EG and CG. The mean and standard deviation of the experimental group age, weight and height of training were  $15.8000 \pm .67612$  year,  $51.2667 \pm 6.49689$  kg and  $1.5593 \pm .04415$  m, respectively. Table 6 also shows that the mean of control group age, weight and height age of training were  $15.6000 \pm .73679$  year,  $51.6667 \pm 3.03942$  kg and  $1.5680 \pm .04989$  m respectively.

### 4.3 Analysis of Results

**Table 6. Descriptive analysis of strength mean of Experimental and Control group**

|          |              | Descriptive |         |                |            |         |         |
|----------|--------------|-------------|---------|----------------|------------|---------|---------|
| Test     | Group        | N           | Mean    | Std. Deviation | Std. Error | Minimum | Maximum |
| PRETEST  | EXPERIMENTAL | 15          | 73.5707 | 10.81562       | 2.79258    | 54.34   | 95.46   |
|          | CONTROL      | 15          | 68.3767 | 15.68313       | 4.04937    | 48.10   | 96.00   |
|          | Total        | 30          | 70.9737 | 13.49772       | 2.46434    | 48.10   | 96.00   |
| POSTTEST | EXPERIMENTAL | 15          | 83.7853 | 10.84131       | 2.79922    | 64.56   | 97.00   |
|          | CONTROL      | 15          | 69.5193 | 15.03216       | 3.88129    | 47.00   | 97.00   |
|          | Total        | 30          | 76.6523 | 14.78045       | 2.69853    | 47.00   | 97.00   |

*N= number of subjects, SD= standard deviation, SE= standard Error*

Table 6 shows that the pretest mean and standard deviation values on strength for experimental and control groups were  $73.5707 \pm 10.81562$  and  $68.3767 \pm 15.68313$  respectively. The posttest means and standard deviation for the experimental and control groups after eight weeks were  $83.7853 \pm 10.84131$  and  $69.5193 \pm 15.03216$  respectively

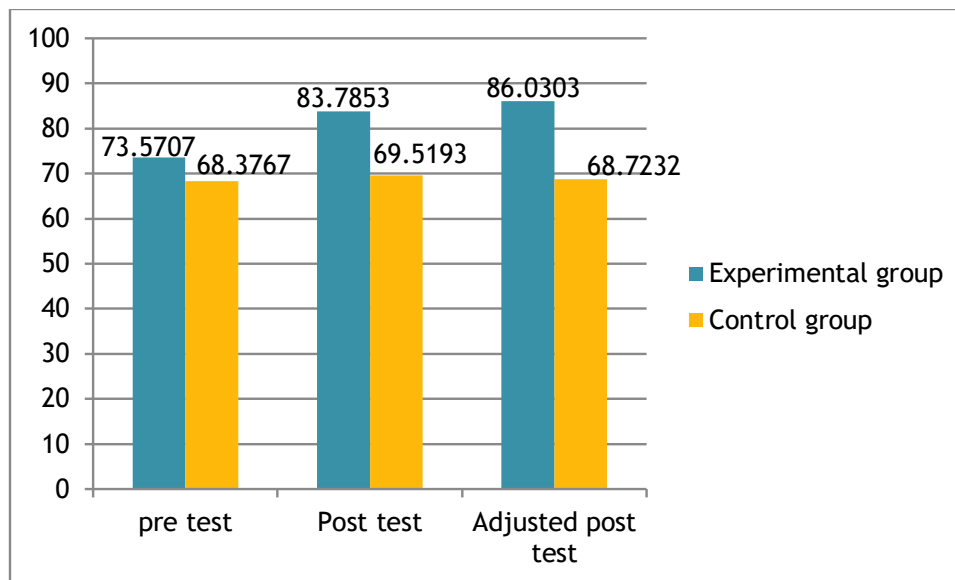
**Table 7. ANALYSIS OF COVARIANCE of the mean of experimental and Control group on strength**

| Means                   | Group         |              | SV     | SSM       | DF | Mean square | F – Ratio | Sig. |
|-------------------------|---------------|--------------|--------|-----------|----|-------------|-----------|------|
|                         | Experi mental | Control      |        |           |    |             |           |      |
| Pre test Mean           | 73.5707       | 68.3767      | Among  | 202.332   | 1  | 202.332     | 1.115     | .300 |
| SD                      | 10.8156<br>2  | 15.6831<br>3 | Within | 5081.135  | 28 | 181.469     |           |      |
| Post test Mean          | 83.7853       | 69.5193      | Among  | 1526.391  | 1  | 1526.391    | 8.887     | .006 |
| SD                      | 10.8413<br>1  | 15.0321<br>6 | Within | 4808.999  | 28 | 171.750     |           |      |
| Adjusted Post-test mean | 86.0303       | 68.7232      | Among  | 26668.044 | 1  | 26668.044   | 8.942     | .006 |
|                         |               |              | Within | 83506.057 | 28 | 2982.359    |           |      |

***SSM = Sum square mean, MS= Mean square, DF= Degree of freedom, Sig. = significance  
F=Ratio needed for significance at 0.05 level of significance = DF (1, 28) =5.11***

Table 7 shows that the obtained F-ratio test applied to the pre-test mean value was 1.115 which is less than the table value of 5.11 for df 1 and 28 (0.300 is greater than 0.05) required for significance at 0.05 level. Therefore, it was insignificant at 0.05 levels. This proved that there was no significant difference in pretest means of strength between the groups. The post-test obtained means F-ratio was 8.887 which was above the table value of 5.11 (0.006 is less than 0.05) .This indicates that there was significant difference in posttest means. The adjusted posttest mean F-ratio value was 8.942, which is greater than table value of 5.11 for df 1 and 28 (0.006 is less than 0.05) required for significance at 0.05 level.

Thus, the mean change for strength between experimental and control groups showed statistically significant difference. Therefore, Based on this, the researcher accepted the H1.1 and rejected Ho.1 at 0.05 level of confidence because of the findings of 8 week Plyometric training has effect on strength performance of male football project Players.



**Figure 6. Graph presentation of mean comparison on percent of strength between Experimental and Control group**

**Table 8. Descriptive analysis of speed mean scores between Experimental and Control Groups**

**Descriptive**

| Test     | Group        | N  | Mean   | Std. Deviation | Std. Error | Minimum | Maximum |
|----------|--------------|----|--------|----------------|------------|---------|---------|
| PRETEST  | EXPERIMENTAL | 15 | 4.3007 | .62947         | .16253     | 3.15    | 5.10    |
|          | CONTROL      | 15 | 4.3167 | .44548         | .11502     | 3.80    | 5.10    |
|          | Total        | 30 | 4.3087 | .53587         | .09784     | 3.15    | 5.10    |
| POSTTEST | EXPERIMENTAL | 15 | 3.4140 | .38157         | .09852     | 2.89    | 3.90    |
|          | CONTROL      | 15 | 4.6333 | .59841         | .15451     | 4.00    | 6.20    |
|          | Total        | 30 | 4.0237 | .79226         | .14465     | 2.89    | 6.20    |

*N= number of subjects, SD= standard deviation, SE= standard Error*

Table 8 shows that the pretest mean and standard deviation values Speed for experimental and control groups were  $4.3007 \pm .62947$  and  $4.3167 \pm .44548$  respectively. The posttest

means and standard deviation for the experimental and control groups after Eight weeks were  $.44548 \pm .38157$  and  $4.6333 \pm .79226$  respectively

**Table 9. ANCOVA of the mean of Experimental and Control group on speed**

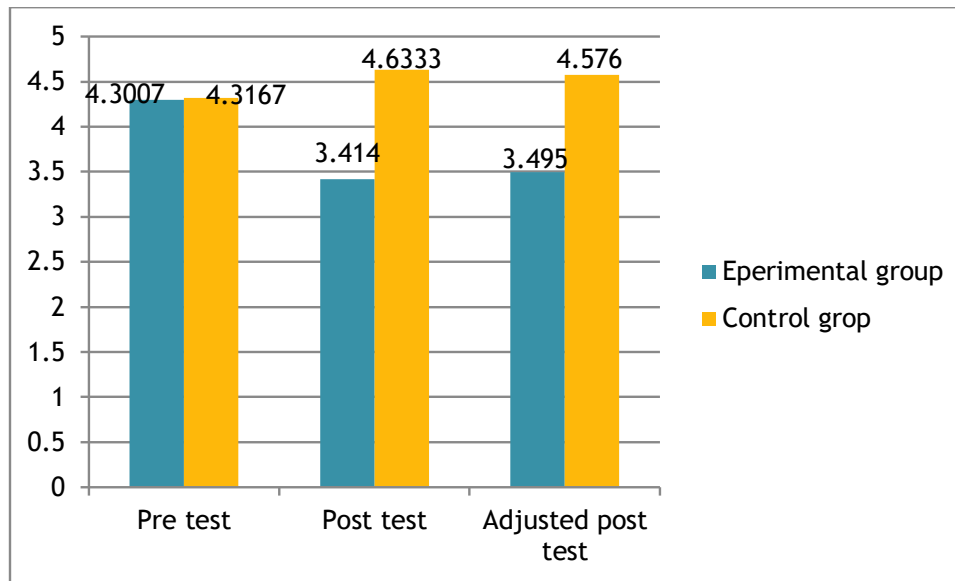
| Means                   | Group        |         | SV      | SSM     | DF | Mean square | F Ratio | Sig. |
|-------------------------|--------------|---------|---------|---------|----|-------------|---------|------|
|                         | Experimental | Control |         |         |    |             |         |      |
| Pre test Mean           | 4.3007       | 4.3167  | Among   | .002    | 1  | .002        | .006    | .937 |
| SD                      | .62947       | .44548  | With in | 8.326   | 28 | .297        |         |      |
| Post test Mean          | 3.4140       | 4.6333  | Among   | 11.151  | 1  | 11.151      | 44.276  | .000 |
| SD                      | .38157       | .59841  | With in | 7.052   | 28 | .252        |         |      |
| Adjusted Post-test mean | 3.495        | 4.576   | Among   | 104.005 | 1  | 104.005     | 26.680  | .000 |
|                         |              |         | With in | 109.149 | 28 | 3.898       |         |      |

**SSM = Sum square mean, MS= Mean square, DF= Degree of freedom, Sig. = significance**

**\* Significant at 0.05 level of significance**

**F=Ratio needed for significance at 0.05 level of significance = DF (1, 28) =4.19**

It is evident from table 9 that the obtained F-ratio test applied to the pre-test mean value was .006, which is less than the table value of 4.19 for df 1 and 28 (0.937 is greater than 0.05) required for significance at 0.05 level. Therefore, it was insignificant at 0.05 levels. This proved that there was no significant difference in pretest means of speed between the groups. The post-test obtained means F-ratio was 44.276, which was above the table value of 4.1911 (0.000 is less than 0.05). This indicates that there was significant difference in posttest means. The adjusted posttest mean F-ratio value was 26.680, which is greater than table value of 4.19 for df 1 and 28 (0.000 is less than 0.05) required for significance at 0.05 level. Thus, the mean change for speed between experimental and control groups showed statistically significant difference. Therefore, Based on this, the researcher accepted the H1.2 and rejected Ho.2 at 0.05 level of confidence because of the findings of 8 week Plyometric training has effect on Speed performance of male football project Players.



**Figure 7. Graph presentation of mean comparison on percent of speed between Experimental and Control group**

**Table 10. Descriptive analysis of power means scores between Experimental and Control group**

| Descriptive |              |    |         |                   |               |         |         |
|-------------|--------------|----|---------|-------------------|---------------|---------|---------|
| Test        | Group        | N  | Mean    | Std.<br>Deviation | Std.<br>Error | Minimum | Maximum |
| PRE<br>TEST | EXPERIMENTAL | 15 | 28.9880 | 5.07490           | 1.31033       | 20.00   | 36.20   |
|             | CONTROL      | 15 | 29.4660 | 4.95153           | 1.27848       | 22.00   | 37.00   |
|             | Total        | 30 | 29.2270 | 4.93239           | .90053        | 20.00   | 37.00   |
| POSTTEST    | EXPERIMENTAL | 15 | 40.4840 | 6.76647           | 1.74710       | 32.33   | 52.44   |
|             | CONTROL      | 15 | 28.5800 | 4.91892           | 1.27006       | 21.34   | 36.02   |
|             | Total        | 30 | 34.5320 | 8.39237           | 1.53223       | 21.34   | 52.44   |

*N= number of subjects, SD= standard deviation, SE= standard Error*

Table 10 shows that the pretest mean and standard deviation values power for experimental and control groups were  $28.9880 \pm 5.07490$  and  $29.4660 \pm 4.95153$  respectively. The posttest means and standard deviation for the experimental and control groups after Eight weeks were  $40.4840 \pm 6.76647$  and  $28.5800 \pm 4.91892$  respectively.

**Table 11. ANCOVA of the mean of Experimental and Control group on power**

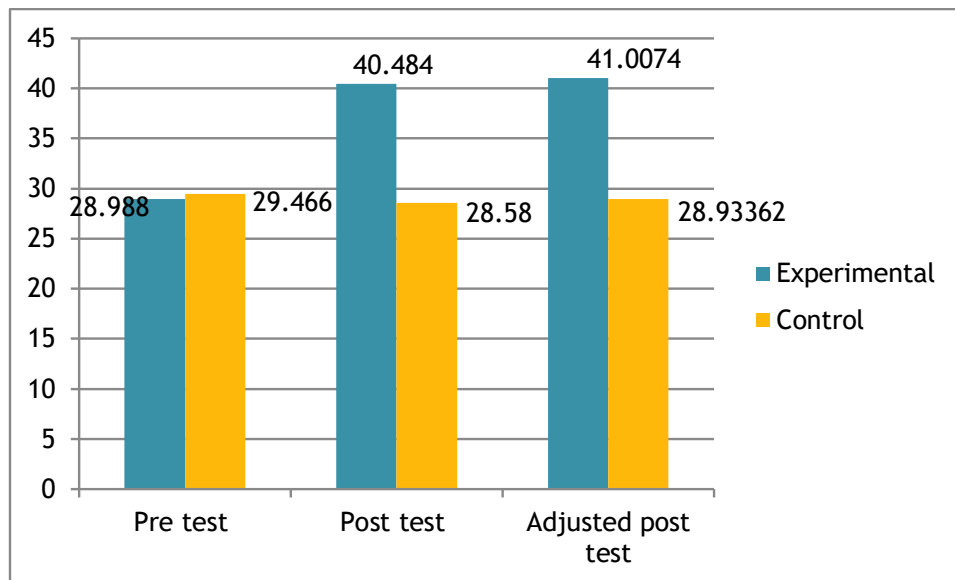
| Means                   | Group        |         | SV      | SSM      | DF | Mean square | F – Ratio | Sig. |
|-------------------------|--------------|---------|---------|----------|----|-------------|-----------|------|
|                         | Experimental | Control |         |          |    |             |           |      |
| Pre test Mean           | 28.9880      | 29.4660 | Among   | 1.714    | 1  | 1.714       | .068      | .796 |
| SD                      | 5.07490      | 4.95153 | With in | 703.812  | 28 | 25.136      |           |      |
| Post test Mean          | 40.4840      | 28.5800 | Among   | 1062.789 | 1  | 1062.789    | 30.374    | .000 |
| SD                      | 6.7664       | 4.91892 | With in | 979.733  | 28 | 34.990      |           |      |
| Adjusted Post-test mean | 41.0074      | 28.9362 | Among   | 1062.789 | 1  | 1062.789    | 30.374    | .000 |
|                         |              |         | With in | 979.733  | 28 | 34.990      |           |      |

***SSM = Sum square mean, MS= Mean square, DF= Degree of freedom, Sig. = significance***

***\* Significant at 0.05 level of significance***

***F=Ratio needed for significance at 0.05 level of significance = DF (1, 28) =4.19***

Table 11 indicated that F-ratio test applied to the pre-test mean value was .068, which is less than the table value of 4.19 for Df 1 and 28 (.796 is greater than 0.05) required for significance at 0.05 level. Therefore, it was insignificant at 0.05 levels. This proved that there was no significant difference in pretest means of power between the groups. The post-test obtained means F-ratio was 30.374, which was above the table value of 4.19 (0.000 is less than 0.05). This indicates that there was significant difference in posttest means. The adjusted posttest mean F-ratio value was 30.374, which is greater than table value of 4.19 for df 1 and 28 (0.000 is less than 0.05) required for significance at 0.05 level. Thus, the mean change for power between experimental and control groups showed statistically significant difference. Therefore, Based on this, the researcher accepted the H1.3 and rejected Ho.3 at 0.05 level of confidence because of the findings of 8 week Plyometric training has effect on power performance of male football project Players.



**Figure 8. Graph presentation of mean comparison on percent of power between Experimental and Control group**

### 4.3 DISCUSSION

The study has designed to explore the effect of Plyometric training on strength, speed and power in case of U-17 male football project players of Mattu city. During the study, the participants were actively participated in every activity from pretest to posttest measurements in addition to general warming up workouts before pre and posttests in the study. Especially, Plyometric training trainees were seriously followed the intervention of 8-week training program. On the other hand, the control group was not participated in any Plyometric training up to the end of the study. However, the participants of the study were train normal or common football training given for both experimental and control group by their coach. Finally, the researcher took the pre and posttest measurement. The study shows significant improvements through the intervention of 8-week Plyometric exercise training programs as follows.

Based on the result of 8-week Plyometric training had significant effect on some selected physical fitness variables such as strength, speed and power between pre and posttests results

through the intervention of 8 weeks Plyometric exercise training. The difference that existed during an analysis of the study shows performance improvement in fitness variables.

Based on the result in the study, mean posttest results score of the Wall sit test after giving continuous training with selected exercise for experimental group was greater than for control group. The mean value for experimental group was 83.7853cm and 68.7232cm for control group. The mean value difference was increased 17.3071cm. The calculated "p" value was 0.006, which was less than 0.05 p value ( $p < 0.05$ ). This implies that Plyometric training was beneficial modality to enhance the fitness of strength. They increase the duration of wall sit test. Therefore, Based on this, the researcher accepted the H1.1 and rejected Ho.1 at 0.05 level of confidence because of the findings.

The finding of this study has supported by the study of (Adigüzel, N. S., & Günay, M, (2016)) that pointed out that Plyometric exercises, has significant improvements on lower body strength of athletes in all area of sport. In addition, Sharkey (1986) has stated that Plyometric training has positive effect on lower body and leg muscles strength of athletes to generate force and carry out energy to execute football skills.

Based on the result in the study, mean posttest results score of the 30-meter sprint run test after giving continuous training with selected exercise for experimental group was less than for control group. The mean value for experimental group was 3.495 s and 4.576 s for control group. The mean value difference was decreased -1.081s. The calculated "p" value was 0.000, which was less than the 0.05 p value ( $p < 0.05$ ). This implies that Plyometric training is a beneficial modality to enhance the fitness of speed. Therefore, there was a reduction of the time by sprint run test from speed. The result has supported by (Faigenbaum et al., 2007; Meylen & Malatesta, 2009; Sedano Campo et al., 2011).

This also describes that there was a substantial difference in speed between the pre-tests and post-tests in Experimental group. Therefore, the results suggest that following Plyometric training for three days per week intervention improves speed. According to (Abrham Abebe Ferede, July - Aug 2020) noted that sprint performance was improved after 8 weeks Plyometric training in young soccer players. This research finding are also supported with the finding of (Hermassi, ET. al., (2014) examine the results of eight weeks short in-season Plyometric program on continual sprint ability leg power, and jump performance of elite football player. So, Plyometric training of three days per week of 8-week improved the Speed

of the players. Therefore, Based on this result the researcher accepted the H1.2 and rejected Ho.2 at 0.05 level of confidence because of the findings.

Based on the result in the study, mean posttest results score of the Vertical jump test after giving continuous training with selected exercise for experimental group was greater than for control group. The mean value for experimental group was 41.0074cm and 28.9362cm for control group. The mean value difference was increased 12.0712cm. The calculated "p" value was 0.000, which was less than the 0.05 p value ( $p < 0.05$ ). Therefore, Based on this, the researcher accepted the H1.3 and rejected Ho.3 at 0.05 level of confidence because of the findings. This implies that Plyometric training is a beneficial modality to enhance the fitness of power. An experimental study conducted on the effects of Plyometric and resisted jump training on power of young athletes showed the greatest amount of change in vertical jump. The result of this study supported by Lehnert, M.(2009).

In addition, this study was supported by the study of (Ioannides, C., Apostolidis, A., Hadjicharalambous, 2020) reported that after a Plyometric training explosive leg power improved. Again, Plyometric training also significantly improved the explosive jumping ability of the players. An experimental study conducted on the effects of Plyometric and resisted jump training on speed and explosive power of young athletes showed the greatest amount of change in vertical jump ( (Mesfin Mengesh, 2015) ). So, the result of the study were supported and Plyometric training of three days per week of 8-week improved the power of the players.

The finding of the present study is similar to different scholars' findings. For instance, Aykora and donmez (2017) reported that there was a statistically significant difference in the mean values of vertical and initial test measurements ( $1.66 \pm 0.88$  cm) in Plyometric exercise. Similarly, Mine *et al.*(2020) on their six-week Plyometric intervention on 16-22 age group female volleyball players, vertical jump values are higher than the initial values cognizant of this, Plyometric exercises may have a positive effect on the jump performance. Likewise, Pancar et al. (2018) reported that the 8-week Plyometric training program applied in addition to handball training was significant in favor of the posttest ( $29.71 \pm 3.58$  cm) in the vertical jump performance of female handball players in the 12-14 age group ( $p < 0.05$ ). Gul et al. (2017), also by Plyometric training, which they applied to basketball players for 8 weeks, has seen as effective on the vertical and horizontal jump.

## **CHAPTER FIVE**

### **5. SUMMARY, CONCLUSION AND RECOMMENDATION**

#### **5.1. SUMMARY**

The purpose of the study was to explore the effects of 8-weeks Plyometric training on some selected physical fitness variables of U-17 male football project players of Mattu city, Oromia Region, Ilu Aba Bor zone, Ethiopia. In this study, all possible efforts were made to get the most credible answers to the hypothesis by collecting relevant information through player's pre and posttest. More specifically, to attain the general objective of the study, the following specific objectives were stated.

- A. To evaluate the effect of 8-weeks Plyometric training on the performance of strength male football project players.
- B. To diagnoses the effect of 8-weeks Plyometric training on the speed performance of male football project players.
- C. To identify the effect of 8-weeks Plyometric training on the power performance of male football project players.

Based on the specific objectives the hypotheses were formulate and tested. Thirty male players were participated in U-17 football project of Mattu city. The study employed true experimental research design. Pre-test and post-test has taken before and after training to get the required data for the study. All of the players took a series assessment such as Wall-sit test for lower body strength, 30-Meter Sprint run Test for speed and vertical jump test for power.

The Participant has allocated to Experimental and Control Group used to census method and simple random sampling technique. The exercise program has designed to 15 experimental groups for 8- weeks, three times per week, each session lasting in 60-minutes duration at varying intensities (low, moderate and high) intensity. Each session has warming up, main part (Plyometric training) and cooling down phase. ANCOVA was employ to analyze the collected data by SPSS version 23 and level of significance was set at  $P < 0.05$ .

The following findings were investigated from the results of EG and CG. After analyzing the pre and post-test results of each variable of the study, the following major findings has investigated.

As presented in chapter four there was significant difference and gradual decrement between Experimental and Control group.

- ✚ The result of this study indicated that Plyometric training has a significant effect on Strength of players on EG. However, there was no significant improvement made in Strength on the CG.
- ✚ The finding of this study shows that there was a significant improvement in speed of male U-17 football players on EG. However, there was no significant improvement made in speed on the CG.
- ✚ The finding of this study indicated that there was a significant improvement in lower body Power of male U-17 football players on EG. However, there was no significant improvement made in power on the CG.

## 5.2. CONCLUSIONS

This study has shown significant improvement in selected Plyometric training variables during training periods in posttest as conclusion:

- ✚ The finding of study revealed that, eight weeks Plyometric training program brought significant improvement on U-17 male football players of Mattu city to build lower body strength and endurance performance measured by Wall sit test
- ✚ The result of the study shows that, eight weeks of Plyometric training has a significant improvement of speed on U-17 male football project players of Mattu city by reducing the time to cover the distance as measured by 30m sprint run.
- ✚ The finding of the study indicated that, eight weeks of Plyometric training has a significantly improvement of power on U-17 male football project players of Mattu city by increased lower body power or reflected in a higher jump.
- ✚ Generally, In a 8 -weeks Plyometric training intervention, substantial changes in some selected physical fitness variable characteristics such as strength, speed and power were observed on the U-17 male football project players of Mattu city.

### 5.3. RECOMMENDATION

Based on the major findings and conclusions of the study, it is important to state the following points as a recommendation.

The present investigation indicates that Plyometric training used to strength, Power and Speed had a substantial impact on several parameters important to Football performance. Furthermore, the data suggest that such an intervention was implemented within the training schedule without negatively affecting other aspects of performance.

- ✚ The finding of the study shows that, eight weeks Plyometric training program brought significant improvement on strength of U-17 male football players of Mattu city to build lower body strength and endurance performance measured by Wall sit test. Therefore, the researcher recommends that the Plyometric training program should be used as a part of physical preparation of football players and it is necessary to raise the awareness of the trainers with the importance of Plyometric training in the direction of the skill, because of their significant influence on raising the level of the player physically and skillfully.
- ✚ The result of the study showed that, eight weeks of Plyometric training has a significant improvement on speed of U-17 male football project players of Mattu city by reducing the time to cover the distance in a short period as measured by 30m sprint run. The researcher recommends that sport professionals and related fields to guide and educate on the importance and value of Plyometric training programs to achieve physical fitness and physiological variable performance.
- ✚ The finding of the study shows that, eight weeks of Plyometric training has a significant improvement on power of U-17 male football project players of Mattu city by increase lower body power or reflected in a higher jump. The researcher recommended to football players, coaches and technical committees for improving fitness qualities and skilled performances.
- ✚ Generally, the researcher recommends that, Coaches, personal trainers, technical committees and administrators should be required to incorporate Plyometric exercise into their regular schedule. Further studies should be conducted in the same area on different samples in terms of age, groups, sex and training experience. Moreover, this research was

use as an input and experiment of research results if choosing similar problems as the object of research.

✚ In addition, this study has conducted on strength, power and speed only. Therefore, the researcher recommended other researchers to evaluate the effects of this training method on other physical fitness variable elements.

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## APPENDIX-A

### WALLAGA UNIVERSITY

#### SCHOOL OF POSTGRADUATE STUDIES

##### I. Information record system

Dear respondents the main objective of these questionnaires is to collect relevant information about exploring the effects of 8-weeks Plyometric training on some selected physical fitness variables of U-17 male football project players. So your cooperation has a great contribution for the successes of the study, I would like to say thank you in advance for your collaboration,

##### Player's information

- |                      |                           |
|----------------------|---------------------------|
| 1. Name_____         | 4. Chronological age_____ |
| 2. Training age_____ | 5. Sex_____               |
| 3. Address_____      | 6. Phone number_____      |

##### **PART II. Personal health status Physical Readiness Questionnaires**

This questionnaire is design to obtain information on the health status and physical health statues readiness of the subjects participating for the research study. The information has kept strictly confidential.

**INSTRUCTION:** - Please read the following questions carefully and indicate your correct responses to each question by circling it: -

1. Are you taking any prescription medicines recently? A. Yes B. No
2. If your answer is yes, write the drug Dosage \_\_\_\_\_
3. Do you have a recent physical injury such as bone, muscle and joint, which will be aggravate by physical exercise? A. Yes B. No
4. If your answer is yes, indicate the type of injury that you have\_\_\_\_\_
5. Do you have suffered with heart condition? A. Yes B. No
6. Do you have upper or lower back pain, which has been serious by exercise?  
A. Yes B. No
7. Have you ever felt pain in your chest when you do physical exercise? A. Yes B. No
8. Have you ever suffered from shortness of breath at rest or during exercise?  
A. Yes B. No

As per the questions, I have read and understand clearly the form and have given accurate information in regard to my health status with my signature indicated below.

Name\_\_\_\_\_ signature \_\_\_\_\_Date \_\_\_\_\_

## APPENDIX - B

### WALLAGA UNIVERSITY

#### SCHOOL OF POSTGRADUATE STUDIES

**Table 12. Profile of the study participants of Experimental and Control group**

**profile of the study participants of Experimental group**

| <b>N<sub>o</sub></b> | <b>Name of Participants of Experimental group</b> | <b>Sex</b> | <b>Age</b> | <b>Weight(kg)</b> | <b>Height(cm)</b> |
|----------------------|---------------------------------------------------|------------|------------|-------------------|-------------------|
| 1.                   | Experimental                                      | Male       | 16         | 41                | 1.52              |
| 2.                   | Experimental                                      | Male       | 16         | 58                | 1.55              |
| 3.                   | Experimental                                      | Male       | 16         | 48                | 1.60              |
| 4.                   | Experimental                                      | Male       | 16         | 58                | 1.54              |
| 5.                   | Experimental                                      | Male       | 17         | 60                | 1.62              |
| 6.                   | Experimental                                      | Male       | 16         | 45                | 1.50              |
| 7.                   | Experimental                                      | Male       | 15         | 53                | 1.52              |
| 8.                   | Experimental                                      | Male       | 15         | 49                | 1.56              |
| 9.                   | Experimental                                      | Male       | 15         | 51                | 1.58              |
| 10                   | Experimental                                      | Male       | 15         | 53                | 1.55              |
| 11                   | Experimental                                      | Male       | 15         | 58                | 1.57              |
| 12                   | Experimental                                      | Male       | 16         | 42                | 1.50              |
| 13                   | Experimental                                      | Male       | 17         | 60                | 1.65              |
| 14                   | Experimental                                      | Male       | 16         | 48                | 1.60              |
| 15                   | Experimental                                      | Male       | 16         | 45                | 1.53              |

### Profile of the study participants of Control group

| <b>No</b> | <b>Name of Participants of<br/>Control group</b> | <b>Sex</b> | <b>Age</b> | <b>Weight(kg)</b> | <b>Height(cm)</b> |
|-----------|--------------------------------------------------|------------|------------|-------------------|-------------------|
| 1.        | Control                                          | Male       | 16         | 44                | 1.48              |
| 2.        | Control                                          | Male       | 16         | 50                | 1.54              |
| 3.        | Control                                          | Male       | 15         | 53                | 1.58              |
| 4.        | Control                                          | Male       | 16         | 52                | 1.50              |
| 5.        | Control                                          | Male       | 15         | 50                | 1.59              |
| 6.        | Control                                          | Male       | 16         | 54                | 1.63              |
| 7.        | Control                                          | Male       | 15         | 53                | 1.62              |
| 8.        | Control                                          | Male       | 17         | 54                | 1.60              |
| 9.        | Control                                          | Male       | 15         | 48                | 1.51              |
| 10.       | Control                                          | Male       | 15         | 52                | 1.57              |
| 11.       | Control                                          | Male       | 15         | 49                | 1.54              |
| 12.       | Control                                          | Male       | 16         | 54                | 1.60              |
| 13.       | Control                                          | Male       | 15         | 52                | 1.58              |
| 14.       | Control                                          | Male       | 17         | 56                | 1.65              |
| 15.       | Control                                          | Male       | 15         | 54                | 1.53              |

**Table 13. Pre and posttest of Wall sit test, 30m sprint run test and Vertical Jump of experimental group**

| No | Name of EG | Test scores of Experimental group participants |       |                           |      |                         |       |
|----|------------|------------------------------------------------|-------|---------------------------|------|-------------------------|-------|
|    |            | wall sit (sec.)                                |       | 30m sprint run test(sec.) |      | Vertical jump test(cm.) |       |
|    |            | Pre                                            | Post  | pre                       | Post | pre                     | Post  |
| 1  | A          | 78.53                                          | 79.00 | 3.50                      | 3.40 | 33.40                   | 34.00 |
| 2  | B          | 68.45                                          | 71.50 | 3.60                      | 3.00 | 20.00                   | 33.50 |
| 3  | C          | 54.34                                          | 64.56 | 4.70                      | 2.89 | 25.00                   | 36.12 |
| 4  | D          | 70.23                                          | 91.00 | 4.90                      | 3.75 | 28.00                   | 51.18 |
| 5  | E          | 65.55                                          | 76.23 | 4.90                      | 3.00 | 30.00                   | 41.25 |
| 6  | F          | 74.32                                          | 95.00 | 5.00                      | 3.00 | 35.00                   | 46.00 |
| 7  | G          | 80.00                                          | 91.30 | 4.80                      | 3.10 | 36.20                   | 42.31 |
| 8  | H          | 85.12                                          | 97.00 | 5.10                      | 3.70 | 26.25                   | 46.32 |
| 9  | I          | 56.32                                          | 67.32 | 4.10                      | 3.90 | 32.18                   | 42.42 |
| 10 | J          | 70.50                                          | 91.00 | 4.40                      | 3.71 | 22.12                   | 32.47 |
| 11 | K          | 80.00                                          | 83.00 | 4.60                      | 3.41 | 22.16                   | 32.44 |
| 12 | L          | 70.40                                          | 75.41 | 4.30                      | 3.85 | 34.10                   | 42.38 |
| 13 | M          | 84.34                                          | 94.00 | 3.88                      | 3.90 | 32.11                   | 32.33 |
| 14 | N          | 70.00                                          | 85.00 | 3.58                      | 3.60 | 27.30                   | 52.44 |
| 15 | O          | 95.46                                          | 95.46 | 3.15                      | 3.00 | 31.00                   | 42.10 |

**Table 14. Pre and posttest of wall sit, 30m sprint run, vertical jump, 1.5-mile run and body composition test of Control group**

| No  | Name of CG | Test score participants of control group |       |                           |      |                         |       |
|-----|------------|------------------------------------------|-------|---------------------------|------|-------------------------|-------|
|     |            | wall sit (sec.)                          |       | 30m sprint run test(sec.) |      | Vertical jump test(cm.) |       |
|     |            | Pre                                      | Post  | Pre                       | Post | Pre                     | Post  |
| 1.  | A          | 79.50                                    | 80.30 | 4.00                      | 6.20 | 25.00                   | 24.05 |
| 2.  | B          | 54.25                                    | 54.60 | 3.90                      | 5.60 | 35.10                   | 28.05 |
| 3.  | C          | 96.00                                    | 97.00 | 4.00                      | 4.10 | 23.00                   | 21.34 |
| 4.  | D          | 60.40                                    | 63.60 | 5.10                      | 4.80 | 28.00                   | 29.00 |
| 5.  | E          | 58.67                                    | 70.00 | 3.80                      | 4.20 | 34.00                   | 33.23 |
| 6.  | F          | 69.49                                    | 70.60 | 3.90                      | 4.40 | 37.00                   | 36.02 |
| 7.  | G          | 81.20                                    | 80.23 | 4.60                      | 4.40 | 24.00                   | 22.00 |
| 8.  | H          | 58.10                                    | 58.30 | 4.70                      | 4.20 | 29.00                   | 29.02 |
| 9.  | I          | 92.34                                    | 90.50 | 4.90                      | 5.00 | 22.00                   | 22.00 |
| 10. | J          | 61.90                                    | 62.99 | 4.20                      | 4.60 | 25.50                   | 25.56 |
| 11. | K          | 48.10                                    | 47.00 | 4.00                      | 4.60 | 31.00                   | 31.01 |
| 12. | L          | 90.60                                    | 89.50 | 4.10                      | 4.60 | 27.35                   | 27.37 |
| 13. | M          | 59.20                                    | 62.67 | 3.95                      | 4.70 | 36.00                   | 35.00 |
| 14. | N          | 50.70                                    | 51.45 | 4.70                      | 4.00 | 32.00                   | 30.00 |
| 15. | O          | 65.20                                    | 64.05 | 4.90                      | 4.10 | 33.04                   | 35.05 |

## **APPENDIX- C**

### **WALLAGA UNIVERSITY**

#### **SCHOOL OF POSTGRADUATE STUDIES**

##### **Consent Form of Subjects**

**Researcher:** Dagim Tasfaye Nagari

**Advisors:** Mr. Idosa Jabessa (Ass pro)

**Thesis Title:** Exploring the effects of 8-weeks Plyometric training on some selected physical fitness variables of U-17 male football project players in Mattu city Oromia Regional State, Ethiopia.

##### **Purpose of the study**

The purpose of this study is to Explore the effects of 8-weeks Plyometric training on some selected physical fitness variables of U-17 male football project players in Mattu city .

##### **Procedure and duration**

The research study has administered by the regulations of research ethics on human beings. The researcher was explain in detail about the purpose of the project, the procedures were used, the potential benefits and the possible risks of participation in this study. You can ask the researcher any question that you have about the study, and you will expect to receive satisfactory answers regarding your question. If you agree to participate in this study, please sign these form freely without any external influence. The study will undergo for 2 months with 3 days per week and maximum 1 hour of duration per day. You can resign at any time from the study if you want without precondition. A basic explanation of the project has summarized below.

##### **Risks and the Safeguards:**

The risks of this research study are small. While administering the tests and during training session you may experience localized muscle fatigue in your muscles. You might feel some muscle soreness and fatigue during and after the session of the exercise training. Since the environment of the study and equipment for the training are standardized. The risk and injury have a possibility to minimize within appropriate sequence of training principle. So, we do not expect any unusual risks as a direct result of this study .If any unexpected physical

injuries occurs, appropriate first aids were provided and financial compensations for medical cost will be given only during the ongoing process of the study.

**Confidentiality:**

The information obtained about you has kept in confidence, and although it is free to release to your own physician. The information has used only for scientific purpose without identifying you as an individual.

**Rights:**

Participation for this study is full voluntary. You have the right to declare to participate or not in this study. If you decide to resign, you have the right to withdraw from the study at any time and this was not labeling you for any loss of benefit, which you otherwise are entitled.

Contacts address: If there is any question or inquires any time about the study or the procedures, please contact:

**Researcher:** Dagim Tasfaye Nagari at +251928663571

**E-mail:** dagimtasfaye8@gmail.com

If you have any questions on your rights as a research subject, you can call the Institutional Research Ethics Review Committee (IRERC) wallagaUniversity.

**APPENDIX -D**  
**WALLAGA UNIVERSITY**  
**SCHOOL OF POSTGRADUATE STUDIES**

**Table 15. First and second Month schedule for Experimental group**

| Month | Weeks                | Time        | Type of Plyometric training | Set | Repetition | Recovery     | Intensity | Frequency | Duration |
|-------|----------------------|-------------|-----------------------------|-----|------------|--------------|-----------|-----------|----------|
|       | 1 <sup>st</sup> Week | 11:20-12:20 | Jumping rope                | 2   | 4          | 30s for each | Low       | 3day/week | 1hour    |
|       |                      |             | Squat jump                  | 2   | 4          |              |           |           |          |
|       |                      |             | Lateral jump                | 2   | 4          |              |           |           |          |
|       |                      |             | Single leg side to side hop | 2   | 4          |              |           |           |          |
|       |                      |             | Double leg vertical jump    | 2   |            |              |           |           |          |
|       |                      |             | Two foot ankle hops         | 2   | 4          |              |           |           |          |
|       |                      |             | Sprint run                  | 2   | 4          |              |           |           |          |
|       | 2 <sup>nd</sup> week | 11:20-12:20 | Side to side jump           | 3   | 5          | 30s for each | Moderate  | 3day/week | 1hour    |
|       |                      |             | Lateral jump                | 3   | 5          |              |           |           |          |
|       |                      |             | Box jump                    | 3   | 5          |              |           |           |          |
|       |                      |             | Forward skip                | 3   | 4          |              |           |           |          |
|       |                      |             | Side to side jump           | 3   | 5          |              |           |           |          |
|       |                      |             | One leg box jump            | 3   | 5          |              |           |           |          |
|       | 3 <sup>rd</sup> week | 11:20-12:20 | Bouncing run                | 4   | 4          | 30s for each |           | 3day/week | 1hour    |
|       |                      |             | Lateral jump                | 3   | 5          |              |           |           |          |
|       |                      |             | Sprint run                  | 4   | 6          |              |           |           |          |
|       |                      |             | Split jumps                 | 4   | 6          |              |           |           |          |
|       |                      |             | High jumps                  | 4   | 6          |              |           |           |          |
|       |                      |             | Power drop                  | 4   | 6          |              |           |           |          |
|       |                      |             | High skipping               | 4   | 6          |              |           |           |          |
|       | 4 <sup>th</sup> week | 11:20-12:20 | Squat jump                  | 5   | 6          | 60s for each | High      | 3day/week | 1hour    |
|       |                      |             | Lateral jump                | 4   | 6          |              |           |           |          |
|       |                      |             | side to side jumps          | 4   | 6          |              |           |           |          |
|       |                      |             | Standing jump and reach     | 5   | 6          |              |           |           |          |
|       |                      |             | Side shuffle                | 5   | 6          |              |           |           |          |
|       |                      |             | Sprint run                  | 5   | 6          |              |           |           |          |

| Month | Week                 | Time        | Type of Plyometric training         | set | Repetition | Recovery     | Intensity | Frequency | Duration |
|-------|----------------------|-------------|-------------------------------------|-----|------------|--------------|-----------|-----------|----------|
|       | 5 <sup>th</sup> Week | 11:20-12:20 | Lateral jump with one leg           | 2   | 5          | 30s for each | Moderate  | 3day/week | 1hour    |
|       |                      |             | Box jump                            | 2   | 5          |              |           |           |          |
|       |                      |             | Truck jump                          | 3   | 4          |              |           |           |          |
|       |                      |             | Truck jump                          | 4   | 4          |              |           |           |          |
|       |                      |             | Bouncing run                        | 3   | 4          |              |           |           |          |
|       |                      |             | High skipping                       | 4   | 3          |              |           |           |          |
|       | 6 <sup>th</sup> week | 11:20-12:20 | Diagonal cone hops                  | 3   | 5          | 30s for each | Moderate  | 3day/week | 1hour    |
|       |                      |             | Side to side jumps                  | 3   | 5          |              |           |           |          |
|       |                      |             | One leg box jump                    | 3   | 4          |              |           |           |          |
|       |                      |             | High knees                          | 3   | 5          |              |           |           |          |
|       |                      |             | Back shuffle                        | 4   | 5          |              |           |           |          |
|       |                      |             | Jumping jack                        | 3   | 5          |              |           |           |          |
|       | 7 <sup>th</sup> week | 11:20-12:20 | Lateral jump                        | 4   | 6          | 30s for each |           | 3day/week | 1hour    |
|       |                      |             | Sprint run                          | 4   | 6          |              |           |           |          |
|       |                      |             | Squat jump                          | 4   | 6          |              |           |           |          |
|       |                      |             | Front shuffle                       | 3   | 4          |              |           |           |          |
|       |                      |             | High knees                          | 3   | 7          |              |           |           |          |
|       |                      |             | One leg box jumps                   | 4   | 7          |              |           |           |          |
|       | 8 <sup>th</sup> week | 11:20-12:20 | High skipping                       | 5   | 7          | 60s for each | High      | 3day/week | 1hour    |
|       |                      |             | Diagonal cone hops                  | 4   | 8          |              |           |           |          |
|       |                      |             | Single leg                          | 3   | 8          |              |           |           |          |
|       |                      |             | Jumping jack                        | 4   | 6          |              |           |           |          |
|       |                      |             | Jump and reach with keeping balance | 4   | 6          |              |           |           |          |
|       |                      |             | High knees                          | 5   | 7          |              |           |           |          |
|       |                      |             | Sprint run                          | 4   | 7          |              |           |           |          |

| Name            | PLYOMETRIC TRAINING PLAN             |                                                                                                                                                                                                                  |      |                                                        |                                        |                             |        |
|-----------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------------------------------------|----------------------------------------|-----------------------------|--------|
| Month 1 Up to 2 | First and Second Month Training Plan |                                                                                                                                                                                                                  |      |                                                        |                                        |                             |        |
| 8 Weeks         | Principle of training                | Types of activity performs                                                                                                                                                                                       | Time | Intensity                                              | Repetition                             | Rest                        | Remark |
|                 | Warming-up                           | <ul style="list-style-type: none"> <li>✓ Walking</li> <li>✓ Jogging</li> <li>✓ Slow running</li> <li>✓ Dynamic stretching</li> </ul>                                                                             | 10m  | Low                                                    | Depending on the intensity of exercise |                             |        |
|                 | Main part                            | Jumping rope<br>Squat jump<br>Sprint run<br>Single leg side to side hop<br>Double leg vertical jump<br>Two foot ankle hops<br>Jumping jack<br>High knees<br>Bouncing run<br>Lateral jump<br>box jump<br>Gym work | 40m  | Low, moderate, and high based on the training protocol |                                        | 30 second for each exercise |        |
|                 | Cooling down                         | <ul style="list-style-type: none"> <li>✓ Walking</li> <li>✓ Jogging</li> <li>✓ Slow running</li> <li>✓ Static stretching exercise</li> </ul>                                                                     | 10m  | Low                                                    |                                        |                             |        |
|                 |                                      |                                                                                                                                                                                                                  |      |                                                        |                                        |                             |        |



Source =Own survey 2025

**Figure 9. Some example of posttest from posttest of Experimental group**