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# Effect of Eight-Week Calisthenics Exercise On Some Selected Physical Fitness Quality and Skill Performance In Case of Bahir Dar University U -17 Female Handball Project Players

Belaynesh, Getnet

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**BAHIR DAR UNIVERSITY**

**SPORT ACADEMY**

**SPORTS SCIENCE DEPARTMENT**

**EFFECT OF EIGHT-WEEK CALISTHENICS EXERCISE ON SOME  
SELECTED PHYSICAL FITNESS QUALITY AND SKILL  
PERFORMANCE IN CASE OF BAHIR DAR UNIVERSITY U -17  
FEMALE HANDBALL PROJECT PLAYERS**

**BY: BELAYNESH GETNET**

**AUGUST 2022**

**BAHIR DAR ETHIOPIA**

**BAHIR DAR UNIVERSITY**

**SPORT ACADEMY**

**DEPARTMENT OF SPORT SCIENCE**

**Effect of Eight-Week Calisthenics Exercise on Some Selected Physical  
Fitness Quality and Skill Performance In Case Of Bahir Dar University**

**U -17 Female Handball Project Players**

**By**

**Belaynesh Getnet**

**A Thesis Submitted to The School of Graduate Studies Bahir Dar  
University Sport Academy in Partial Fulfillment of The Requirements  
For The Degree Of Masters of Science In Coaching Handball.**

**Advisor's Name: Sisay Adugna (Assistant professor)**

**AUGUST 2022**

**BAHIR DAR ETHIO**

## DECLARATION

This is to certify that the thesis entitled “**Effect of 8-Week Calisthenics Exercise on Some Selected Physical Fitness Quality and Skill Performance In Case Of Bahir Dar University U -17 Female Handball Project Players**”, submitted in partial fulfilment of the requirements for the degree of Master of Science in coaching handball of Department of sport science, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

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**APPROVAL OF THESIS FOR DEFENSE**

I hereby certify that I have supervised, read, and evaluated this thesis/dissertation titled “**effect of 8-week calisthenics exercise on some selected physical fitness quality and skill performance in case of Bahir Dar University u -17 female Handball project players**” by Belaynesh Getnet prepared under my guidance. I recommend the thesis be submitted for oral defense.

<b>Sisay Adugna (Assistant professor)</b>	..... ..	.....
Advisor’s name	Signature	Date
.....	.....	.....
Department Head	Signature	Date

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**APPROVAL OF THESIS FOR DEFENSE RESULT**

As members of the board of examiners, we examined this dissertation/thesis entitled “**Effect Of 8-Week Calisthenics Exercise on Some Selected Physical Fitness Quality and Skill Performance In Case of Bahir Dar University U -17 Female Handball Project Players**” By Belaynesh Getnet. We hereby certify that the thesis/dissertation is accepted for fulfilling the requirements for the award of the degree of “master of science in coaching Handball”.

**Board of Examiners**

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Name of Internal Examiner	Date	Signature
.....	.....	.....
Name of External Examiner	Date	Signature

## **DEDICATION**

I dedicate this thesis to God who made this possible. Secondly, I would like to dedicate this thesis to my family members. I am forever grateful for their continued support and words of encouragement at times when it seemed like there was no way forward

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## List of Abbreviations

**CO**=Control group

**EG**=Experimental group

**MD**=Main difference

**N**= Number

**POT**=Post test

**PT**=Pre test

**DF**=Degree of freedom

**SD**=Standard deviation

**SPSS**= Statistical Package for Social Sciences

## Abstract

*The objective of this study was to find out the effect of calisthenics exercise on some selected physical fitness qualities and skill performance at Bahir Dar University u-17 female Handball project players. The study applied a quantitative research approach and employs an experimental design to attain the intended objectives. For this study, the researcher has selected all 20 female Handball players who participate in the Bahir Dare University u-17 female Handball project. Were participated by using a comprehensive sampling technique and were randomly assigned into two equal groups, the Experimental group (N=10) and the Control group (N=10). During 8 week intervention, the experimental group formed calisthenics exercises for three days and each session lasted 60 minutes including warm-up and cool-down exercises. The control group participated in only a regular handball training program. The data were measured on passing accuracy, speed dribble, agility, and muscular strength on two occasions first before administration of calisthenics exercise as a pre-test and second after 8 weeks of the calisthenics exercise as a post-test. The data collected from the subject of the study were analyzed by using SPSS version 23 software by paired sample t-test and independent-sample t-test with a significance level of 0.05. The analyzed data showed that calisthenics exercise significantly improved passing accuracy, speed dribble, agility, and muscular strength in the pre-post test of EG at ( $p < 0.05$ ) But no significant differences were found in all of the variables in CG at ( $p > 0.05$ ). In addition, as it was assessed by the independent t-test the post-test passing accuracy, speed dribble, agility, and muscular strength in EG were significantly improved than the post-test result of CG ( $p < 0.05$ ). Based on this finding, it can be concluded that the eight-week calisthenics exercise helps to improve agility, muscular strength, passing accuracy, and speed dribble of u-17 female handball project players.*

**Key words:** Calisthenics exercise, Muscular strength, speed dribbling, passing accuracy, Agility



# CHAPTER ONE

## 1. INTRODUCTION

### 1.1 Background of the study

Handball is the most popular team sport in the world, and they involve a variety of distinct movements (Mohamed et al., 2009). Its success is determined by the effectiveness of individual players' actions as well as teamwork. The foundation of the training process is the proper assessment of both individual and team actions, which may lead to excellent teamwork. Handball is one of those team sports that draws a lot of attention and generates a lot of international enthusiasm, bringing people from all over the world together (Kamar, 2008). The modern handball game began in Scandinavia in the early nineteenth century, and its popularity has grown to over 19 million people (International Handball Federation, 2014). It has been an Olympic sport for men since 1972 and women since 1976.

Handball is an Olympic sport in which two teams of six court players and a goalkeeper compete against each other. Furthermore, it is a team sport defined by fast-paced defensive and attacking activities during the game, with the purpose of the game being to score goals. Running, jumping, pushing, changing directions, and particular movements such as passing, catching, dribbling, throwing, checking, and blocking need team handball players to coordinate their movements properly. Throughout the game, the intensity levels alternate between standing and walking, jogging and moderate running, sprinting and quick forward, sideward, and backward motions (Michalsik et al., 2012; Poval et al., 2012). Handball demands a high level of physical fitness for the game's essential motions, such as jumping, diving, blocking, running, sprinting, and throwing. Handball is a physically demanding Olympic body-contact sport (Tibebu & Tilahun, 2020). Handball becomes a quick, sophisticated, and dynamic team sport (Wagner et al., 2014). To be successful in handball players require a high level of physical fitness, technical, and tactical skills (Van den, 2004).

As a result, handball players should develop both health and skill-related physical fitness attributes and sports skills through various training programs. According to Srivastava R, (2013) Calisthenics exercises are one form of exercise consisting of a variety of simple, rhythmical, movements; intend to enhance a physical fitness component with movements such as bending, jumping, swinging, twisting, and kicking, by using one's body weight as resistance. Calisthenics when performed vigorously and with variety can benefit both muscular endurance and strength, in addition to improving psychomotor skills such as balance, agility, and coordination. Calisthenics exercise can be performed by people of all age groups and genders without risk of injury when performed properly.

The activation of various muscle groups can aid in the development of proprioception and coordination. As a result, calisthenics exercise is commonly employed in both rehabilitation and sports training. Calisthenic exercises are quick muscle contractions performed while moving with your body weight to improve body strength and flexibility. Many actions like flexion, jumping, shaking, and bending, for example, can influence every muscle group in the body, including the arms, legs, body, neck, and back. Due to their distinct central and peripheral effects, calisthenics exercises are discussed in the literature in various populations (Ozer Kaya et al., 2012).

Physical fitness is essential in a handball game because every player is expected to run regularly. Handball is a competitive sport and it needs good physical fitness (physical abilities) and skill performance. Athletes must have strong physical abilities to play good handball. Strength, agility, and flexibility are examples of physical fitness (Ministry of Health of the Republic of Indonesia in Nala: 2002). Skill-related physical fitness refers to an individual's athletic ability in sports like tennis and includes skill-related traits like agility; the health-related component is a measure of muscle strength and flexibility (Hopkins & Walker, 1988)

Passing accuracy is one of the basic technical skill performance elements of handball sport. It involves holding the ball with one or two hands and passing the ball accurately to a teammate.

Accurate passing to a teammate is important for success and results in handball during fast breaks or other attacking activities. Passing accuracy performance depends on the player's optimal coordination of his/her body to create the maximum velocity and accuracy. Hence, the player when she/he is ready for throwing has to use all body segments from ankle to wrist (Emel & Nilufer, 2014). According to Gorostiaga (2005), to increase the chances of scoring as fast as possible, the ball must go at the highest speed and aim at the target of a player.

Handball players have to dribble quickly so they can come out of the congested area and attempt the goal. An additional important variable that has a great influence to contribute to technical skill performance in handball is speed dribbling. Suresh et al. (2014) contended that speed dribbling is an important technique for handball players. It assists a handball player in moving with the ball towards the opponent's goal while maintaining control of the ball in the open area. In handball, speed dribbling is the skill of running as fast as possible while keeping the ball out in front, where it can be controlled closely by the dribbler. Throwing the ball and sprinting after it is not speed dribbling. Furthermore, when there is a clear free area, it is used offensively. It helps a player's movement with the ball in open spaces (Suresh et al., 2014).

Therefore, this study aimed to investigate the effect of calisthenics exercise on some selected physical fitness qualities and skill performance among Bahir Dar University u-17 female handball project players.

## **1.2 Statement of the problem**

Callisthenic is a type of exercise that consists of a variety of movements that are practically performed without the need for equipment or apparatus that use your body weight. It is designed to increase body flexibility and strength through movements such as swinging, twisting, jumping, kicking, or bending; uses only body weight for resistance (Srivastava R, 2016). There are many different variations such as different gymnastic movements, bounce exercises, push-ups, shuttle, pull-ups, lunge, plank, squat, set up, crunch, dips, plyjack, burpee, and mountain climber

There are studies in the literature that convey the positive effects of calisthenics exercises on flexibility (Colakoglu FF, 2008).

Among those researchers, (Santhosh & Davidson, 2021) (Santhosh, & Davidson, 2021); (SINGTHIN & Sriramatr, 2019) ;( Panther, & Rani, 2022); (E. Thomas et al. 2017) to improve the effect of calisthenics exercise has a positive effect on agility and muscular strength.

Krishnan and Arumugam (2013) Callisthenic exercise have a good effect on physical fitness. Therefore, when the researcher observes Bahir Dar university u-17 female handball project players in their regular training they have the problem of performance in physical fitness, passing accuracy, and speed dribbles. The researcher thought that if the number of sessions given in a week was increased with contents of resistance, it would influence physical fitness, passing accuracy, and speed dribbling otherwise the situation made players has poor passing accuracy and speed dribbles. These studies have already shown that calisthenics exercise improves physical fitness variables, but none of the researchers have looked at the influence of calisthenics exercises on handball-specific physical fitness variables like agility, muscular strength, and handball skill performance.

Therefore, the study aimed to investigate the effect of calisthenics exercise on some selected physical fitness qualities and skill performance in the case of Bahir Dar University u-17 female handball project players.

### **1.3 Objective of the study**

#### **1.3.1 General objective of the study**

The general objective of this study was to investigate or explore the effect of 8 weeks of calisthenics exercise on some selected physical fitness and skill performance in the case of Bahir Dar University u-17 female handball project players.

#### **1.3.2 Specific objective of the study**

The following were the specific objectives.

1. To measure the effects of calisthenics exercise on the agility of u-17 handball players.
2. To measure the effects of calisthenics exercise on the muscular strength of u-17 handball players.
3. To evaluate the effects of calisthenics exercise on speed dribbling of u-17 handball players.
4. To evaluate the effects of calisthenics exercise on passing accuracy of u-17 handball Players.

#### **1.4 Hypotheses**

The researcher has formulated the following hypotheses:

1. **H<sub>1</sub>**: Calisthenics exercise would have significant effects on the agility of u-17 handball players.
2. **H<sub>1</sub>**: Calisthenics exercise would have significant effects on the muscular strength of u-17 handball player
3. **H<sub>1</sub>**: Calisthenics exercise would have a significant effect on the speed dribbling of u-17 handball players.
4. **H<sub>1</sub>**: Calisthenics exercises would have a significant effect on the passing accuracy of u-17 handball players.

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

The outputs of this research may have the following importance:-

- Draw attention to coaches and handball players on the effects of eight-week calisthenics exercise on agility, and muscular strength fitness test of u-17 female handball project player.
- Give information about the relevance of calisthenics exercise to improve the female handball player's passing performance and speed dribbling through a designed program.
- Used as a springboard for further investigation or who wish to study the problem in greater depth.
- Finally, this study provides avail baseline information and reference data on the effects of calisthenics exercise on some selected physical fitness qualities and handball performance of handball players, coaches, and instructors

## 1.6 Operational definition of terms

1. **Exercises:** a subset of physical activity that is planned and structured aimed at improving the fitness of players.
2. **Calisthenics:** Body weight exercise consists of a variety of gross motor motions, such as running, standing gripping, pushing, and so on, that are generally performed rhythmically and with minimum equipment.
3. **Agility:** is the ability to stop, start and change the direction of the body or body parts rapidly under control.
4. **Muscular strength:** the maximum force a muscle or muscle group can produce at one time.
5. **Passing accuracy:** the ability to give the ball as much as possible to the teammate exactly and accurately in a very fast manner without being interrupted by an opponent, accurate passing ensures the pace and continuity of team plays and keeps the pressure on the defence by allowing each attacker the chance to make a scoring chance.
6. **Physical fitness:** is defined as a condition in which an individual has enough energy avoid fatigues and enjoy life (it contains agility, flexibility, and muscular strength)
7. **Speed dribbling:** is the skill of moving as fast as possible by bouncing a ball on the ground with fingers while keeping the ball going forward.

## CHAPTER TWO

### 2. REVIEW OF RELATED LITERATURE

#### 2.1 An overview of Calisthenics exercise

The word ‘calisthenics’ has, historically, been employed to describe a range of physical activities. The online version of the Macquarie Dictionary (2020) offers three meanings: first, a general definition of ‘exercising the muscles to gain health, strength, and grace of form and movement’, along with the more specific ‘light gymnastic exercises’ designed to enhance individuals’ physical health. A perusal of archival records in Australia reveals a range of activities that, over time, have been designated as ‘calisthenics’ (Mollenhauer & Mollenhauer, 2021)

The word calisthenics is derived from two Greek words, "Kàlos" meaning beauty, and "Sthénos" power. Although Calisthenics was originally developed in the United States as a series of bodyweight exercises used to improve the overall fitness level of girls, later on, it evolved into a training culture aimed at improving health and fitness using body weight. This training method aims to improve strength and endurance without needing any specialized tools or places. In calisthenics training, body weight is used as resistance; since the exercise intensity can be regulated, it can be used in many different areas, from military training to general health improvement (Ölmez & Akcan, 2021).

The first encounter of Calisthenics exercise can be argued to be from the Spartan era (600-400B.C) Calisthenics exercise would have been a major part of a Spartan soldier’s workout regime. Some of the calisthenics exercises included in their training programs are Lunges, squats, crunches, jumping jacks, pull-ups, pushups, dips, and planks. Every culture and civilization has utilized the Calisthenics exercise in one way. The Shaolin monks in China used Calisthenics exercises to build their strength so that they could protect their monasteries from looters and robbers. Traditional Indian wrestlers used calisthenics exercises to condition their bodies.

In their camps, the Roman gladiators practiced Calisthenics. The army up to this day uses Calisthenics exercise as a way of testing physical fitness levels.

Around 527 BC, Shaolin Monks is the first group of “Warriors” to use exercise to improve mental and physical performance. I say this because the Shaolin was not a military fighting force. They were, however, the first group of people that trained as combatants all day, every day that used calisthenics in their training. The monks trained to defend their monasteries from Chinese looters. Even though they were not a conventional fighting army, Shaolin monks are still regarded as some of history's deadliest fighters (Srivastava, R. 2016). For warriors trained in offensive tactics, the Persian Empire was the first organization to use calisthenics exercises, starting at the young age of six.

Since then calisthenics has been used by military forces to dominate their enemies” Calisthenics exercise introduced in ancient Greece, where it was mentioned in a Persian scout report on Spartan warriors before the battle of Thermopylae, with the Persians interpreting the odd synchronized motion as dance, and thus a sign of weakness”. Calisthenics has been a decisive advantage that has proven to improve human mental and physical performance for thousands of years. Their implementation has only been improved on and continues to deliver faster workout results than any apparatus or equipment. The only thing you need to increase your mental and physical performance is yourself (Srivastava, R. 2014).

Now a day the term calisthenics refers to defined exercise with similar features to gymnastics but mainly done outdoors, in parks, using bars and rings. The goal of this discipline is to develop muscular strength and endurance in a variety of ways, such as executing the most number of pull-ups, dips, and pushups with and without external resistance.

## **2.2 Calisthenics exercise and handball**

In the past, Greece was the origin of calisthenics, which was influenced by Roman gymnastics. The Greek words "kallos" for beauty and "thenos" for strength are the origins of the word "calisthenics." Calisthenics is a form of exercise consisting of a variety of movements without the use of equipment or apparatus, but mainly using your body weight.



It uses only one's own body weight as resistance and is designed to enhance both body strength and flexibility through actions like bending, jumping, swinging, twisting, or kicking. Calisthenics is aerobic and dynamic exercise and is suitable for sedentary and also for older people. They are rhythmic, smooth, enjoyable exercises that are easy to perform alone or in a group format, and can be modified according to the subject's fitness levels. Calisthenics consists of a variety of simple movements that are intended to increase body strength and flexibility using the weight of one's own body for resistance. Callisthenic fitness training can build both muscle endurance and cardiovascular fitness in addition to improving psychomotor skills such as balance, agility, and coordination. Calisthenics can be beneficial for both muscular and cardiovascular fitness. (Santhosh, R., & Davidson, 2021)

Calisthenics exercises are one form of exercise consisting of a variety of simple, rhythmical, movements; intend to enhance a physical fitness component with movements such as bending, jumping, swinging, twisting, and kicking, by using one's body weight as resistance. Calisthenics when performed vigorously and with variety can benefit both muscular endurance and strength, in addition to improving psychomotor skills such as balance, agility, and coordination. Calisthenics exercise can be performed by people of all age groups and genders without risk of injury when performed properly (Srivastava R, 2013).

'Urania Game,' a ball game mentioned in the Odyssey, was played by the ancient Greeks. Homer describes the game as being played with a wool ball in which players would throw it up in the air to be caught by their opponent, who would then throw it up again. In 1926, a scene from this ancient game was discovered engraved in stone in the city of Athens, proving Homer's story (International Olympic Committee, 1986).

Handball is one of the oldest ball games known to man, having originated in Ancient Rome. *Expulsion ludere*, a game played by Roman women, was the first to use the handball technique, whereas *hapastum*, a rugby-like game, was chosen by Roman men.

The game's popularity increased throughout Europe during the Roman conquest. Karl Schelenz (1890–1966), the father of handball, adapted Torball for men's practice in 1919 (British Columbia Handball Federation, n.d.), giving him the name of "Father of Modern Handball" (International Olympic Committee, 1986).

Handball is an Olympic sport in which two teams of six players compete against each other on the court. It's also a team sport with fast-paced defensive and offensive activity throughout the game, with the goal of the game being to score goals. Team handball players must synchronize their actions when running, jumping, pushing, changing directions, and performing specific moves like passing, catching, dribbling, throwing, checking, and blocking. The intensity levels in the game change between standing and walking, jogging and moderate running, sprinting, and rapid forward, sideward, and backward motions throughout the game (Michalsik et al., 2012; Poval et al., 2012).

**History of Handball** The team handball game of today was formed by the end of the 19th century in northern Europe, primarily in Denmark, Germany, Norway, and Sweden. The modern handball rules were created in 1898 by Danish physical education teacher Holger Nielsen, and they were published in 1906. In the Olympic Games, handball is played. Men's handball was 1st played outside at the 1936 Summer Olympics in Berlin, and then indoors at the 1972 Summer Olympics in Munich, and has been an Olympic sport ever since. The addition of women's team handball to the Olympics in 1976.

According to (Saavedra,) Team handball (handball) began as an outdoor game between two teams of eleven players. It has developed into an indoor sport with each team consisting of seven players. Handball is a popular sport that is enjoyed by people of all ages and skill levels, from recreational to professional. The origins of the current game can be found in the early nineteenth century in Scandinavia. Around 19 million people play it today (International Handball Federation, 2014), and it has been an Olympic sport for men since 1972 and women since 1976.

### **2.3 Benefits of Calisthenics exercise to Handball players**

Calisthenics doesn't necessitate the use of any particular equipment. Calisthenics is a form of exercise consisting of various movements without the use of equipment or apparatus, but mainly using own body weight (Mathew & Mahadevan, 2018)

Its goal is to develop fitness by bending, jumping, swinging, and kicking while just using one's body weight as resistance (Srivastava, R. et al., 2013). Calisthenics is energetic, aerobic exercise that is appropriate for both sedentary and older people. They are rhythmic, easy, pleasurable exercises that may be done alone or in a group setting and can be adapted to suit the physical fitness levels of the subjects. Callisthenic exercises are a collection of simple movements designed to increase physical fitness by using the body's weight as resistance. Muscle endurance, cardiovascular fitness, coordination, power, balance, agility, and speed can all be improved with callisthenic fitness training (Srivastava et al., 2016).

Calisthenics is exercises that are performed without the need for any specific equipment and are intended to improve physical fitness variables such as muscular endurance and strength (Santhosh & Davidson) A calisthenics workout does not require any equipment because it relies on the resistance of one's body weight Squats, pull-ups, pushups, lunges dip, jumping jacks, setups, and crunches are some of the basic calisthenics exercises. When performing calisthenics exercises, maintaining proper form and posture is more important than completing a specified number of repetitions

### **2.4 Concepts of physical fitness,**

Physical fitness indicates that a definition of physical fitness should focus on the health-related aspects of fitness. It is proposed that the physical education profession's primary concern should be for the promotion of health-related physical fitness, defined as a state characterized by an ability to perform daily activities with vigor, and demonstration of traits and capacities that are associated with a low risk of premature development of the hypokinetic diseases (i.e., those associated with physical inactivity)(Pate, 1988).

Total force fitness, which also includes mental, behavioral, medical, nutritional, spiritual, and social wellness, contains physical fitness as one of its components. Consistent regular exercise can have a positive impact on social health, depression, generalized anxiety, and sleep deprivation (Physical Fitness, 2018)

Physical fitness is defined as the ability to perform daily chores efficiently while also having enough energy to adapt to surprising demands. Physical fitness refers to an individual's capacity to efficiently handle everyday responsibilities without undue exhaustion, leaving energy for family, hobbies, and leisure time activities, as well as a physical reserve in the event of an emergency. In other words, this refers to an individual's ability to live a full and balanced life, which includes mental, emotional, social, and spiritual factors, as well as not just the physical, but the individual's entire capacity for total self-expression (Olu and Obasanmi Pius, 2011).

It is the ability to safely and successfully fulfill the common as well as unexpected demands of daily life without becoming too tired. Simply put, it is the ability of the body to work properly and efficiently, and it contributes to overall life quality (By et al., 2019). Physical fitness is a term that describes a person's overall health and well-being, as well as their ability to participate in sports, jobs, and daily activities. Physical fitness is generally attained through a combination of healthy nutrition, moderate-intensity physical activity, and adequate rest, as well as a proper recovery plan (Revolution, n.d.)

A completely fit person has a positive attitude toward life. Fitness is a must-have for any young man. It installs self-confidence and keeps a person mentally attentive. Because the mind and body are not in complete harmony, physical fitness is important for humans to adapt well to their surroundings. Although it is widely acknowledged that physical fitness is a crucial component of a child's appropriate growth and development, a universal definition of physical fitness has yet to be agreed upon. The multidimensional qualities of physical fitness can be divided into two groups, according to study and scholarly inquiry: health-related physical fitness and skill-related physical fitness (By et al., 2019)

## **2.5 Component of physical fitness**

It is recommended that the important element of fitness education in physical education be health-related fitness testing. These field-based health-related fitness tests often include several components body composition (e.g., body mass index, BMI), cardiorespiratory endurance (e.g., one-mile run or Progressive Aerobic Cardiovascular Endurance run test), flexibility (e.g., sit-and-reach), and muscular strength/endurance (e.g., push up curl-up or trunk-lift). (Yang et al., 2019). Agility and power are skill-related physical fitness components that are basic skills in performing different sports activities in speed, acceleration, changing direction, jumping, and weight lifting. Cardiorespiratory endurance, muscular strength, and muscular endurance are all components of health-related physical fitness. Specific components of health-related fitness are vital to increasing health and wellbeing in children, in addition to physical activity behaviour. Body composition, cardiorespiratory endurance (aerobic fitness), muscular strength and endurance, and flexibility are the five categories of health-related fitness. (Brusseau et al., 2018).

Physical fitness is a state of health and well-being that includes both skill and health components. Skill-related physical fitness refers to an individual's athletic ability in sports like tennis and includes skill-related traits like agility; the health-related component is a measure of muscle strength and flexibility (Hopkins & Walker, 1988). Physical fitness components linked to improved performance in sports and motor skills are referred to as skill-related physical fitness.

The components are commonly defined as agility(that relates to the ability to rapidly change the position of the entire body in space with speed and accuracy); balance, (that relates to the maintenance of equilibrium while stationary or moving); coordination, (that relates to the ability to use the senses, such as sight and hearing, together with body parts in performing motor tasks smoothly and accurately); power, (that relates to the ability to the rate at which one can perform work); speed, (that relates to the ability to perform a movement within a short period of time); and, reaction time that relates to the time elapsed between stimulation and the beginning of the reaction to it.(Shashidhar & Madialagan, 2015)

## **2.6 Physical fitness quality in handball**

Modern team handball is quick, complicated, and a dynamic sport that needs well-developed endurance, strength, speed, coordination, Power, and shooting performance (Wagner *et al.*, 2014). Handball is a high-intensity Olympic team sport that emphasizes running, jumping, sprinting, as well as arm throwing, blocking, and pushing (Gorostiaga *et al.*, 2006). When strength, sprint, endurance, and sport-specific characteristics combine in handball and other team sports, some interference between different components of physical fitness occurs.

According to (Apaak *et al.*, 2021) in handball, these skills may include shooting, passing or throwing, and dribbling. In handball, there are just a few tests that may be used to evaluate a player's ability level. Front Shoot is used to evaluate shooting ability, Accuracy Throw is used to evaluate throwing ability, Speed Pass is used to assess passing ability, and Agility Dribble is used to evaluate dribbling ability. The players must engage in high-intensity motor activity to play modern handball. Strength, speed, agility, endurance, and coordination, as well as basic and specific motor abilities and cardio-respiratory capacities, are essential for performing specific motor assignments and space orientation in handball. Handball is an endurance sport that requires players to have physical fitness such as speed, agility, flexibility, and strength to participate well (Devaraju & KALIDASA, (2014)

### **2.6.1 Agility**

The ability to change directions quickly and accurately is what is meant by agility. Agility is described as a quick whole-body movement accompanied by changes in velocity or direction in response to stimuli. It's a fundamental motor skill in sports like rugby, football, tennis, basketball, and handball that need multidirectional changes of direction. (Spasic and colleagues, 2015)

It is essential for a successful handball player. Agility has recently been defined as a quick whole-body movement with a change in velocity or direction in response to a stimulus, and different authors have accepted this definition.

A pre-planned change of direction task is referred to as "change-of-direction" speed, and this word has grown increasingly popular to separate this closed talent from agility that requires a reaction. Apart from the change of direction, there are two more elements of agility to consider in the above definition.

To begin with, "change in velocity" implies that an agility game scenario could only contain deceleration, in which an attacking player decides to reduce speed suddenly to create space between himself and the opponent. The second important element of this definition is that a change in velocity or direction is in response to an external stimulus provided by an opponent's actions. (W. Young et al., 2016). For instance; Handball players should have the skill of shooting, passing, and dribbling.

A considerable amount of research has been undertaken to show the positive effects of calisthenics on the agility of sports performance (SINGTHIN, & Sriramatr, 2019) to determine the effects of Calisthenics and Pilate's core muscle training on the agility of football players. Test result under the table

*Table 1: Paired-sample t-test results to follow up on the interaction effect.*

Variable	Pre-test		Post-test		P-value
Group	Control	Calisthenic	Control	Calisthenics	
	(S.D)	s M (S.D.)	(S.D)	M (S.D.)	
Agility	9.84 (0.34)	9.58 (0.45)	9.80(0.36)	9.26 (0.39)**	0.029

Table 1:- show that (SINGTHIN, B., & Sriramatr, S. (2019) agility test the result analyses by paired t-test on the effects of calisthenics exercise on agility performance show an overall significant increase ( $p < 0.05$ ) after calisthenics exercise. The test showed that the control group had agility post-test higher than pre-test ( $p < .05$ ). Panihar & Rani, (2022) determine the effect of calisthenics training on physical fitness parameters and sports-specific skills of soccer players: a randomized controlled trial. In the experimental group (Group-B), significant improvement was seen during the Illinois agility test.

Agility tests the result analyses by using the paired t-test and independent t-test respectively. The level of significance (p-value) was kept at  $\leq 0.05$ . Similar findings Santhosh, R., & Davidson(2021) calisthenics exercise caused improvements in selected motor fitness variables among slum boys during Covid-19. The results of the study showed that there was a significant improvement in the selected motor fitness variables of agility as a result of performing CE

### **2.6.2 Muscular strength**

Muscular strength refers to a muscle's ability to apply force and is a health-related element of health fitness (USDHHS, 1996). Strength is a unique quality. Each major muscle group of the body would need to be measured for a complete assessment. The rating of one repetition maximum is the same in both lab and outdoor testing (the maximum amount of resistance you can overcome one time). Handball is a high-intensity team sport that necessitates constant changes in intensity and kinetic activities. It is distinguished by a large number of side movements, jumps, throws, and body contacts, all of which rely only on muscular strength (Alegre et al., 2006).

A considerable amount of research has been undertaken to show the positive effects of calisthenics exercises on muscular strength. (Krishnan, K., & Arumugam, C. 2013). Who studies the effect of callisthenic and dumbbell exercise on muscular strength endurance and flexibility of rural school boys. The stud was quasi-experimental and the population consisted of all 14-17 Years male rural school boys. To serve as a sample, 45 rural schoolboys who were invited to a local team's camp in the erode district rural region were selected. The subjects were randomly divided into three groups two experimental groups and a control group Experimental I group:  $15.50 \pm 1.50$  years,  $45 \pm 5.40$  kg,  $160.50 \pm 5.30$  cm; Experimental II group:  $15.50 \pm 1.50$  years,  $45 \pm 5.40$  kg,  $160.50 \pm 5.30$  cm; and the control group:  $15.50 \pm 1.50$  years,  $45 \pm 5.40$  kg,  $160.50 \pm 5.30$  cm. The research's two training groups calisthenics and dumbbell exercises were its independent variables. The dependent variables muscular strength and flexibility were assessed using standing board jumps and sit-and-reach tests, respectively.



First, the subjects took the pre-test, and then the two experimental groups performed the selected exercises while the control group did not practice any specific training

According to Thomas et al. (2017) determine the effects of a calisthenics training intervention on posture, strength, and body composition. Twenty-eight male participants (24.2 - 4.2 years; 67.0 - 8.3 Kg; 173.3 - 5.2 cm) were divided into two groups, a Calisthenics-based intervention group (SG) and a control group (CG). The SG comprised 12 male participants (24.8 -6.2 years; 62.6 - 8.9 Kg; 171.8 - 3.9 cm), whereas the CG comprised 16 males.

In the study, the subjects of the experimental group then underwent training in calisthenics exercises. The control group did not undergo any special training during this. A paired t-test was used to analyse differences between pre and post-intervention within groups. When applicable, an unpaired t-test was performed to analyze the differences between the groups. For all analyses, significance was defined at ( $p= 0.05$ ).

## **2.7 Basic principle of training**

The principles of training aid in the development of a continuous and specific increase in physical ability by adapting a training load and program to the demands of a sport and, most significantly, to the individual needs of each player. The following principles of regular training should be followed by a training program to improve performance.

### **2.7. 1 Overload**

For the induction of training adaptations, an athlete must be exposed to an overload stimulus at regular intervals. Changing the style of exercise, length, frequency, intensity, and recovery period between training sessions can all be used to create an overload stimulus (Lambert et al., 2005).

Similarly, before a training session, an overload training stimulus can be imposed by modifying nutrition and influencing the intracellular environment. To avoid damage, exercise over weights must be gradually raised while also allowing the body to adjust.

Furthermore, varying the type, volume, and intensity of training load helps the body to recuperate and overcompensate. As a result, as adaption occurs, loading should gradually increase.

According to Zaffagnini et al., (2016) overloading has been achieved by following the acronym FITT.

**Frequency:** Increasing the number of times you train per a week.

**Intensity:** is defined as increasing the training difficulty. For example, instead of running at 10 km/h, try 12 km/h or increase the weight you squat.

**Time:** Increase the amount of time you use training during each session.

**Type:** Make the training you're doing more difficult.

### 2.7.2. Progressions

The program must be regularly advanced to maintain increases in muscle development and performance by gradually increasing the demands placed on the body (Pearson et al. 2000). Increase the frequency of training; increase the number of repetitions in each set; increase the number of exercises; decrease the rest periods between sets and/or exercises; increase the weight employed, or change the speed of movement.

### 2.7.3 Specificity

It is the principle that indicates that a specific type of exercise is required to increase the fitness of a specific body part (Stone *et al.*, 2007). The type of training you perform should be best managed. You should train the energy system that you primarily use for training as well as the physical fitness components that are most important to your sport. To determine your capability, you should also evaluate the fitness factors that are required in your training program. When choosing proper facilities for sports training, the specificity of training is the most important factor to consider, especially if performance improvement is a primary goal.

#### **2.7.4. Individualism**

Everyone is different and reacts to training in their own unique way. Some people can manage a higher volume of training, while others respond better to higher intensities. Genetic ability, muscle fiber type predominance, other life factors, chronological or athletic age, and mental state are all factors that influence (Burgess, 2017).

#### **2.7.5. Variation**

To achieve the goals and objectives of individual training cycles, it is necessary to change the nature of the exercise, the environment, the time of day of the session, and the training group. Variation has a great role in varying the training content to maintain the athlete's interest and motivation. Variation states that exercises should be changed regularly; therefore, players do not overstress a certain part of the body (Vincent et al., 2013). In addition, this principle implies that we should consistently change aspects of the workouts for the players.

#### **2.7.6 Reversibility**

Reversibility, also known as regression, is described as "the state of fitness or performance returns to a normal untrained state when training loads are lowered or removed completely." "Use it or lose it," as the saying goes.

#### **2.7.7. Recovery**

Players must get adequate rest between workouts to recover and be well prepared for the next training. The following are factors that need to be considered during the recovery process after a training session: 1. an athlete aged older than 25 years needs longer recovery periods than younger athletes (Bompa, 1999). 2. Environmental conditions training and competing in the heat impose more physiologic stress on the athlete and require a longer recovery period (Noakes, 2001). 3. The type of training and competition that induces muscle damage requires longer recovery periods than activities that cause fatigue but no muscle damage or soreness.

## 2.8 Technical & tactical requirements of handball

Technical skills are essential in every sport. The technique is the capacity to perform a movement conveniently and effectively (Czerwinski & Taborsky, 1997). The technique is based on coordination and conceptual and physical characteristics. Technical skills are an essential skill for success in handball; in addition to a high level of power, strength, agility, and good aerobic and anaerobic energy systems (Hermassi, van den Tillaar, et al., 2015) the technical tool during a handball training session allows one to efficiently develop motor skills.

Technical skills or elements of offense and defense: According to (Istvan Juhász et al., 2015, pp.15-31).

Technical elements of the offense are further classified into two:

(1) Technical elements without the ball: This includes the basic position of the offending player, start, run, stop, jump up, landing, and feints (fake start, fake run movement). (2) Technical elements with the ball: which consists of the possession of the ball such as Passing the ball, catching the ball, dribbling the ball, faking with the ball (e.g. Starting a fake, fake run movement, feinting a pass- and a shot), blocks, blocking-breakaway and Techniques to gain a goal (shooting the ball).

Technical skills or elements of defense: Technical elements of defense are the following: basic position, motion in basic position, collisions activities to get the ball: intercepting or hitting the ball, hindering the goal: blocking, and defense against blocks: over-slipping, rounding Changing directions (Czerwinski & Taborsky, 1947).

**Tactical skills:** Tactics is defined as the choice of the most useful and the most effective action in a given concrete situation. The higher the level of physical condition and the greater the repertoire of technical skills, the more useful and more successful the tactics of action can be (Czerwinski & Taborsky, 1947) All of the movements used against the opposing team are referred to as tactics. It is a behavior that is used to achieve a specific goal by employing the most effective approaches in various scenarios and

actions. Tactics are further divided into attack (individual, group, and team) and tactics of defense (individual, group, and team). Players' technical, tactical, social, and physical characteristics also determine their handball performance. Technical skills are required for activities such as tackles, shoots, fakes, blocking, and side-cutting (Michalsik et al., 2015).

## **2.9 Passing in handball**

Passing in handball is one of the basic technical skill elements. Passing is the basic building block of an attack, the simplest connection between two attacking players. The player in possession of the ball must pass it to a teammate. The player needs to consider the direction, distance, time, and type of pass while making a choice. Passing can be classified in many different ways based on the use of arms: According to the distance of the flight, there are two-hand passes (sticking from the chest, behind the head), dominant-handed passes, and non-dominant-handed passes: short pass, medium pass, and long pass, based on flight path: straight pass, bounce pass, lob pass (curl pass), and upper, half-upper, near the hip, lower, or in a specific situation, based on position relative to a teammate: forward pass, side pass, backward pass, pass from behind the back and pass from behind the head and according to the characteristics of the activity performed by a passing player: pass from a stationary position, running passes (in motion), and jump pass (preliminary stride, vertical).

Moreover, passing is divided into two parts based on distances. These are 1. Short distance passes such as bounce pass, the close handoff pass, and the shovel pass. 2. Long-distance passes are the ground pass (roller), the shoulder pass (baseball), jump pass, and side arm pass.

Generally, passing in handball has different types, such as bounce pass, wrist pass, overhead one hand, and two hand pass, under arm pass, chest pass (push pass), a shovel pass, hook pass, ground pass, jump pass, back hand pass, side pass, shoulder (baseball) pass, and side arm pass, etc. Three main factors affect passing in handball. Those factors are the position of a player, the trajectory or path of the ball, and the distance between the passer and the receiver (Czerwinski & Taborsky, 1947).

### **2.9.1 Throwing accuracy**

In team handball, passing is the act of throwing the ball toward a teammate. Therefore, most literature uses throwing in place of passing, and also passing is one part of throwing and biomechanically the same. Throwing in handball, the offensive players attempt to throw a ball to their teammate from a position without being tackled or obstructed by the opposing defensive players.

This is accomplished using tactical components of passing the ball and utilizing the different speeds of throwing and techniques.

Likewise, in modern handball, offensive success revolves around a team's ability to move the ball quickly and accurately from one player to another player (Clanton & Dwight, 1997). On the other hand, during the possession of the ball, your player's responsibility is to attack the goal with the intent to score. But, if the scoring possibility is not clear, you must keep the rhythm of the attack going by passing the ball to a teammate. Therefore, consistent, accurate passing ensures the pace and continuity of team play and keeps pressure on the defense by allowing each attacker the opportunity to be a scoring threat.

According to (Kizer, 1968) who study Attitudes and Basketball Skill: The Effects of Calisthenics and Pre-activity Warm-up upon Basketball Skill and Attitudes toward Physical Education. There was a significant difference between the pre-test and post-test mean scores within the experimental group regarding basketball skills. The result indicated that calisthenics exercise showed a significant effect on the passing performance of the athlete than the control groups.

### **2.10 Dribbling**

Dribbling helps a player to move with the ball towards the opponent's goal under the control of the ball within the free space. In handball, medium-high dribbling is used more often by attackers than low or high dribbling. In this manner, the ball is led alongside the body so that a player doesn't kick it and can also protect it from an opponent. The ball is pushed down by moving the arm, forearm, and wrist toward the ground. A player can dribble in place, when walking or while running, with a dominant hand (right hand for a 17

right-handed person), with a non-dominant hand (left hand for a right-handed person), and by alternating between right and left hands. Good techniques of dribbling/bouncing permit players to keep the position of the ball longer than 3 seconds move up the court and avoid an opponent IHF, (2019).

### **2.10.1 Speed dribbling**

Speed dribbling in handball is the skill of running as fast as possible while keeping the ball in front, available to be closely controlled the ball by the dribbler at that moment. It is not throwing the ball and sprinting after it. It is used offensively when there is open space toward the opponent's goal. Dribbling is one of the basic techniques in the game of handball which is important because students mastered dribbling as one way to attack the opponent and maintain the position of the ball to avoid being captured by the opponents. (Ruslan, & Hamdiana, 2019). Speed dribbling in handball is the skill of running as fast as possible while keeping the ball in front, available to be closely controlled the ball by the dribbler at that moment. It is used offensively when there is open space toward the opponent's goal. Dribbling helps a player move with the ball through the open space toward the opponent (Suresh et al., 2014).

Likewise, speed dribbling skill enhances the possession of the ball on a fast break with no teammate to pass and no defender b/n you and the opponent's goal. A player will be allowed to dribble and take an additional three steps to reach the goal for a shot if they successfully fake a defender in a one-on-one position after taking three steps. Dribbling will allow you to escape a 3-second violation that results in a free throw for the opposition when you are unable to pass to a teammate (Barbara, 2011).

A player holds the ball in both hands after receiving it and before dribbling. When an opponent gets close to a player, the ball is dribbled sideways at hip level.

Elbow and wrist joints work together to produce the motion of bouncing on the ground. The angle of the bounced ball depends on the speed that which the player is moving.

According to (Kizer, 1968) determine Attitudes and Basketball Skill: The Effects of Calisthenics and Pre activity Warm-up upon Basketball Skill and Attitudes toward Physical Education. There was a significant difference between the pre-test and post-test mean scores within the experimental group regarding basketball skills. The result indicated that calisthenics exercise showed a significant effect on the dribble performance of the athlete than the control group



## CHAPTER THREE

### 3. RESEARCH METHODOLOGY

#### 3.1 Research design

The objective of this study was to investigate the effect of 8 weeks of calisthenics exercise on some selected physical fitness qualities and skill performance of Bahir Dar University U-17 female handball project players. Depending on the nature and appropriateness of the pre and post-test data the research approach designed in this study employed experimental design since it helps to measure, assess, evaluate and analyze the effect of calisthenics exercise on the independent variable on the dependent variable (physical fitness and skill performance). Both control and experimental groups attended their regular handball training sessions given by the coach but in addition, the experimental groups are undergoing a calisthenics exercise program.

*Table 2: The Study Design Layout*

Treatment	Callisthenic exercise
Training weeks	8 weeks
Total duration	3 days/week
Duration/session	60 minute
Intensity	Low, moderate, High
Training days	Monday, Wednesday, and Saturday
Training time	Morning and afternoon

#### 3.2 Geographical Location of the Study Area

The study was conducted in the Amhara region Capital city of Bahir Dar, located in West Gojjam Zone, Ethiopia. Bahir dar city is located in the southwest part of Ethiopia, about 565 Km NW of Addis Ababa. The town has a latitude and longitude of 11°36'N and 37°23'E respectively, and an elevation of 1,800 meters. Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), this town has a total population of 221,991, of whom 108,456 are men and 113,535 women.

The study will be conducted at Bahir Dar University, which is located between latitudes of  $11^{\circ} 34' 20''$  N and a longitude of  $37^{\circ} 24' 10''$  E 1800 m.

The altitude on the campus is 2830 meters above sea level with a mean annual temperature of  $14.84^{\circ}\text{C}$  (FAO, 2006). Bahir Dar University was established in 1963, currently, it has 8 campuses, 1 admin HQ; 8 staff accommodation sites, 54,000+ Students; around 20k boarding, 6,390+ Staff (academic and admin)

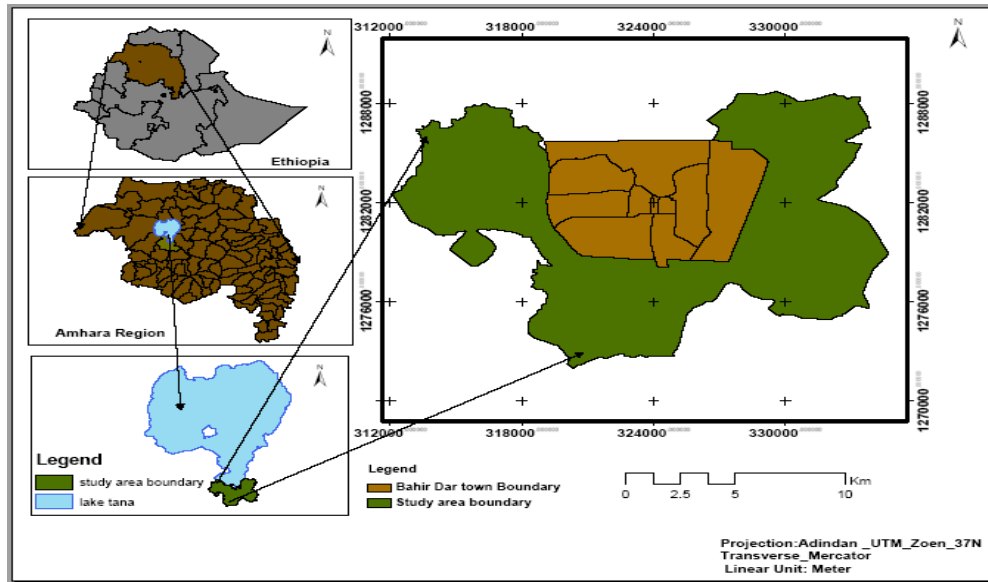


Figure 1 Map of Bahir dar city and Bahir Dar University

### 3.3 Population and Sampling Technique

The study was conducted at Bahir Dar University u-17 female handball players since the research is experimental to monitor in training as well as manage in test administrations and data analysis all 20 female players were taken. In this study, the researcher has used comprehensive sampling techniques, this is because the Bahir Dar university female handball project holds 20 players, and then the researcher has used these players as a whole for experimental study purposes. Therefore, the sample population of this study included all of the handball players at Bahir Dar university u-17 female handball project players. Then, the random assignment technique was used to assign the control and experimental group. Thus 10 participants were randomized as an experimental group (EG) and the other 10 subjects as a control group (CG).

Finally, the experimental group (n=10) underwent an additional 8 weeks of calisthenics exercise with 3 sessions per week, each lasting 60 minutes, and the other group was assigned as a control group (N= 10). Both the EG and the CG participated in normal handball training given by the coach and EG take additional calisthenics exercises for eight weeks (EG).

### **3.4 Source of Data**

To complete the study the researcher used primary data that was collected through pre and post-test of the experimental and control group and secondary data that was collected by the researcher used books, the internet, and journal.

### **3.5 Data collection instrument**

To collect the quantitative data concerning the effects of calisthenics exercises on the same selected physical fitness quality and skill performance tests such as agility for the Illinois Agility Run test, muscular strength for chin-up (pull up) test, passing score for accuracy throw and speed dribble for obstacle dribble. Before the experimental groups are going to the calisthenics exercise, a pre-test was taken from both the control and experimental groups. Post-test was also taken from both groups after 8 weeks of calisthenics exercise in an experimental group. For the success of the study, necessary materials and facilities such as cones, balls, walls, pens, stopwatches, whistles, record sheets, meters, and other related materials were used. The tests shall be conducted within the following order

*Table 3: Criterion measures (Selection of Tests)*

NO	Major variables to measure	Test items	Unit
1	Agility	Illinois agility run test	M/S
2	Muscular strength	Pull up	RM
3	Speed dribble	Obstacle dribble	M/S
4	Passing	Accuracy throw	In point

### 3.6 Data Collection Procedures

#### 3.6.1. Handball Skill Test

The detailed descriptions of the skill tests were conducted on the subjects are as follows

##### 3.6.1.1 Accuracy Throw Test

**Purpose:** To measure the accuracy of short & long passes of handball players.

**Equipment:** a marked level floor or ground with a smooth surface, a smooth wall, standard inflated number two handballs, colour chinks, measuring tape, scorecards or recording sheets, and pencil/pen.

**Procedure:** Two circles are marked on the wall. The innermost circle is marked from the height of 1.5 m from the ground with a 0.15 m radius and the outermost circle is also marked from the same height with a radius of 0.25 m. Two boxes (1 x 1 m) are marked on the floor at a distance of 7 m and 10 m from the wall. In handball, during the match, the player performs a variety of passes accurately mainly in two forms either short or long passes.

**Short Pass:** The player, with a handball, stands behind a line on the floor marked at 7 meters distance from the smooth wall. On the signal “go”, the player throws the ball at the target, using a one-armed throw (Shoulder Pass). Five throws are compulsory and all must be executed from behind the restraining line (7m).

**For Long Pass:** The player, with a handball, stands behind a line on the floor marked at meters from a smooth wall. On the signal “go”, the player throws

the ball at the target, using a one-armed throw (Shoulder Pass). Five throws are compulsory and all must be executed from behind the restraining line (10 m).

**Scoring:** Five points are scored for each throw hitting the centre circle, and three points for hitting the outer circle. A ball hitting on a line was counted as hitting in the area of the higher score. The score is the total for ten throws (Five throws for a short and long pass each). A maximum of fifty points are possible.

#### No Points will be given if

- An Athlete touches/cuts the restraining line before the release of the ball
- An Athlete loses control of the ball
- The ball shoots outside the target

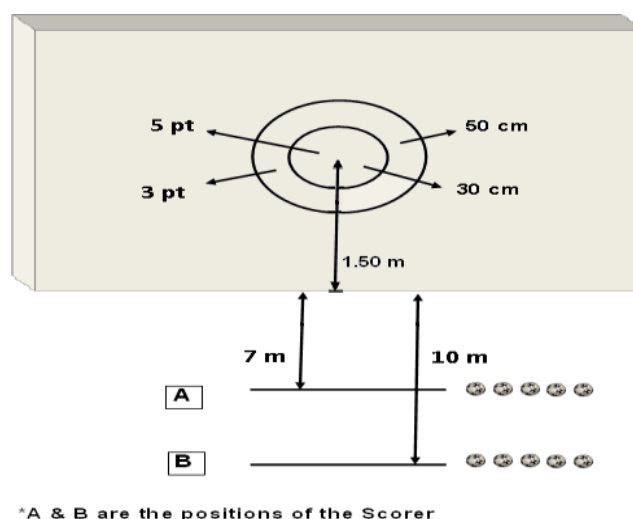


Figure 2 Accuracy Throw Adopted from Yogesh, (2016)

#### 3.6.1.2 Obstacle Dribble

**Purpose:** To measure the speed with which a player can dribble a handball around obstacles in the team.

**Equipment:** A level floor or smooth surface ground, a stopwatch, standard number two inflated handballs, Four Obstacles (Cones, Wooden Blocks, etc.)

**Procedure:** The player stands behind a starting line with a ball in hand and on the signal “go”, starts with a dribble forward and continues to dribble towards

the Finishing Line. The distance between Start & Finish line is 16 meters. The first and last Obstacle is 4 meters away from Start Line & Finish line. The distance between the second to the last obstacle is 3 m, 2m, and 3 m respectively.

**Scoring:** The score is the time in seconds. Time is started on the signal “GO” and stopped the instant the player crosses the finish line.

Retrial if: 1. An Athlete loses control of the ball

2. An Athlete fell down due to an imbalance

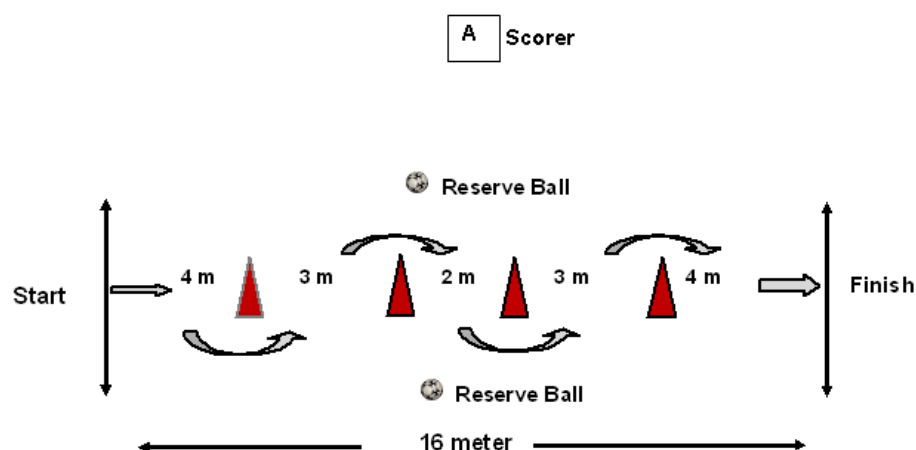


Figure 3 Obstacle Dribble Adopted From Yogesh, (2016)

### 3.6.2 Physical Fitness Tests

The detailed descriptions of the physical fitness tests conducted on the subjects are as follows:

#### 3.6. 2.1. Agility Test (Illinois Agility Run Test)

Illinois Agility Run Test adapted from Davis et al (2000) will employ to test the trainee's agility performance.

**Required Resources;** A flat non-slip surface, measuring tape, 8 cones, a stopwatch, Assistant will be used to conduct the test. The course measures 10m in length and 5m in width.

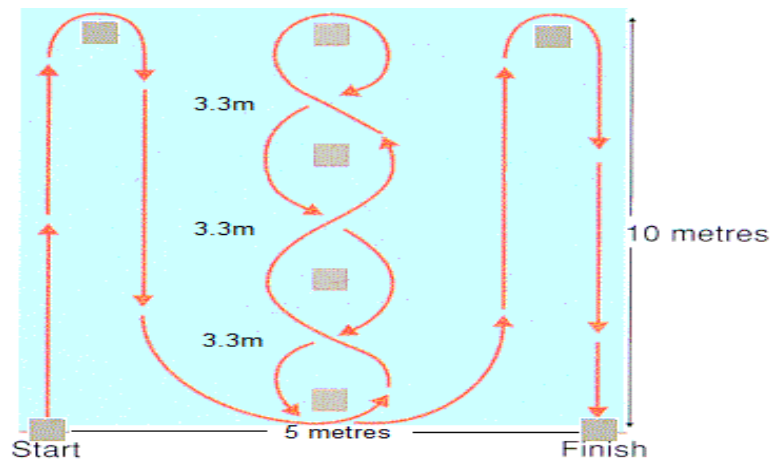


Figure 4 Illinois Agility Run Test Source: Davis et al. 2000

### Testing procedure:

This test requires the athlete to run the line's route in the diagram below as fast as possible.

- ✓ The athlete warms up for 10 minutes
- ✓ The assistant sets up the course as detailed in the diagram
- ✓ The athlete lies face down on the floor at the “Start” cone the assistant gives the command “GO” and starts the stopwatch.
- ✓ The athlete jumps to her feet and negotiates the course around the cones following the
- ✓ The assistant stops the stopwatch and records the time when the athlete passes the “Finish” cone.
- ✓ Three successful trials will be completed
- ✓ Finally, the assistant uses the fastest recorded time.

### 3.6.2.3 Muscular strength

#### The pull-up test

**Purpose:** Use to measure muscular strength.

**Required equipment:** To undertake this test, the researcher was required an overhead bar, assistance, a record sheet, and a pencil.

### How to conduct the test

- ✚ First of all, an athlete conducts warm up for 5 minutes
- ✚ Then athletes grasp the overhead bar using either an overhand grip or underhand grip, with the arms fully extended.
- ✚ The subject then raises the body until the chin clears the top of the bar,
- ✚ Then lowers again to a position with the arms fully extended.
- ✚ The pull-up performs in a smooth motion. Jerky motion, swinging the body, and bending the legs is impossible. As many full pull-ups as possible are performed.

**Scoring:** The total number of correctly completed pull-ups recorded as a score.



Figure 5 pull-up test Source. Thakur R, et al., (2016)

### 3.7 Methods of Data Analysis

The data was gathered from experimental methods. Pre-test and post-test results on some selected physical fitness qualities and passing performance tests have been taken by using field tests. The collected data will be analyzed by using SPSS software (version 23). Within-group and between-group comparisons were made using the paired t-test and independent t-test respectively. These include mean, standard deviations, (t), and (p) values with a 95% of the confidence interval or the level of significance at 0.05. The results were displayed using tables.



### **3.8 Reliability and Validity of instruments**

Test reliability was assured by establishing quality and essential equipment, and reliability of a test and trainee's reliability. The researcher had some practice sessions in the testing procedures with the guidance of the respective experts to ensure the uniformity and reliability of the testing technique. The researcher took all the tests for the study with the assistance of professional experts'. In addition Cronbach's alpha reliability statistics: agility (0.83), muscular strength (0.87), passing accuracy (0.89) and speed dribble (0.90)

### **3.9 Training Protocol**

The calisthenics group carried out 8 weeks of calisthenics-based training 3 times a week (Thomas et al., 2017), (Panihar & Rani, D. 2022) and were randomly assigned to 2 groups. Group A followed regular soccer training and Group B received calisthenics training along with regular soccer training for 3 days/week for 8 weeks.

In other studies, Darwin Engels, & Singh (2020) selected subjects were randomly divided into two groups namely the calisthenics exercise group and the control group. The calisthenics exercise group underwent 8 weeks of calisthenics exercises program, for 3 days a week, for 45 minutes per day, under the supervision of the guide. The control group does not undergo any specific training during 8 weeks program.

Calisthenics exercise will be given to the experimental group. The training went on for eight weeks on Monday, Wednesday, and Saturday.

A total of 24 days would be given in for training sessions. The experimental group namely calisthenic exercises were administered for the duration of 8 weeks and the number of sessions per week was confined to three days each session lasted between 60 minutes including warming up and cool down exercises. These calisthenics exercises were given to the research participants for eight weeks. These include Foot tape, jumping squats, and lunge; side lunge, Triceps Dip, single-leg vertical jumps, split squat jump, top jump, pull-up dig, clapping push-ups, and Chin-ups.

### **3.10 Ethical Considerations**

The study was conducted in such a way that ethical issues were properly addressed. After having letters of permission from Bahir Dar university sports academy for ethical approval, the researcher has been going to the Bahir Dar university sport academy Handball project. Next, the researcher has contact with the parents and coaches for permission. Then after agreeing with the concerned participants, the researchers also introduced the objectives and purposes of the study.

## CHAPTER FOUR

### 4. RESULTS AND DISCUSSION

#### 4.1 Introduction

The purpose of this study was to investigate the effect of 8-week Calisthenics exercise on selected physical fitness qualities and handball performance of Bahir Dar university u-17 female handball players. This chapter deals with the analysis of pre and post-test data collected from randomly selected experimental (n=10) and control (n=10) groups under the study. The selected physical fitness components of this study were muscular strength and agility. For handball skill tests passing accuracy and speed dribble. Pre-test and post-tests were taken from both experimental and control groups before and after 8 weeks of calisthenics exercises intervention in the experimental group, and the scores were recorded. The collected data were analyzed using paired sample t-test to analyzed pre-test and post-test results of muscular strength, agility, passing accuracy, and speed dribbling for both groups and used independent t-test to compare the pre-test and post-test results of the control and experimental group.

#### 4.2 Results of the Study

*Table 4: Demographic characteristics of the participant*

Group	N	Sex	age		height		weight		playing experience
			Mean	S.D	Mean	S.D	Mean	S.D	in year
Experimental group	10	Female	16.2	0.789	1.576	0.05461	50.20	4.6856	2
Control group	10	Female	16.0	0.816	1.476	0.06257	51.200	5.2873	2

As shown the above, in table 1, descriptive characteristics of 20 study participants from Bahir Dar University female handball project players mean of age (EG= 16.20, CG = 16) height (EG = 1.576, CG = 1.476) and weight (EG = 50.20, CG = 51.20) and playing experience for both EG and CG are 2 years, subjects where relatively had the same age, height weight, and Playing experience.

*Table 5: Descriptive Statistics of physical fitness qualities*

Variables	CG							
	Mean std. deviation				Mean std. deviation			
	PT		POT		PT		POT	
Agility	20.40	1.50555	18.07	0.53396	21.20	1.0328	20.70	1.33749
Muscular Strength	4.00	1.05409	6.60	1.42984	4.100	0.9944	4.800	1.03280

Key: - EG=Experimental group, CG= Control group, PT= pre-test, POT= post-test.

The above table shows the pre and post-test results of the agility test for both experimental and control groups. As shown in the table the pre-test score of EG was found to be 20.40 1.50555 whereas the CG pre-test score was found to be 21.20 1.0328. The post-test score of EG was were 18.070 0.53396, whereas the CG post-test score was found to be 20.70 1.3374. The result indicates that the mean value of the EG agility test before giving eight weeks of calisthenics exercise was higher than that after calisthenics exercise. But the mean value of CG stays very close from pre to post-test.

The above table also shows analyzed data from the muscular strength test. The pre-test score of EG was found to be 4.000 1.05409, whereas the CG pre-test score was found to be 4.100 0.9944. The post-test score of the EG was 6.60 1.42984 whereas CG was found to be 4.8000 1.03280. The result indicated that the mean value of EG muscular strength before giving calisthenics exercise was lower than that after calisthenics exercise. But the mean value of CG stays very close from pre to post-test.

*Table 6: Paired sample t-test results of fitness variables for the two groups of pre and post-test*

<b>Variables</b>	<b>Groups</b>	<b>Mean</b>	<b>SD</b>	<b>T</b>	<b>df</b>	<b>P</b>
Agility	EG = PT-POT	2.33	1.1844	6.221	9	0.000
	CG = PT-POT	0.50	1.2693	1.246	9	0.244
Muscular strength	EG = PT-POT	-2.60	1.3499	-6.091	9	0.000
	CG = PT-POT	-0.70	1.05935	-2.090	9	0.066

Key: - EG=Experimental group, CG= Control group, PT= pre-test, POT= post-test, MD=mean difference, SD=Standard deviation and df= degree of freedom.

The above table paired t-test result indicates the test of significance differences of the two groups (EG and CG) of pre and post-test results. Based on the data presented in the table the pre and post-test results of agility showed a statistically significant difference in EG. The result suggests that EG significantly improved (MD= 2.3300, SD = 1.1844, p=0.000) when exposed to 8 weeks of calisthenics exercise. But no significant difference was observed in CG (MD=0.5000, SD=1.26930, p=0.244).

The above table also shows that EG significantly improved Muscular strength (MD= -2.60000, SD = 1.34990, p=0.000) after 8 weeks of calisthenics exercise. But no significant difference was observed in CG (MD= -0.7000, SD=1.05935, p=0.066).

*Table 7: Descriptive statistics of passing accuracy and speed dribble.*

Skill Test	EG				CG			
	Mean std. deviation				Mean std. deviation			
	PT		POT		PT		POT	
Speed Dribble	16.90	1.9692	12.90	1.5951	17.30	2.0027	16.70	1.8885
7m	13.30	4.3217	20.50	2.6770	13.70	3.2676	13.70	4.0013
Passing accuracy								
10m	14.40	3.8930	18.00	3.2317	13.00	3.1622	13.50	2.7182
Passing accuracy								

Key: - EG=Experimental group, CG= Control group, PT= pre-test, POT= post-test.

The above table shows the pre and post-test results of Speed dribble for both experimental and control groups. As shown in the table the pre-test mean of EG was found 16.90 with a standard deviation of 1.9692 and the CG pre-test mean was found to be 17.30 with a standard deviation of 2.0027. But after the 8-week calisthenics exercise given to EG, the mean score of Speed dribble for EG has a great change from pre to post-test but the mean value of CG stays very close from pre to post-test. As the table shows, the Speed Dribble score of EG mean found 12.90 with a standard deviation of 1.5951 after 8-week calisthenics exercise whereas the CG post-test mean found 16.7000 with a standard deviation of 1.8885.

In addition to passing score, the above table shows analyzed data of passing accuracy from 7m and 10m distances. Accordingly, the pre-test score of EG from 7m distance was found to be 13.30 4.3217 and the CG pre-test score was found to be 13.70 3.2676. But after 8-week calisthenics exercise was given to EG, the passing accuracy score of EG was found to be 20.50 2.6770 whereas, CG found 13.70 4.0013.

In the case of 10m distance, the EG pre-test score was found to be 14.40 3.8930 and CG scored 13.00 3.1622. The post-test score of EG was found to be 18.00 3.2317 whereas, CG was found to be 13.50 2.7182.

*Table 8: Mean comparison results of handball skill test for both groups of pre and post*

Variables	Groups	Mean	SD	T	df	P
Speed dribble	EG =PT-POT	4.000	1.6996	7.442	9	0.000
	CG =PT-POT	0.600	1.0749	1.765	9	0.111
7m	EG =PT-POT	-7.200	2.3944	9.509	9	0.000
Passing accuracy	CG =PT-POT	0.000	3.4960	0.000	9	1.000
10m	EG =PT-POT	-3.600	2.0655	-5.511	9	0.000
Passing accuracy	CG =PT-POT	-0.500	2.7182	-0.582	9	0.575

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Key: EG= Experimental group CG = control group PT post-test POT = post-test, SD= standard deviation, df = degree of freedom

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The above table shows the test of significant differences between the two groups (EG and CG) of pre and post-test results. According to the data presented in the table, the pre and post-test results of speed dribble showed a statistically significant difference in EG. The result suggests that EG significantly decrease a time (MD= 4.000, SD=1.6996, p=0.000) when exposed to 8m weeks calisthenics exercise than CG (MD= 0.600, SD= 1.0749, p=0.111). Hence, ( $P < 0.05$ ) post-test speed dribble was significantly improved than pre-test scores for the EG. But no significant improvement was observed in CG ( $P > 0.05$ ).

The above table also shows the test of significant difference between the two groups (EG and CG) of pre and post-test results of passing accuracy from 7m and 10m. According to the data presented in the table, the pre and post-test results of passing accuracy from 7m for the EG showed a statistically significant difference (MD= -7.200, SD= 2.3944,  $P = 0.000$ ).

Hence, ( $P < 0.05$ ) post-test scores were significantly increased than the pre-test score for the EG. But, no significant difference was observed in 7m passing accuracy score of CG between pre-and post-testing ( $MD = 0.000$ ,  $SD = 3.4960$ ,  $P = 1.0$ ) ( $P > 0.05$ ).

Similarly the pre and post-test result of passing accuracy from 10 m for the EG showed a statistically significant difference ( $MD = -3.600$ ,  $SD = 2.0655$ ,  $P = 0.000$ ) hence, ( $P < 0.05$ ).

But no significant difference was observed in 10m passing accuracy score of CG between pre and post-test ( $MD = -0.500$ ,  $SD = 2.7182$ ,  $P = 0.575$ ). The result shows that eight weeks of calisthenics exercise caused a significant improvement in total passing accuracy from 7m & 10m distance in EG

*Table 9: Independent Sample t-test result measured between the experimental and control group of pre-test in physical fitness variables.*

Variables	Group	Df	Mean	SD	p-value
Pre-test	Control	9	21.20	1.0328	0.185
Agility	Experimental	9	20.40	1.5055	
Pre-test	Control	9	4.100	0.9944	0.830
muscular strength	Experimental	9	4.100	1.0540	

Key: DF= degree of freedom, SD= standard deviation

The above table also displays the significance differences between the two groups (CG and EG) of pre-test results. The mean values of physical fitness variables pre-test of the control and experimental group were 21.20 and 20.40 in agility and the standard deviation was 1.0328 and 1.5055 respectively. And also the mean values of control and experimental groups muscular strength were 4.100 and 4.100; the standard deviation value was 0.9944 and 1.0540 respectively. From the data, we can see that in the above table, the P-value of the agility test was 0,185 and for muscular strength was 0.830. The results indicated that the two groups (EG and CG) have no significant difference observed in the pre-test result of agility and muscular strength ( $P > 0.05$ ).



*Table 10: Independent Sample t-test result measured between the experimental and control group of post-test in physical fitness variables.*

Variables	Group	Df	Mean	S.D	p-value
Post-test agility	Control	9	20.700	1.33749	0.000
	Experimental	9	18.070	0.53396	
Post-test muscular strength	Control	9	4.800	1.03280	0.005
	Experimental	9	6.600	1.42984	

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Key: DF= degree of freedom, SD= standard deviation

The above table 8 also displays the significance differences between the two groups (EG and CG) of post-test results. The mean values of physical fitness variables post-test of the control and experimental group were 20.70 and 18.070 in agility and the standard deviation was 1.33749 and 0.53396 respectively. And also the mean values of control and experimental groups muscular strength were 4.800 and 6.600; the standard deviation value was 1.03280 and 1.42984 respectively. From the data, we can see that in the above table, the P-value of the agility test was 0.000 and for muscular strength was 0.005. According to the data presented in the table, the post-test result of EG was significantly improved in agility and muscular strength than post-test result of CG ( $P < 0.05$ ).

*Table 11: Independent Sample t-test result measured between the experimental and control group of pretest in technical skill variables.*

Variables	Group	Df	Mean	S.D	p-value
Pre-test 7m	Control	9	13.70	3.2676	0.818
passing accuracy	Experimental	9	13.30	4.3217	
Pre-test 10m	Control	9	13.00	3.1622	0.390
passing accuracy	Experimental	9	14.40	3.8930	
Pre-test	Control	9	17.30	2.0027	0.658
Speed dribble	Experimental	9	16.90	1.9692	

Key: DF= degree of freedom, SD= standard deviation

The above table also displays the significance differences between the two groups (CG and EG) of pre-test results. The mean values of handball skill variables pre-test of the experimental and control group were 13.70 and 13.3000 in 7m passing accuracy and the standard deviation was 3.26769 and 4.32178 respectively. In addition, the data as shown in the above table, the mean values of experimental and control groups 10m passing accuracy were 13.0000 and 14.4000; standard deviation value was 3.16228 and 3.89301 respectively. Similarly, in the case of speed dribble mean values were 17.3000 and 16.9000 and the standard deviation was 2.00278 and 1.96921 respectively. From the data, we can see that in the above table, the P-value of 7m passing accuracy was 0.818, for 10m passing accuracy was 0.390 and for speed, dribble was 0.658. The results indicated that the two groups (EG and CG) have no significant difference observed in the pre-test result of 7m passing accuracy, 10m passing accuracy, and speed dribble ( $P > 0.05$ ).

*Table 12: Independent Sample t-test result measured between the experimental and control group of posttest in technical skill variables.*

Variables	Group	Df	Mean	S.D	p-value
Posttest 7m passing accuracy	Control	9	13.70	4.00139	0.000
	Experimental	9	20.50	2.67706	
Posttest 10m passing accuracy	Control	9	13.50	2.71825	0.004
	Experimental	9	18.00	3.23179	
Post-test Speed dribble	Control	9	16.70	1.88856	0.000
	Experimental	9	12.90	1.59513	

Key: DF= degree of freedom, SD= standard deviation

The above table 8 also displays the significance differences between the two groups (CG and EG) of post-test results. The mean values of handball skill variables post-test of the experimental and control group were 13.70 and 20.500 in 7m passing accuracy and the standard deviation was 4.00139 and 2.67706 respectively. And also the mean values of experimental and control groups 10m passing accuracy were 13.50 and 18.00 standard deviation value was 2.71825 and 3.23179 respectively.

Similarly, in the case of speed dribble mean values were 16.70 and 12.90 and the standard deviation was 1.88856 and 1.59513 respectively. From the data we can see that in the above table, the P-value of 7m passing accuracy was 0.000, for 10m passing accuracy was 0.004 and for speed, dribble was 0.000. According to the data presented in the table, the post-test result of EG was significantly improved in 10m passing accuracy, 10m passing accuracy, and speed dribble than post-test result of CG ( $P < 0.05$ ).

## **CHAPTER FIVE**

### **5. DISCUSSION AND IMPLICATION**

#### **5.1 Discussions**

The aim of this study was to examine the effect of eight weeks of calisthenics exercise on some selected physical fitness qualities and skill performance in the cause of Bahir Dar University u-17 female handball players.

The experimental group participated in eight-week calisthenics exercise. But the control group did not participate in this selected calisthenics exercise program. Based on the finding of the study, the experimental group has a significant positive effect on selected physical fitness qualities and handball skills of passing accuracy and speed dribble. The CG had not shown significant on selected physical fitness qualities and handball skill of passing accuracy and speed dribble. In this study the effect of eight weeks of calisthenics exercises on agility, muscular strength, and handball performance.

##### **5.1.1 The effect of calisthenics exercise on agility**

The finding of the present study reveals that calisthenics exercise has had a significant effect on agility. The effect of calisthenics exercise on agility there was a significant difference in paired t-test score of EG and independent-sample t-test score between two groups (EG and CG) post-test. Whereas, the paired t-test score of CG and independent-sample t-test score of two groups (EG and CG) pre-test had not seen a significance difference. The result suggests that EG significantly improved agility from (MD =2.330, SD=1.1844,  $p=0.000$ ). Hence, ( $P < 0.05$ ) EG was significantly improved. But CG (MD=0.500, SD=1.26930,  $p=0.244$ ), not significant at 0.05 level of confidence. The independent sample t-test result indicated that EG significantly improved than CG as observed in post-testing ( $p = 0.000$ ,  $P < 0.05$ ).

As the data (table 5) showed the mean values of the agility were 20.400 in before calisthenics exercise, which was improved to 18.070 after 8 weeks of calisthenics exercise; this means that the agility score test of EG decreased time by 2.33 seconds after 8 weeks of calisthenics exercise. But the pre and post-test scores of CG stay very close to 21.20 and 20.70 pre and post-test respectively. This indicates that eight weeks of calisthenics exercise has a positive significant effect on agility in handball. Hence the researcher accepted hypothesis H1.1 at a 0.05 level of confidence

This result was in agreement with the findings in accordance to Santhosh, R., & Davidson(2021) on the effect of calisthenics exercise on selected motor fitness variables among slum boys during covid-19. The results of the study showed that there was a significant improvement in agility. The finding of the present study also agrees with the findings of (SINGTHIN & Sriramatr's, 2019) study was to assess the effects of Calisthenics and Pilates core muscle training on the agility of football players.

(Sarasin, 2019) his study was on the effects of Pilates, calisthenics, and plyometric training on the physical performance of volleyball players. There is a significant difference between the two means of groups of calisthenics exercise on agility. The result is also supported by the finding of (Panihar, & Rani, 2022) that studies the effect of calisthenics training on physical fitness parameters and sports specific skills of soccer players: in a randomized controlled trial. Experimental group significant improvement was seen during for the Illinois agility test.

**Implication:** The main aim of this study was to examine the effect of eight weeks of calisthenics exercise on the agility of physical fitness and skill performance in the case of Bahir Dar University u-17 female handball project players. Based on the result of the study calisthenics exercise have a positive significance on the agility of handball player. Calisthenics exercise is used to develop agility performance of handball players. So, these training methods are suggested to players and coaches for improving agility performances.

This implication is supported by Santhosh, & Davidson (2021) calisthenics exercise caused improvements in selected motor fitness variables among slum boys during Covid-19. The results of the study showed that there was a significant improvement in the selected motor fitness variables of agility as a result of performing.

### **5.1.2 The effect of calisthenics exercise on muscular strength**

The finding of the present study reveals that calisthenics exercise has had a significant effect on muscular strength. The effect of calisthenics exercise on muscular strength there was a significant difference in paired t-test score of EG and independent-sample t-test score between two groups (EG and CG) post-test. Whereas, the paired t-test score of CG and independent-sample t-test score of two groups (EG and CG) pre-test had not seen a significance difference. The result suggests that EG significantly improved muscular strength (MD = -2.600, SD= 1.34990,  $p=0.000$ ). Hence, ( $P < 0.05$ ) EG was significantly improved. But CG (MD= -0.700, SD=1.05935,  $p=0.066$ ), ( $P > 0.05$ ) not significant at 0.05 level of confidence. The independent sample t-test result indicated that EG significantly improved than CG as observed in post-testing ( $p = 0.005$ ,  $P < 0.05$ ).

To the data (table 5) showed mean values of muscular strength were 4.000 before calisthenics exercise, which was improved to 6.600 after the 8-week calisthenics exercise program, EG shows an improvement in their muscular strength. The number of pull up performed at one time increased by 2.60 but the pre and post-test scores of CG stay very close to 4.100 and pre and post-test 4.800 respectively. This indicates that eight weeks of calisthenics exercise has a positive significant effect on muscular strength in handball. Hence the researcher accepted hypothesis H1.2 at 0.05 level of confidence.

This result is in agreement with the findings of Srivastava R, (2016) his study conducted on the effects of 12 weeks of Pilate, calisthenics, and combined exercise on selected physical fitness skills. The result indicated that calisthenics exercise showed a significant effect on the muscular strength performance of the athlete than the control group.

This result is also supported by the finding of Thakur. R, et. , al (2016) studies conducted on the effect of calisthenics and non-calisthenics exercise on physical fitness components. The result indicated that the calisthenics exercise program might be help full for the sustainable development of muscular strength. Some finding also presented by (E. Thomas et al. 2017) (2017) studies how a calisthenics training intervention affects body composition, strength, and posture. The pull up-test a significant improvement ( $p < 0.0001$ ) is shown between SG pre vs. SG post.

**Implication:** The main aim of this study was to examine the effect of eight weeks of calisthenics exercise on the muscular strength of physical fitness and skill performance in the case of Bahir Dar University u-17 female handball project players. Based on the result of the study calisthenics exercise have a positive significance on the muscular strength performance of handball player. Calisthenics exercise is used to develop the muscular strength performance of handball players. This implication is supported by ( Srivastava R, 2016) who studied on effects of 12 weeks Pilate, calisthenics, and combined exercise on selected physical fitness skills. The result indicated that calisthenics exercise showed a significant effect on muscular strength performance.

### **5.1.3 The effect of calisthenics exercise on speed dribble**

The finding of the present study reveals that calisthenics exercise has had a significant effect on the speed of dribble. The effect of calisthenics exercise for speed dribble there was a significant difference in paired t-test score of EG and independent-sample t-test score between two groups (EG and CG) post-test. Whereas, the paired t-test score of CG and independent-sample t-test score of two groups (EG and CG) pre-test had not seen a significance difference. The result suggests that EG significantly improved the speed dribble score test (MD 4.00, SD=1.69967,  $p=0.000$ ). Hence, ( $P < 0.05$ ) EG was significantly improved. But CG (MD=0.6000, SD=1.07497,  $p=0.111$ ), ( $P > 0.05$ ) not significant at 0.05 level of confidence. The independent sample t-test result indicated that EG significantly improved than CG as observed in post-testing ( $p = 0.000$ ,  $P < 0.05$ ).

As the data (table 7) the analysis result indicated that the showed mean values of speed dribble were 16.900 before the calisthenics exercise program, which was improved to 12.900 after the 8-week calisthenics exercise program, EG shows an improvement in their speed dribble. This means that the speed dribble score test of EG decreased time by 4.00 seconds after 8 weeks of calisthenics exercise. But the pre and post-test scores of CG stay very close to 17.300 and 16.700 pre and post-test respectively. This indicates that 8 calisthenics exercise has a positive significant effect speed dribble on in handball. Hence the researcher accepted hypothesis H1.3 at 0.05 level of confidence.

This result of speed dribble variables discussed above was in agreement with Kizer, (1968). Attitudes and Basketball Skill: The Effects of Calisthenics and Pre activity Warm-up upon Basketball Skill and Attitudes toward Physical Education. There was a significant difference between the pre-test and post-test mean scores within the experimental group regarding basketball skills. The result indicated that calisthenics exercise showed a more significant effect on the dribbling performance of the athlete than in the control groups.

**Implication:** The main aim of this study was to examine the effect of eight weeks of calisthenics exercise on speed dribble physical fitness and skill performance in the case of Bahir Dar University u-17 female handball project players. Based on the result of the study calisthenics exercise have a positive significance on the speed dribble performance of handball player. Calisthenics exercise is used to develop speed dribble performance of handball players.

#### **5.1.4 The effect of calisthenics exercise on passing accuracy**

The finding of the present study reveals that calisthenics exercise has had a significant effect on the 7m passing accuracy. The effect of calisthenics exercise for 7m passing accuracy there was a significant difference in paired t-test score of EG and independent-sample t-test score between two groups (EG and CG) post-test. Whereas, the paired t-test score of CG and independent-sample t-test score of two groups (EG and CG) pre-test had not seen a significance difference. The result suggests that EG significantly improved passing accuracy from 7m (MD= -7.20000, SD =2.39444, p=0.000).



Hence, ( $P < 0.05$ ) EG was significantly improved. But CG ( $MD=0.000$ ,  $SD=3.49603$ ,  $p=1.000$ ), not significant at 0.05 level of confidence. The independent sample t-test result indicated that EG significantly improved than CG as observed in post-testing ( $p = 0.000$ ,  $P < 0.05$ ).

As the data (table 7) showed the mean values of the 7m passing accuracy pretest score were EG= 13.300 before the calisthenics exercise program. which was increased to EG= 20.500 after 8 weeks of calisthenics exercise program, this means 7m passing accuracy performance of EG increased by 7.20 points after the after 8 weeks of calisthenics exercise. But the pre and post-test scores of CG stay the same at 13.700 and 13.700 pre and post-test respectively.

The final findings of the study also revealed that the calisthenics exercise program had an effect on the 10m passing accuracy of female handball players. The effect of calisthenics exercise for 10m passing accuracy there was a significant difference in paired t-test score of EG and independent-sample t-test score between two groups (EG and CG) post-test. Whereas, the paired t-test score of CG and independent-sample t-test score of two groups (EG and CG) pre-test had not seen a significance difference. The result suggests that EG significantly improved passing accuracy from 10m ( $MD= -3.60000$ ,  $SD =2.06559$ ,  $p=0.000$ ). Hence, ( $P < 0.05$ ) EG was significantly improved. But CG ( $MD=-0.500$ ,  $SD=3.49603$ ,  $p=0.575$ ), not significant at 0.05 level of confidence.

The independent sample t-test result indicated that EG significantly improved than CG as observed in post-testing ( $p = 0.004$ ,  $P < 0.05$ ). As the data (table 7) showed the mean values of the 10m passing accuracy pretest score were EG= 14.400 before the calisthenics exercise program. which was increased to EG= 18.00 after 8 weeks of calisthenics exercise program, this means 10m passing accuracy performance of EG increased by 3.60 points after the after 8 weeks of calisthenics exercise. But the pre and post-test scores of CG stay very close to 13.000 and 13.5000 pre and post-test respectively. This indicates that eight weeks of calisthenics exercise has a positive significant effect on passing accuracy on handball. Hence the researcher accepted hypothesis H1.4 at 0.05 level of confidence.

The finding of passing accuracy discussed above was in accordance with Mulu, A. (2021) who studied the effect of eight weeks of strength training on passing and shooting skills of a handball in the case of woreta secondary and preparatory school female students. The result showed that strength training significantly improved passing skills in the experimental group at ( $p < 0.05$ ). But no significant differences were found in the variable control group ( $p > 0.05$ ). This finding is also in agreement with Kizer, (1968) determine attitudes and basketball Skills: The Effects of Calisthenics and Pre activity Warm-up upon Basketball Skill and Attitudes toward Physical Education. There was a significant difference between the pre-test and post-test mean scores within the experimental group regarding basketball skills. The result indicated that calisthenics exercise showed a significant effect on the passing performance of the athlete than the control groups.

**Implication:** The main aim of this study was to examine the effect of eight weeks of calisthenics exercise on passing accuracy physical fitness, and skill performance in the case of Bahir Dar University u-17 female handball project players. Based on the result of the study calisthenics exercise have a positive significance on the passing accuracy of physical fitness player. Calisthenics exercise is used to develop the passing accuracy performance of handball players. This implication is supported by Kizer's (1968) calisthenics exercise showed a significant effect on passing performance.

## **CHAPTER SIX**

### **6. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS**

#### **6.1 Conclusion**

Based on the major findings and results of this study, the following points were stated as a conclusion.

- Eight weeks of calisthenics exercise has greater significance in improving the agility of u- 17 female handball project players.
- Eight weeks of calisthenics exercise has greater significance in improving the muscular endurance of u-17 female handball project players.
- Eight weeks of calisthenics exercise has greater. Significantly in improving the speed dribble of u-17 female handball project players.
- Eight weeks of calisthenics exercise has greater significance in improving the passing accuracy of u-17 female handball project players.

#### **6.2 Limitation of the study**

The following limitations were encountered by the researcher while conducting this study. First, the number of the population is too little because, for this reason, the researcher used all samples so there are heterogeneous variable events and it was having an effect on the result of the study. Second, the subjects were not always able to exercise at the same time of the day, because they were busy preparing for the mid-year examination. The subjects had to exercise when they were able to fit it into their schedule. Third lack of Lack technology. Forth, the other limitation was the researcher did not control the player's extraneous variables such as ways of lifestyle, diet, time management, nutrition, and air resistance, which may be different and may not be controlled.

### 6.3 Recommendations

Based on the results, discussions, and findings of the study, the following would be recommended:

- As noted in the results of the present study, calisthenics exercise is more effective to enhance physical fitness qualities and handball performance. So, coaches and handball players are highly recommended to include this training in their training program.
- Trainers should focus on developing agility, and muscular strength for their main role in enhancing the physical and skill performance of handball players.
- Coaches also recommended raising trainers' awareness of the importance of calisthenics exercises to improve some physical fitness quality and handball skill performance of handball players.
- The study was conducted only to investigate the effects of calisthenics exercise on some selected physical fitness variables (agility, muscular strength) and handball performance (passing performance and dribble). So, it is recommended for others with other physical fitness qualities and handball skills.
- Calisthenics exercise can be recommended as a mode of training to enhance the physical fitness quality and passing performance of handball players.
- This research was done for eight weeks Calisthenics exercise program, yet the program may be extended for a better performance enhancement in handball performance and fitness variables, similar study may undertake by employing subjects of other sex, age, and using other variables, which are not observed in this study.

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## APPENDIX A: Eight-week Calisthenics exercises plan

### Week one

D a y	Phase	Exercise	Intensity	Set	Rep.	Rest b/n set sec	Rest b/n exercise in sec	Duration in minutes
M o n d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with the ball, and stretching.	Moderate					10
	Main part	-jumping jacks -Alternative toe taps - chin up - lunges	High	4 4 3 3	10 10 10 10	30sec 30sec 40sec 40sec	1 minte	45
	Cooling down	-light movements -static stretching	Low					5
W e d n e s d a y	Warming Up exercise	Jogging, running, different movement of arm and leg, warming up with the ball, and stretching.	Moderate					10
	Main part	-split squat jump -double jump with swinging arms -chain biceps pull - shuttle run	High	3 3 2 3	10 10 10 10			
	Cooling down	-light movements -static stretching	Low					5
S t u r d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					
	Main Part	- Jumping jacks -Alternative toe tabs - regular pull up - straight dips -Heel teach	High	3 3 3 2 3	10 10 10 8 6	30sec 30sec 30sec 40sec 30sec	1 mint	45
	Cooling down	-light movements -static stretching	Low					5

## Week two

D a y	Phase	Exercise	Intensity	Set	Rep.	Rest b/n set sec	Rest b/n exercise in sec	Duration in minutes
M o n d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with the ball, and stretching.	Moderate					10
	Main part	- Opposite arm swing - squat single leg - squat jump - Pull up - digs	High	2 2 3 3	10 10 10 10	30sec 30sec 40sec 40sec	1minte	45
	Cooling down	-light movements -static stretching	Low					5
W i n e s d a y	Warming Up exercise	Jogging, running, different movement of arm and leg, warming up with the ball, and stretching.	Moderate					10
	Main Part	-Opposite arm swing - squat single leg -squat jump -Pull up		3 3 2 3	10 10 10 8	30sec 30sec 30sec 40sec	1minte	
	Cooling down	-light movements -static stretching	Low					5
S t u r d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with the ball, and stretching.	Moderate					10
	Main Part	- Opposite arm swing - Split squat jump - Diamond push up - Pull up - straight digs	High	3 3 3 2 3	10 10 8 10 10	30sec 30sec 30sec 40sec 30sec	1 mint	45
	Cooling down	-light movements -static stretching	Low					5

### Week three

D a y	Phase	Exercise	Intensity	Set	Rep.	Rest b/n set sec	Rest b/n exercise in sec	Duration in minutes
M o n d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with the ball and stretching.	Moderate					10
	Main part	- Side lunges - squat single leg - squat jump - Pull up	High	2 2 3 3	10 10 10 10	30sec 30sec 40sec 40sec	1 minte	45
	Cooling down	-light movements -static stretching	Low					5
W e d n e s d a y	Warming Up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					10
	Main part	-split squat jump -double jump with swinging arms -biceps pull -pull up	High	3 4 3 3	10 10 10 10			
	Cooling down	-light movements -static stretching	Low					5
S t u r d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					
	Main Part	- jumping jacks 90 degree - alternative jump - Chin up - pull up - Straight dips	High	3 3 3 2 3	10 10 10 8 10	30sec 30sec 30sec 40sec 30sec	1 mint	45
	Cooling down	-light movements -static stretching	Low					5

**Week four**

D A Y	Phase	Exercise	Intensity	Set	Rep.	Rest b/n set sec	Rest b/n exercise in sec	Duration in minutes
M O n d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					10
	Main part	- reversed jumping jacks - foot taps - plank - pull up - straight dips	High	2 2 3 3 2	10 10 10 10 10	30sec 30sec 40sec 30sec 40sec	1minte	45
	Cooling down	-light movements -static stretching	Low					5
W D n e s d a y	Warming Up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					10
	Main part	-split squat jump -double jump with swinging arms -pull up -Foot tape	High	3 3 2 3	10 10 8 10	30sec 30sec 40sec 30sec	1minte	
	Cooling down	-light movements -static stretching	Low					5
S t u r d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					
	Main Part	-Split squat -Long jump without stop -foot taps -pull up -lunge	High	3 3 3 2 3	10 10 10 8 10	30sec 30sec 30sec 40sec 30sec	1 mint	45
	Cooling down	-light movements -static stretching	Low					5

**Week five**

D A y	Phase	Exercise	Intensity	Set	Rep.	Rest b/n set sec	Rest b/n exercise in sec	Duration in minutes
M o n d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					10
	Main part	-Alternative toe taps - Australian pull up -Single squat jump -opposite arm swing -Pull up	High	4 2 3 3 4	10 10 10 10 10	30sec 30sec 40sec 40sec 30sec	1minte	45
	Cooling down	-light movements -static stretching	Low					5
W d n e s d a y	Warming Up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					10
	Main part	-foot tape - chain biceps pull up -Single squat jump -Pull up	High	4 2 3 3	10 10 10 10	30sec 40sec 40sec 30sec	1minte	
	Cooling down	-light movements -static stretching	Low					5
S t u r d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					
	Main Part	- Chin up - regular pull up -side lunge -wall push up	High	3 3 3 2	10 10 10 10	30sec 30sec 30sec 40sec	1 mint	45
	Cooling down	-light movements -static stretching	Low					5

### Week six

D a y	Phase	Exercise	Intensity	Set	Rep.	Rest b/n set sec	Rest b/n exercise in sec	Duration in minutes
M o n d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					10
	Main part	<ul style="list-style-type: none"> <li>- Pistol squat</li> <li>- Opposite arm swing</li> <li>- Pull up</li> <li>- Lunges</li> <li>- Foot tape</li> </ul>	High	2 2 3 3 3	10 8 10 10 10	30sec 30sec 40sec 40sec 30sec	1 minte	45
	Cooling down	-light movements -static stretching	Low					5
W d n e s d a y	Warming Up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					10
	Main part	<ul style="list-style-type: none"> <li>-split squat jump</li> <li>-double jump with swinging arms</li> <li>-Pull up</li> <li>-front plank</li> </ul>	high					
	Cooling down	-light movements -static stretching	Low					5
S t u r d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					
	Main Part	<ul style="list-style-type: none"> <li>-Jumping jacks</li> <li>-Alternative toe tabs</li> <li>- regular pull up</li> <li>-chin up</li> </ul>	High	3 3 3 2	6sec 6sec 10 8	30sec 30sec 30sec 40sec	1 mint	45
	Cooling down	-light movements -static stretching	Low					5



### Week seven

D a y	Phase	Exercise	Intensity	Set	Rep.	Rest b/n set sec	Rest b/n exercise in sec	Duration in minutes
M o n d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					10
	Main part	-side lunges - Alternative toe tape - pull up - dips	High	2 3 3 3	10 10 10 10	30sec 30sec 40sec 40sec	1 minte	45
	Cooling down	-light movements -static stretching	Low					5
W d n e s d a y	Warming Up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					10
	Main part	- jumping jacks - double jump with swinging arm - chin up -chain biceps pull up	High	2 2 3 3 3	10 10 10 10 8			
	Cooling down	-light movements -static stretching	Low					5
S t u r d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					
	Main Part	-Jumping jacks -Alternative toe tabs - regular pull up -side lunges	High	3 3 3 2	10 10 10 8	30sec 30sec 30sec 40sec	1 mint	45
	Cooling down	light movements -static stretching	Low					5

### Week eight

D a y	Phase	Exercise	Intensity	Set	Rep.	Rest b/n set sec	Rest b/n exercise in sec	Duration in minutes
M o n D a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					10
	Main part	-Foot tape -side lunges -pull up -trice dips	High	2 2 3 3	10 10 10 10	30sec 30sec 40sec 40sec	1 minte	45
	Cooling down	-light movements -static stretching	Low					5
W e d n e s d a y	Warming Up exercise	Jogging, running, different movement of arm and leg, warming up with ball and stretching.	Moderate					10
	Main part	-split squat jump - reversed jumping jacks - foot taps - plank - pull up	High					
	Cooling down	-light movements -static stretching	Low					5
S t u r d a y	Warming up exercise	Jogging, running, different movement of arm and leg, warming up with the ball, and stretching.	Moderate					
	Main Part	-Lunge jumps -Alternative toe tabs - pull up -shuttle run	High	3 3 3 2	10 8 10 8	30sec 30sec 30sec 40sec	1 mint	45
	Cooling down	-light movements -static stretching	Low					5

### **APPENDIX B: Normative data of Illinois Agility Run Test for 16 to 19 years old**

Gender	Excellent	Above average	Average	Below average	Poor
Male	<15.2 sec	15.2 - 16.1 sec	16.2-18.1sec	18.2-19.3sec	>19.3 sec
Female	<17.0 sec	17.0 - 17.9 sec	18.0-21.7 sec	21.8-23.0 sec	>23.0 sec

Source: Davis et al. 2000

### **APPENDIX C: Normative data for the chins test/pull up/**

The following are national norms for ages 16 to 19.

Gender	Excellent	Above average	Average	Below average	Poor
Male	>13	9-13	6-8	5-3	<3
Female	>6	5-6	3-4	1-2	0

Source: Davis B. et al., 2000

## APPENDIX D: Profile of participants

### A. Experimental Group

No	Age	Height(m)	Weight(kg)	Playing experience
1	16	1.50	46.00	2
2	16	1.55	48.00	2
3	17	1.60	49.00	2
4	15	1.55	45.00	2
5	16	1.57	59.00	2
6	17	1.55	47.00	2
7	16	1.58	48.00	2
8	17	1.53	50.00	2
9	15	1.68	53.00	2
10	17	1.65	57.00	2

### B. Control Group

No	Age	Height(m)	Weight(kg)	Playing experience
1	15	1.40	46.00	2
2	16	1.45	52.00	2
3	16	1.45	49.00	2
4	17	1.47	43.00	2
5	15	1.50	57.00	2
6	17	1.45	53.00	2
7	16	1.49	57.00	2
8	15	1.60	48.00	2
	16	1.55	48.00	2
10	17	1.40	59.00	2

### APPENDIX E: Demographic characteristics of the study participants

Group	N	Sex	Age		Height		Weight		Playing experien
			Mean	S.D	Mean	S.D	Mean	S.D	In year
E.G	10	Female	16.20	0.789	1.576	0.05461	50.2	4.6856	2 year
C.G	10	Female	16.00	0.816	1.476	0.06257	51.20	5.2873	2 year

E.G= experimental group, C.G= control group

### APPENDIX F: Pre and post-test results of physical fitness variables for the control group

NO	Variables			
	Agility		Muscular strength	
	Illinois agility run		Pull up test	
	Pre- test	Post-test	Pre-test	Post-test
1	20	20	4	5
2	22	21	5	5
3	21	20	4	3
4	20	21	2	4
5	22	23	5	6
6	21	20	4	6
7	20	21	5	4
8	23	22	4	5
9	21	18	5	6
10	22	21	3	4

**APPENDIX G: Pre and post-test results of physical fitness variables for the experimental group**

NO	Variables			
	Agility		Muscular strength	
	Illinois agility run		Pull up test	
	Pre-test	Post -test	Pre- test	Post-test
1	20	18	4	7
2	19	17	5	6
3	21	18	3	6
4	20	17.60	5	8
5	21	18.05	2	6
6	18	17.55	5	6
7	23	19	4	6
8	19	18	4	6
9	21	19	5	10
10	22	18	3	6

**APPENDIX H: Pre and post-test handball skill test for the control group**

NO	Variables					
	Passing accuracy				Speed dribble	
	7m		10m			
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
1	14	15	10	13	18	17
2	14	10	15	11	17	16
3	9	11	13	13	14	14
4	13	6	6	11	19	17
5	14	15	14	14	20	18
6	9	15	16	18	19	20
7	15	14	14	13	16	15
8	12	13	12	14	15	16
9	18	18	17	18	19	19
10	18	20	13	10	16	15

**APPENDIX I: Pre and post-test handball skill test for the experimental group**

NO	Variables					
	Passing accuracy				Speed dribble	
	7m		10m			
	Pre-test	Post test	Pre test	Post test	Pre test	Post-test
1	15	21	18	22	15	12
2	18	22	13	17	19	13
3	6	18	10	16	15	12
4	16	23	9	15	15	10
5	10	19	19	21	16	13
6	12	18	17	22	17	14
7	17	25	19	20	20	16
8	9	17	10	15	18	12
9	11	19	13	13	15	14
10	19	23	16	19	19	13



## APPENDIX J: Independent sample test SPSS pre-test result of physical fitness variables

### Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
Pre-test Agility	CG	10	21.200	1.03280	0.32660
	EG	10	20.400	1.50555	0.47610
Pre-test muscular strength	CG	10	4.100	0.99443	0.31447
	EG	10	4.000	1.05409	0.33333

EG= Experimental group, CG= Control group

### Independent Samples Test

		Levene's Test for Equality of Variance		t-test for Equality of Mean						
		F	Sig	T	DF	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Agility pre-test	Equal variances assumed	1.365	.258	1.386	18	.183	.8000	.57735	.41297	2.01297
	Equal variances not assumed			1.386	15.935	.185	.8000	.57735	.42433	2.02433
Muscular Strength pre-test	Equal variances assumed	0.79	.782	.218	18	.830	.1000	.45826	-.86276	1.06276
	Equal variances not assumed			.218	17.939	.830	.1000	.45826	-.86300	1.06300

### APPENDIX K: Independent sample test SPSS post-test result of physical fitness variables

#### Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
Post-test Agility	CG	10	20.7000	1.33749	0.42295
	EG	10	18.0700	0.53396	0.16885
Post-test muscular strength	CG	10	4.8000	1.03280	0.32660
	EG	10	6.6000	1.42984	0.45216

EG= Experimental group, CG= Control group

#### Independent Samples Test

		Levene's Test for Equality of Variance		t-test for Equality of Mean						
		F	Sig.	T	DF	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Agility post test	Equal variances assumed	3.858	.065	5.775	18	0.000	2.6300	.45541	1.6732	3.58678
	Equal variances not assumed			5.775	11.798	0.000	2.6300	.45541	1.6358	3.62415
Muscular Strength post test	Equal variances assumed	.355	.558	-3.227	18	.005	-1.8000	.55777	-2.971	-.62816
	Equal variances not assumed			-3.227	16.382	.005	-1.8000	.55777	-2.98019	-.61981

## APPENDIX L: Independent sample test SPSS pre-test result of handball skill

### Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pre-test 7m passing accuracy	CG	10	13.700	3.26769	1.03333
	EG	10	13.300	4.32178	1.36667
Pre-test 10m passing accuracy	CG	10	13.000	3.16228	1.00000
	EG	10	14.400	3.89301	1.23108
Pre-test speed dribble	CG	10	17.300	2.00278	0.63333
	EG	10	16.900	1.96921	0.62272

EG= Experimental group, CG= Control group

### Independent Samples Test

		Levene's Test for Equality of Variance		t-test for Equality of Mean						
		F	Sig	T	DF	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Pre-test 7m passing accuracy	Equal variances assumed	2.257	.150	.233	18	.818	.40000	1.71335	-3.19961	3.99961
	Equal variances not assumed			.233	16.756	.818	.40000	1.71335	-3.21887	4.01887
Pre -test 10m passing accuracy	Equal variances assumed	2.077	.167	-.883	18	.389	-1.4000	1.58605	-4.73217	1.93217
	Equal variances not assumed			-.883	17.274	.389	-1.4000	1.58605	-4.74223	1.94223

Pre-test speed dribble	Equal variances assumed	0.0000	1.000	450	18	.658	.40000	.88819	-1.46603	2.26603
	Equal variances not assumed			450	17.995	.658	.40000	.88819	-1.46606	2.26606

### **APPENDIX M: Independent sample test SPSS post-test result of handball skill**

#### **Group Statistics**

	Group	N	Mean	Std. Deviation	Std. Error Mean
Post-test 7m passing accuracy	CG	10	13.7000	4.00139	1.26535
	EG	10	20.5000	2.67706	.84656
Post-test 10m passing accuracy	CG	10	13.5000	2.71825	.85959
	EG	10	18.0000	3.23179	1.02198
Post-test speed dribble	CG	10	16.0000	1.88856	.59722
	EG	10	12.9000	1.59513	.50442

EG= Experimental group, EG= Control group

### Independent Samples Test

		Levene's Test for Equality of Variance		t-test for Equality of Mean						
		F	Sig	T	DF	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Post-test 7m passing accuracy	Equal variances assumed	.576	.458	-4.467	18	.000	-6.8000	1.52242	-9.99850	3.60150
	Equal variances not assumed			-4.467	17.487	.000	-6.8000	1.52242	-10.03221	-3.56779
Post-test 10m passing accuracy	Equal variances assumed	1.368	.257	-3.370	18	.003	-4.5000	1.33542	-7.30560	-1.69440
	Equal variances not assumed			-3.370	15.712	.004	-4.5000	1.33542	-7.31152	-1.68848
Post-test speed dribble	Equal variances assumed	.651	.430	4.861	18	.000	3.8000	.78174	2.15763	5.44237
	Equal variances not assumed			4.861	17.487	.000	3.8000	.78174	2.15433	5.44567

**APENDIX-: PHOTOS DURING SKILL TEST****ACCURACY THROW TEST 7&10M LINES**