JIMMA UNIVERSITY

COLLEGE OF NATURAL SCIENCES

DEPARTMENT OF SPORT SCIENCE

EFFECT OF 12-WEEK MUSCULAR STRENGTH TRAINING ON UPPER AND LOWER MUSCLE STRENGTH PERFORMANCE OF BETHEL EVANGELICAL SECONDARY SCHOOL STUDENTS' (OROMIA REGION).

BY: SULEMAN DAWIT

A RESEARCH SUBMITTED TO JIMMA UNIVERSITY DEPARTMENT OF SPORT SCIENCE POST GRADUATE PROGRAM IN PARTIAL FULFILLMENT OF REQUIREMENTS FOR THE DEGREE OF MASTER OF EDUCATION IN TEACHING PHYSICAL EDUCATION

NOVEMBER, 2018

JIMMA, ETHIOPIA

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APROVED SHEET

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DECLARATION

Effect of 12-Week Muscular Strength Training on Upper and Lower Muscle Strength Performance of Bethel Evangelical Secondary School Students' (Oromia Region).

Prepared by Suleman DawitI recommended that it be summated as fulfilling thesis requirement.

Submitted By Suleman Dawit _____ _____

Signature Date

Mr. Samson Wondirad (Ass.Prof) _____ _____

Advisor Signature Date

Mr.Bashir Edo _____ _____

Co-Advisor Signature Date

As members of the Board of Examiners of the M.Ed. Thesis Open Defense Examination, I certify that I have read and evaluated the Thesis prepared by Suleman Dawitand examined the candidate. I recommend that the Thesis be accepted as fulfilling the Thesis requirement for the degree of Master of education teaching in physical education.

_____ _____ _____

Chairperson Signature Date

_____ _____ _____

Internal examiner Signature Date

_____ _____ _____

External examiner Signature Date

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ABREVIATIONS AND ACRONYMS

PE: Physical Education

REPS: Repetitions

1-RM: One-Repetition Maximum

NSCA: National Strength Training and Conditioning Association

ACSM: American College of Sport Medicine

SPSS: Statistical Package for Social Science

UBW: Upper body workout

LBW: Lower body workout

ACE: American council on exercise

HBMI: Health body mass index

NRHR: Normal resting heart rate

MHR: Maximum heart rate

WHR: Working heart rate

EHR: Exercise heart rate

A.Av: Above Average

B. Av: Below Average

BESS: Bethel Evangelical Secondary School

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ABSTRACT

The main objective of this study was to examine the effect of muscular strength training on the upper and lower muscle strength performance of bethel evangelical secondary school students'. The study comprises forty (40),health students often grade ten (10) in BESS; selected students were inclusive criterion-based purposive sampling from the class (i.e. height (1.59-1.78), weight (46-62), HBMI (18.38-24.60), NRHR (60-78) and the age of 16-17.As Ritchie al., (2003) were indicated "members of a sample are chosen with a purpose to represent a location or type in relation to the criterion". Similarly, muscular strength training was systematically used exclusive criterion-based students' with heart failure problem, females during menstrual cycle, pregnant women and behavioral problem.Additionally, physical education teacher were selected as a supervisor. The Quasi-experimental study is used to carry out this research. The study subjects were selected from the availability samples. In this attempt, data were collected through pre-test and post-test results of eight muscular strength variables on the students' performance level.

In this quasi-experimental research design, the Paired-Sample T-test was used to compute and analyze pre-test and post-test results of the selected students and the results revealed that the selected group outperformed significantly ($p<0.05$).The study results clearly reported, that there was significance difference between pre-test and post-test of muscular strength exercise tests on the students' performance level. Ultimately, the study post-test result was revealed, that 12-week muscular strength training enhances muscular strength of upper and lower body of the students.Furthermore, there was better improvement in pushups and wall sits. In standing broad jumps lower improvement of performance was observed relative to the rest muscular strength variables.Finally, based on the major findings some valuable suggestions were forwarded to some valuable places beginning from school principal to higher Federation.

***Keywords**: Muscular, strength, training, exercise, performance, pre-test and post-test.*

CHAPER ONE

INTRODUCTION

1.1. Background of the study

Physical fitness is a state of health or condition of the body's ability to withstand the stress of daily life. Fitness is divided in to two components. Health related and skill related fitness (Mood et al., 1983). Experts agree that it has many dimensions and levels. It has been further broken down into two categories of components that, collectively, help define it: Health-related fitness, such, cardio respiratory, muscular strength and endurance, muscular flexibility, and body composition. Skill-related fitness includes: agility, balance, coordination, power, reaction time, and speed (Matt Wattles, 2016).

Any definition may include health-related and or performance-related components, and they are not mutually exclusive they overlap. You cannot develop power without training for speed and strength. Agility is composed of speed, strength, power; flexibility, reaction time, balance, and coordination (skill), so sports training to improve one component also improve others (Stray-Gunderson and Gonyea, 1985).

Muscular strength refers to the amount of force a muscle can produce with a single maximal effort. Muscle strength is measured during muscular contraction. According to the American Council on Exercise (ACE), muscular strength is the maximal force a muscle or muscle group can exert during a contraction. Muscular strength is usually measured with one-repetition maximum (1-RM) test. During a 1-RM an exerciser performs one repetition of a single exercise to see how much weight he or she can lift (Cannon and Marino, 2010).You might think that muscular strength is simply how strong you are. For example, how much you weight you can carry, how many pounds you can lift at the gym or how many pushups you can do during a workout. But a true muscular strength definition is a little bit more complicated than that. ACE provides definitions for these terms that are related to muscular strength: Muscular endurance is the ability of your muscles to exert force against resistance over a sustained period of time. And muscular power is the combination of muscular force and the speed of movement. For example, the number of push-ups you can do in one minute depends in part on your muscle strength but also on your muscular power and muscular endurance (Jennifer and Scott, 2018).

When you include strength training in your exercise program you build lean muscle mass and improve your metabolism. Having stronger muscles will also help you to move through your daily activities and burn more calories with greater ease. And muscles help to improve the way that your body looks. A tighter, leaner body looks better at every size (Davis, 2000).

The basic principles of strength training involve a manipulation of the number of repetitions (reps), sets, tempo, exercises and force to cause desired changes in the strength, endurance or size by overloading of a group of muscles (Keating, 2003).

Strength training is a type physical exercise specializing in the use of resistance to induce muscular contraction which builds the strength, anaerobic endurance, and size of skeletal muscles. The aim of every movement we make from walking to driving involves our muscles. Muscles are unique, they have the ability to relax, contact, and produce force. They are metabolically active, meaning that the more muscle you have, the more calories your body uses at rest and during exercise. Your muscles are highly responsive to strength training, which helps to become larger and strong (Edgerton, 1985).

But muscle definition also depends on your level of body fat. If your muscles get bigger but you still carry too much fat, you may not see sculpted muscles on your body. To improve both muscle definition and muscular strength you need to combine a healthy diet to lose fat with a resistance training program to build muscle. When you improve muscular strength and muscular definition, you enjoy many different benefits, especially if you are trying to lose weight. And you don't have to be an expert body builder to take advantage of them. Strength training provides benefits for exercisers of all levels (Brian Mac 2000).

The size of your muscle fibers and the ability of nerves to activate muscle fibers are related to muscle strength. In addition to understanding the definition of muscular strength, it's also important to understand the benefits of strong muscles. Building muscle strength helps with body alignment, makes performing everyday actions easier, increases metabolism, and relieves stress. But there are other factors that affect how strong you are and how much strength you have to complete daily chores or exercises. Strength training improves both the size of your muscle fibers and it also improves the ability of your nerves to communicate with the muscles. So as your muscles get bigger with resistance training (muscle hypertrophy) they also become more

coordinated and better able to perform movements that require strength (Gabriel, Kamen and Frost, 2006). The effectiveness of many physical performances is related to various basic traits found in boys and girls including their maturation, body size, physique type. Many of these traits are related to heredity; others, such as body weight have hereditary implications, also be affected by environmental influences, including the nature and amounts of exercises, nutritional practices and health habits (Mazumdar, 2012).

Student who takes part in sport experience have a higher level of self-esteem, self-confidence and developed skill. Sport helps to build confidence, a positive body image, and lower level of depression (Digest, 1997). Strength and conditioning programs have helped many athletes with the ability to enhance their performance. It is a commonly accepted fact that many physical fitness can be enhanced through proper strength training and conditioning (Teshome, 2012).

The fitness formula for a well-conditioned physical fitness trainer is a simple one. There are no short cuts, no magic pills. Along term commitment is necessary to reach and maintain a trainer full physical potential. The two primary objectives of the strength program are to prevent injury and enhance the abilities to perform the exercise. Also the strength program of a physical fitness trainer must be intense, brief, and generate the type of muscular gains that most functional in performing the exercise (Hoff and Helgerud, 2002).

Unfortunately, students were not receiving ample amount of physical exercises at school. At school level the communities like parents and teachers were giving more attention to other subject areas than physical fitness exercise. Understanding the common purpose of muscular strength exercises were certainly building strength, that directly impacting the body was crucial. That was why it needed to conduct to examine this study. Hence, this study was employed with a view to improve students' strength with regarding to the relationship of eight selected physical fitness variables. And the study was to explore effect of muscular strength on upper and lower muscle strength performance of students.

DambiDolo city was the investigators working area where the researcher served and has more work experiences in teaching physical education and sport. With this long period of time the

researcher has been observed a lot of problem in muscular strength on upper and lower body muscle strength performance of students' in BESS, Oromia.

1.2. Statement of the Problem

Physical fitness is an important component leading healthy life style. The inclusion of regular fitness activity helps students maintain fitness, develop muscular strength and improve cardiovascular health. A regular fitness activity improves the absorption of nutrients by the body, improves digestive processes and increases physiological process (http:// www. ehow.com).
The main purpose of health and wellbeing with in curriculum for excellence is to develop the knowledge and understanding, skills, capabilities, and, attributes necessary for mental, emotional, social, physical wellbeing now and in the future (Hillman et al., 2009).

For children and adolescents, regular physical activity contributes to physical fitness and overall health by increasing health and endurance, building health bones and muscles, regulating weight and promoting mental health and wellness. Participation in physical activity is crucial for the holistic development of young people to nurture their physical, social, and emotional health as well as intellectual side (Castelli et al., 2007).

Students who participate in physical fitness exercise can develop their skill and become physically healthy in terms of strength and weight management. Early involvement in practicing or training in sport can also minimize the likelihood of the development of a number of health related conditions, (Digest 1997). A healthy body nurtures a healthy mind and school-based physical education and sports programs are ideal to facilitate the training program for strength-training technique practice.

The engagement in physical fitness in sport is an issue of national concern especially of students. In any sport activity, there will be motor skill development only through practice. It is the same also for muscular fitness exercises. For any muscular fitness exercise, there will be practice of techniques. Through practice in high school, there is a change in motor skill development of students.

The major constraints associated with BESS found to have low attitude towards physical fitness due to its unpopularity, absence of physical education gym in the schools. At school level, the

communities like parents and teachers were giving more attention to other subject areas than physical education. It was undeniable that muscle strength physical fitness exercises were very important for high school students, particularly for BESS students. From my experience in the school, I was observed that muscular strength physical fitness exercises were less considerable than ball games such as; basketball, football, handball, and volley ball. Specially, dormitory students were relatively poor in their strength level than non-dormitory students. That would be why the investigator was highly interested to conduct the study. Furthermore, no research had been conducted yet on this title.

1.3. Objectives of the Study

1.3.1. General Objective

The general objective of the study was to examine the effect of twelve-week muscular strength training on upper and lower muscle strength performance of BESS students.

1.3.2. Specific Objectives

The specific objectives of the study were:

- Assess the current fitness status of upper and lower body muscle strength training exercises on students' performance level.
- Find out the significance difference between pre-test and post-test of student's strength performance level.
- Examine the effect of twelve-week muscular strength training on students' upper and lower body muscle strength level.

1.4. Hypothesis

Accordingly, the following hypotheses were formulated.

1.4.1. H0 (Null hypothesis)

There would not be a large significance difference between the pre-test and post-test effects of muscular strength training exercises on students' performance level.

1.4.2. H1 (Alternate hypothesis)

There would be a large significance difference between the pre-test and post-test effects of muscular strength training on students' performance level.

1.5. Significance of the Study

The study has the following significances: Muscular strength was very important to student's health and overall well-being, manage their weight better, feel better (with more energy, a better mood, feel more relaxed) and build their body strength. In addition, it notifies the department and school principal to create favorable condition for physical exercise. Lastly, it would help as a resource material for further investigation.

1.6. Delimitation of the Study

The study was delimited to BESS ten grade students on effect of upper and lower muscle strength performance. There are four high schools in the town: Kellem secondary school, Lafto secondary school, JanSayo secondary school, and BESS. Bethel Evangelical Secondary School was selected as a target of the study for proximity to the researcher, as well as for manageability purpose. Depending on the nature of the study, sample size would be delimited to one experimental classes of the school.

1.7. Limitation of the Study

The most serious limitations were lack of reference materials, and other resources, including related researches in our context, lack of material and equipment's such as comfortable exercise mats and physical education gym in the school. Additionally on this experimental research, the investigator was faced complexity in recording the students' performance through test. To mention some constraints of time and money were contributed to the inadequacy of the research. However, the investigator was tried all his best to maintain the excellence of this study by putting utmost effort.

1.8. Operational definition of terms

- **Skill**: Skill isan athlete's ability to choose and perform the right techniques at the right time, successfully, regularly, and with a minimum of effort (Edgerton, (1985).
- **Performance**: Performance is the cumulative effect of genetics, practice, psychological and situational factors that can be observed in training and competition(Gerhardt, 1983).
- **Pre-test**: Pre-test is a preliminary test administered to determine performance of students' before training (Brian Mac, 2000).
- **Post-test**: Post-test is an achievement test administered after training (Davis, 2000).
- **Training**: Training is pedagogical process of upgrading or improving performance (Gerry Carr, 1992).
- **Exercise**: Exercise is different movements which involve rotating joints in specific patterns to challenge muscles in different ways(Len Hoy, 1980).
- **Rep**:Repisthe number of exercise done in one set (cooper, 1968).
- **Set**: Mean doing a certain number exercises one time(Marino, 2010).
- **Fitness**: Fitness is the condition of being physically fit and healthy or the quality of being suitable to fulfill a particular role or task (Mood et al., 1983).
- **Strength**: Strength is the quality or state of being physically strong (Huber man, 1994)
- **Endurance**: Endurance is the ability of an organism to exert itself and remain active for a long period of time, as well as its ability to resist, withstand, recover from, and has immunity to trauma, wounds, or fatigue (Brain and Coleman, 1978).
- **Physical**: Physical is relating to the body as opposed to the mind (Lewis, 2003).

- **Education**: Education is the process of receiving or giving systematic instruction, especially at a school or university (https://en.m.wikipedia.org).
- **One-repetition maximum**: One-repetition maximum is performing one repetition of a single exercise to see how much weight he or she can lift (Cannon and Marino, 2010).
- **Experimental**: Based on new ideas, forms or methods that are used to find out what effect they have: (Ritchie and Lewis, 2003)

1.9. Organization of the study

This study was organized in such a way that the first chapter presents and discusses the introduction (background), statement of the problem, objective of the study, and hypothesis, significance of the study, delimitation, limitation and operational definition of terms. The second chapter was attempted to forward various literature works of scholars that has been relation to the topic under discussion. The concern of chapter three was on presenting the methodology of the study. Chapter 4 was reported the results of analysis and discussion of the study and finally chapter five presents the summary, conclusion, and recommendation of the study.

CHAPTER TWO

2.1. REVIEW OF RELATED LITERATURE

The purpose of this chapter is to discuss the literature related to physical fitness exercises, and the discussion of some selected exercises of muscular strength and factors that affect improvement of performance.

2.1.1. Health related physical fitness

The definition of health-related fitness involves exercise activities that you do in order to try to improve your physical health and stay healthy, particularly in the categories of cardio vascular endurance, muscular strength, flexibility, muscular endurance and body composition. An example of health related fitness is aerobic exercises you do to improve cardio vascular endurance.

Muscular strength is the amount of force that a muscle can apply in a given contraction. The key to making your muscles stronger is working them against resistance, whether that be from weights or gravity. If you want to gain muscle strength, try exercises, such as lifting weights or resistance exercises. Anaerobic activities such as weight lifting are good to develop muscular strength and endurance. More weight less rep to develop strength. Less weight and more reps to develop endurance (Ally and Bacon, 1977).

2.1.2. Physical education in secondary school

Physical education, also known as Phys Ed., PE, gym class, and known in many commonwealth countries as physical training is an educational course related of maintaining the human body through physical exercises. It is taken during primary and secondary education and encourages psychomotor learning in a play or movement exploration setting to promote health (Anderson, 1989).

In the United States, the goal of physical education is to "develop physically literate individuals who have the knowledge, skills and confidence to enjoy a lifetime of healthful physical activity. Zero Hour is a before-school physical education class first implemented by Naperville Central High School. In the state of Illinois this program is known as Learning Readiness P.E. (LRPE). It

was based on research indicating that students who are physically fit are more academically alert and experience growth in brain cells or enhancement in brain development. NCHS pairs a PE class that incorporates cardiovascular exercise, core strength training, gross lateral movements, and literacy and math classes that utilize movement to enhance learning and improve achievement (The Daily Telegraph, 2008).

2.1.3. History of strength training

Strength training is not a modern invention. Egyptian tombs show pictures of lifting bags filled with sand and Stone swinging and throwing exercises. These types of things were also popular in early Germany, Scotland, and Spain. Weightlifting competitions date back to the early Greek civilization. These events led to the origination of games that later became known as the modern Olympics. The pioneers of these events did not have the sophisticated equipment that we have today or the research on training and physiology to back up the exercises, but they did have the most important thing-the desire to lift something heavy for fun, sport, and physical health.

Mother Nature's gifts are all that these originators had to use. They made equipment out of whatever they could. As time went on, they created more modern inventions for weightlifting. For example, dumbbells originated in the 1700's when a rod was placed between two church bells. When a clapper was removed from the bells, they became silent, or dumb, hence the word dumbbell. Indian clubs, which resemble a bowling pin and kettle balls (cast-iron balls with a handle), were popular in the early 1800's. Weight-training equipment evolved in the form of pulleys, air pressure devices, and multi stations in the 19th century. At first, the people who used this type of equipment were strongmen performing at contests and exhibitions. Amateur weightlifting became a sanctioned event at the Olympics in 1896, although there were no female athletes. Women's weightlifting didn't become a sanctioned Olympic sport until 2000.

Weight training progressed significantly in the 1900's with the invention of the adjustable, plate-loaded barbell. Weight training became more popular at this time because it was much easier to change the weight on the barbells. Weight training really gained momentum when sports coaches began to see that it was an excellent addition to athletic and physical education programs.

Bodybuilding soon followed on the sandy shores of Muscle Beach in Venice, California. Bodybuilding was practiced by men and women who participated in physique shows,

weightlifting competitions, and acrobatics demonstrations. This was when women's progression into weightlifting really took hold. This is primarily contributed to the Nautilus machines. These machines used variable resistance. The Nautilus variable resistance machines hit the market in the 1970's. The machines were great because they were less intimidating than free weights. They allowed people to lift light weights easily, which was perfect for the woman who was just starting out. The creator of the Nautilus, Arthur Jones, preached a philosophy of training that gave people a road map and instructions for the use of his machines. He proposed a 20-minute workout three times a week that included one set of 8 to 12 repetitions for each Nautilus machine. Many people are still following his recommendations today.

The innovation of the Nautilus machines inspired a fitness revolution, and many different companies came on the market with their own resistance machines. In the 1970's, the aerobics revolution began, and it flourished throughout the 1980's. Women who had previously been training with weights were now jumping and stepping in huge proportions aerobics rooms rather than going out to weight floors. A hybrid of selector zed equipment was the plate-loaded machine, which was introduced in the later 1980's. Hammer Strength was the first of these machines. Entire body movement was the focus for these machines, rather than specific body parts. The machines felt natural and smooth, and they actually led to a resurgence of lifting free weights. Women were coming back into the weight room. It was also becoming apparent, through research and anecdotal reports, that resistance training produced huge benefits for those who participated in sports. There probably isn't any serious athlete or sports team today that doesn't believe in training with weights.

Strength training in the past was very plain; there was not a lot that could be changed about the way an exercise was done. Today, the world of weightlifting is changing all of the time with new machines, workouts, equipment, and techniques. Fitness and everything associated with it has come far. Strength training, to me, is something that is only going to get better. The benefits that come from it are astronomical. We, as a society, have come to figure out that weight training is not only for a select few; it is for everyone. Every person needs strength training in some way or another.

Strength training is evolving as we speak. From circuit training to multiple muscle workouts, functional core training is the cause of this evolution. Balance, stability, pure core strength, and

functional training are vital to the new strength trainers. It is only going to get better. Future strength training practices will allow us to function better and be able to produce a much faster, stronger, and more agile athlete.

2.2. Muscular Fitness:

Muscular fitness is the capability of skeletal muscles to function efficiency in activities where generating force and continuous muscle contraction are needed you need fitness to increase work capacity, to be decrease injury, to prevent low back pain, and to improve athletic performance.
Increased muscular fitness can also improve your appearance. Because, good posture makes anyone look better. Since muscle is denser than body fat, one kilogram of muscle takes up less space than one kilogram of fat. Thus, two persons of the same height and weight but with different amount of muscle will look quite different. This means the student with less muscle will have poor posture. Whereas the student with more muscle will have better appearance because muscle is less bulky than fat, and fit muscles keep areas of the body such as the abdomen from protruding (Len Hoy and Cyril Carter, 1980).

2.3. Muscular Strength:

Muscular strength is the maximum amount of force that can be applied by a muscle during a single maximal contraction. Throughout your life you need some strength to avoid injury, to meet emergencies, and to engage fully and independently in daily activities. It takes strength to wash your clothes, to lift and carry a basket, which is full of tomato, to lift and carry kids to change a flat tire; and to run quickly. Strength allows you to do more work and to move more work and to move more smoothly and efficiently. Students who perform regular appropriate exercise possess. Sufficient strength for participation in activities such as: jumping, lifting, running, pushing etc. Strength helps you to have good posture and prevent back pain and muscular injuries. Lack of strength in the back and abdominal muscles is associated with poor and lower back problems (McARDLE et al., (2000).

2.3.1. Types of Strength:

There are three types of strength: dynamic strength, static strength, and isokinetic strength.

Dynamic Strength: Dynamic strength is also called isotonic strength. (Iso means "same" and Tonic means "same."). It is defined as the maximal weight that can be lifted at one time. Dynamic strength required shortening or lengthening the muscle, causing a certain body part to move through a full range of motion. Weight lifting is the common form of isotonic training. Exercises such as sit-ups, pushups, chin-ups, are isotonic exercises. Because they require isotonic muscle contraction that involve part of body part of the bend then gradually relaxes and lengthen.

The major values of performing isotonic contraction in exercise are the increase of joint range of motion. In addition, isotonic movements tend to facilitate blood circulation and thereby helping to facilitate muscular endurance. In isotonic exercise a body part is moved and the muscles change in length, either, shortening or lengthening (Grosvenor, 1984).

Static Strength: Static strength is a muscle's ability to exert a force without changing length. It is also called isometric strength. Metric means "length"; isometric means "some length". Static strength demands forcefully contracting the muscles in a fixed position. That is, with no change in the length of the muscle or in the angle of the joint at which the contraction takes place. The measure of static strength is achieved when you exert maximal force against an immovable object. Attempting to lift or push an object that cannot be moved places the muscles in a state of static contraction. In isometric exercise, you contract, your muscles but do not change their length. Even no movement of the body part occurs. Pushing your rigid arms against a wall while tightening your arms muscles in an, example of an isometric exercise.

Static strength is specific to the angle at which it was trained. Any gain in static strength is limited to the specific joint angle at which it was trained. Any gain in static strength limited to the specific joint angle at which the contraction is taking place. Static contractions are use in treatment (rehabilitation), and to gain strength at a "fixed point" of a lift (Mood et., 1983 Sports and Recreational Activities for Men and Women).

Isokinetic Strength: Isokinetic strength is strength that allows you to exercise with a constant resistance through the full range of motion. Kinetic means "movement"; Isokinetic refers to movement at fixed speed. It requires changes in the length of muscle while the contraction is

performed at a constant speed. Isokinetic strength is measured with an expensive electronic or hydraulic apparatus. Isokinetic devices are designed so that regardless of the amount of force applied against a resistance it can only be moved at a certain speed. That speed will be the same whether maximum force or only half the maximum force applied. Consequently, when training isokinetic ally, it is absolutely necessary to exert as much force against a resistance as possible for maximum strength gains to occur. Several isokinetic devices are available commercially. A major disadvantage of these devices is their cost. Many of them came with a computer added printing device and are used primarily as diagnostic and rehabilitative tools in the treatment of various injuries (Allyn and Bacom, 1977).

2.3.2. Muscular strength and endurance:

Muscular strength and endurance are two important parts of your body's ability to move, lift things and day-to day activities. Muscular strength is the amount of force you can put out or the amount of weight you can lift. Muscular endurance is how many times you can move that weight without getting exhausted (very tired).

According to Frits and Peter Hatting, (1979) Hand ball, there are five reasons why exercise is important?

Everyone is aware of the importance of exercise, but do you know why exercise is important? Exercise benefits many different areas of your body and your life. Here are five good reasons why you should make exercise a regular part of your routine.

1. Weight Control: One of the most common benefits of exercise is that it helps you control and manage your weight. Exercise burns calories, which results in shedding pounds. Although rigorous exercise will burn more calories, even simple exercises such as a brisk walk can have a positive impact on weight loss.

2. Physical Fitness: Exercise doesn't just keep you trim-it helps you stay healthy. Regular exercise increases your overall level of fitness, which in turn boosts your immune system and makes you more resilient to illnesses like the common cold. Combined with your regular vaccinations, physical exercise might just be your ticket to getting through flu season in one piece.

3. Energy: One of the reasons to exercise regularly is that it gives you energy. Rather than going for that second cup of coffee, a workout can help oxygen flow more freely throughout the body and give you a much-needed burst of energy to get you through the day. It also increases your overall stamina, which can help you stay energized for longer to begin with.

4. Mental Health: Exercise has been proven to provide a mood booster, as it releases chemicals into your brain that help you feel happier and can ease the effects of depression, ADHD, and anxiety. It can also allow you to sleep better at night, which is important to maintaining an overall good mood.

5. Long-Term Health: In addition to all of the immediate benefits of regular exercise, it can help you stave off health conditions such as heart disease and diabetes in the long term. Working out increases your "good" cholesterol and decreases your risk of serious medical issues, especially those pertaining to the heart. Exercise can help with a myriad of health issues and it's as easy as taking a simple walk. Try to work physical activity into your daily routine one step at a time.

2.3.4 Improving Muscular Strength and Endurance:

There are many ways to improve muscular strength and endurance. A gym or fitness center is a good place to go if you're interested in doing resistance training (also called strength training, weight training or weight lifting). This involves working a muscle or group of muscles against resistance to increase strength and endurance. Resistance training can include using: equipment like medicine balls, or weight machines, resistance tubes or bands during exercises, your own body as a weight, as you would do during pushups or sit-ups.

Of course, you don't have to go to a gym or buy exercise equipment to improve muscular strength and endurance. Doing normal daily activities like lifting groceries or walking up and down stairs can also help. You can also do many exercises at home that don't need equipment, such as push-ups and sit-ups. All you have to do is challenge your muscles to work harder or longer than they usually do. Remember, if you're going to do strengthening exercises that involve lifting, it's important to use the correct techniques (Davis, 2000).

2.3.5 Factors Influencing Strength and Muscular Endurance

1. Types of muscle tissue: As written by Cooper, (1968), there are three types of muscle tissue those which have different structures and functions.

A. Smooth muscle tissue (those inside internal organs of the body): consists of long, spindle shaped fibers, with each fiber containing only one nucleus. The fibers involuntary and are located in the walls of esophagus, stomach, and intestines, where they move food and waste products through the digestive tract.

B. Cardiac muscle tissue (the heart muscle): is also involuntary and, as its name implies, is found only in the heart. These fibers contract in response to demands on the cardiovascular system.

C. Skeletal muscle tissue (those which are attached to the bones): consist of long, cylindrical, multinucleated fibers. They provide the force needed to move the skeletal system and can be controlled voluntarily.

2. Leverage is an important mechanical principle that influences strength: The body uses a system of levers to produce movement. Muscles are connected to bones via tendons, and some muscles (referred to as "primary movers") cross over a particular movement. The movement occurs because when a muscle contracts it physically shortens and pulls the two bones connected by the joint together. A person with long arms and legs has a mechanical advantage in most movements, since that is exerted can act over a longer distance. Although it is not possible to change the length of your limbs, it is possible to learn to use your muscles more effectively.

3. Skeletal muscle tissue consists of different types of fibers that adapt differently to training.

There are **three distinct types of muscle fibers**, slow-twitch (Type *I*), fast-twitch (Type IIb), and intermediate (Type IIa).

The **slow-twitch fibers** are generally red in color and are well suited to produce energy with aerobic metabolism. Slow-twitch fibers generate less tension but are resistant to fatigue.

Endurance training leads to adaptations in the slow-twitch fibers that allow them to produce energy more efficiently and to better resist fatigue.

The **fast-twitch fibers** are generally white in color and are well suited to produce energy with anaerobic processes. They generate greater tension than slow-twitch fibers, but they fatigue more quickly. These fibers are particularly well suited to fast, high-force activities, such as explosive weight-lifting movements, sprinting, and jumping. Resistance exercise enhances strength primarily by increasing the size (muscle hypertrophy) of fast-twitch fibers.

The **intermediate fibers** have biochemical and physiological properties that are between those of the slow-twitch and fast-twitch fibers. A distinct property of these intermediate fibers is 1that they are highly adaptable, depending on the type of training that is performed.

4. Muscular endurance and strength are part of the same continuum: Though strength and muscular endurance are developed in different ways, they are part of the same continuum. Absolute strength is the maximal force that can be exerted at one time, while absolute endurance reflects the ability to sustain a sub maximal force over an extended period of time. Most activities rely on various combinations of strength and endurance. For this reason, it is important to have sufficient amounts of strength and endurance.

5. Genetics, Gender, and Age affect muscle fitness performance: Each person inherits a certain percentage of fast-twitch and slow-twitch muscle fibers. This allocation influences the potential a person has for muscle fitness activities. Individuals with a larger percentage of fast-twitch fibers will generally increase muscle size and strength more readily than individuals endowed with a larger percentage of slow-twitch fibers.

People with a larger percentage of slow-twitch fibers have greater potential for muscular endurance performance. Regardless of genetics, all people can improve their strength and muscular endurance with proper training. Formals, strength training is usually associated with marked increased with marked increase in muscle size. Whereas, for females strength training tend to develop sizable increase in muscle size but usually females acquire limited increase. The higher levels of testosterone found in the male are responsible for higher muscle size in combination with an overload resistance program. Females with higher testosterone levels tend

to have more masculine characteristics, such as increased facial and body hair, deeper voice, and the potential to develop a little more muscle size.

Perhaps the most critical difference between male and female regarding physical performance is the ratio of strength to weight relative strength).The reduced strength /body weight ratio in female is the result of their higher percentage of body fat. The strength body weight training by decreasing the body fat percentage while increasing lean weight. Women have smaller amounts of the anabolic hormone testosterone and, therefore, have less muscle mass than men. In general, female, has less strength than male, but as previously pointed out; females can perform very capable strength activities.

Maximum strength is usually reached in the twenties and typically declines with age, it is not as dramatic as decreases in strength. As people grow older, regardless of gender, strength and muscular endurance are better among people who train than people who do not.

2.4. Exercise Factors that affect muscular fitness:

To build muscular fitness you must exercise each of the major skeletal muscle groups of the body. Muscular strength imbalance may be resulted when some muscle groups or body areas are stronger than others. Therefore, equal emphasis should be given for each of them. For good result you must do muscular fitness exercises properly through the full range of joint movement. It is also important to keep the muscles flexible enough with flexibility exercises (Millar, 1960).

2.4.1 Factors that determine which component of muscular fitness is developed

To build strength, you must do an exercise against heavy resistance with only a few repetitions. For muscular endurance, you must repeat an exercise many times with light resistance.

Note: The terms set and repetitions. Set mean doing a certain number of exercises one time. Repetitions mean the number of exercise done in one set. For example, one set of five pushups means that you would do five pushups three times with a rest period in between each set, for a total of 15 pushups.

Consider the following four points to bring good result in terms of muscular fitness.

1. The exercises must be performed a minimum of three days a week or a maximum of every other day.
2. To develop muscular strength, do three sets of each of the exercises and three repetitions of each set.
3. To develop muscular endurance, do three sets of each of the exercises and do from 15 to 25 repetitions in each set.
4. You should always take active rest in between each set and avoid holding your breath while exercising (Brain and Coleman, 1978).

2.4.2 Methods of training to develop muscular fitness

The type of training most commonly used to promote muscle fitness is progressive resistance training. It is a method of training to build muscle fitness that provide health and performance benefits. This name is used because the frequency, intensity, and length of time of muscle overload are progressively increases as muscle fitness increases.

According to Cooper, (1982) there are three types of resistance progressive exercises. These are:

- **Isometric Exercise;** in isometric exercise, you contact your muscle but do not change their length. Performance of an isometric exercise generates heat and energy by forcefully contracting the muscle in a fixed position. In isometric exercise, there is no change in the length of the muscle or in the joint at which the contraction takes place. Pushing an object that cannot be moved while contracting your arm muscles, can be taken as an example of an isotonic exercise. In general strength gained through an isometric exercise program is specific to the joint angle at which the contraction takes place.
- **Isokinetic Exercise;** isokinetic exercise is usually done with special machines that are not readily available for most people. This type of exercise allows you to exercise with a constant resistance through the full range of motion. Since the cost of isotonic exercise machines is expensive, they are not used for home or schools but they are still available in many health clubs (Gymnasiums).

- **Isotonic Exercise;** in isotonic exercise a body part is moved and the muscles change in length, either shortening or lengthening. For example, lifting a glass of water to take a drink required isotonic muscle contractions. The muscle in the front of the arm (biceps) contracts and shortens causing the elbow to bend. Then it gradually relaxes and lengthens to allow lowering of the glass. Exercise such as sit-ups, pushups, and chin-ups can be taken as an example of isotonic exercises.

Isotonic exercises can be done with little or no equipment and they are good for muscular fitness. Since effective and efficient movement is an important goal for most students, isotonic exercise is preferred over isometric exercise. Therefore, as far as developing muscular fitness is concerned don't forget to select isotonic exercise.

2.5. Evaluation of Personal Fitness:

Physical fitness is a state of health or condition of the body's ability to withstand the stress of daily life. Fitness is divided in to two components. Health related and skill related fitness (Mood et al., 1983).When you think of health related physical fitness you should think in terms of the five components; these are muscular strength, muscular endurance, cardiovascular endurance, flexibility, and body composition.

Evaluating each of these components will give you complete information about your health related physical fitness. Several tests can be used to measure your physical fitness. Based on the place where they are conducted, selection of physical fitness test should rely as much on its appropriateness. Fitness tests are categorized into laboratory test and field test. For instance treadmill test is a laboratory and twelve minute run test is a field test. Since laboratory tests require expensive equipment and expert's knowledge, but field tests that do not require much time and equipment's (Dougherty, 1983).

These tests can help you to get an assessment result of your current fitness level. It should not constitute the major focus for decision making. All major physical fitness tests systematically exclude students with identified physical, mental, emotional and sensory disability from their forming samples. It is also important to understand that hereditary predispositions limit one's potential for achieving exceptionally high scores of fitness. Therefore, comparison of physical

fitness tests results to health standards and improvement of your fitness is more important than comparisons to results of other students (Millar and, 1960). You should learn to perform each test by yourself. Learning to evaluate your own fitness allows you to have a personal record of your physical fitness on regular basis, keeps you from being dependent on others. Interpreting fitness results require know how to use the rating scale in each test rating chart.

Four rating categories known by fitness zones provided for you to score 'Good' and 'High' fitness zone in any of the components (Gerry Carr, 1991).

2.5.1 according to Stein and Federh off, (1982) there are **four types of physical fitness zone**

- **High performance zone**: High performance zone is a good indicator of adequate physical fitness, but it is not necessary to reach this level to experience good health benefits. Achievement of high performance scores has more to do with performance on various physical tasks than does with good health.
- **Good fitness zone**: Good fitness zone is an indicator of having enough specific fitness components, help to reduce the risk of specific hypo kinetic condition, assuming that you maintain an active life style.
- **Marginal zone**: Marginal scores indicate that some improvement is in order, but you are nearing minimal health standard set by experts.
- **Low fitness zone**: It indicates that you are probably less fit than you should be for your own good health.

In some fitness components you may wish to achieve the high performance zone due to personal reasons. The fitness rating of standard norms illustrated at the end of each test may help you to determine at what level of fitness you are (Gerhardt and Schmolinsky, 1983).

As written by Grosvenor, (1984) the information to be recorded during training falls into two broad categories.

The day-to-day information from training: State of the athlete (health, composure)

,physiological data (body weight, resting heart rate, etc.), the training unit (speed, speed endurance, strength, technique), the training load (the number of miles, the number of sets and repetitions, the number of attempts), the training intensity (kilograms, percentage of maximum, percentage of VO_2), the prevailing conditions (wet, windy, hot etc.), the response to training (the assignments completed, and the resultant heart rate recovery, felt tired, etc.)

Information that measures status: This can take the form of a test. If the test is repeated throughout the program, it can then be used as a measure of progress within the training discipline. Examples of such tests are: Time trials (speed, speed endurance, endurance), muscular endurance (chins, pushups, dips), strength maximum (single repetitions, maximum repetitions), explosive strength (power bounding, vertical jump, overhead shot putt), mobility (objective measurements of the range of movement), and Event specific.

The physiological information to be recorded during training:

- ✓ **The healthy body mass index (BMI);** is one way to see if you're at a healthy weight. If you have a BMI of: Under 18.5 (you are considered underweight and possibly malnourished). 18.5 to 24.9 (you are within a healthy weight range for young and middle-aged adults). 25.0 to 29.9 (you are considered overweight Gellish, 2007).
- ✓ **Maximum heart rate;** can be estimated at training using the commonly (traditional) formula 220 minus your age in years (220-age), Tanaka et al., (2001).
- ✓ **Resting heart rate;** is obtained by taking the pulse for one minute while the body is at rest. For adults, a normal resting heart rate ranges between 60 and 100 beats a minute. Knowing yours can give you an important sign of your heart health (Rex Mazeldine, 1984).
- ✓ **Working heart rate;** is the maximum heart rate minus the resting heart rate (Arnos and Gaines 1984).
- ✓ **Exercise heart rate**; to produce a training effect, the heart rate must be increased 60–80 percent of the working heart rate over and above the resting heart. The formula used by Karoven, (1994) is: **EHR = WHR.60 + RHR**

2.6. National Strength and Conditioning Association History:

The National Strength and Conditioning Association (NSCA) is an international nonprofit educational association founded in 1978. The association serves nearly 30,000 members in 52 countries. Its headquarters are in Colorado Springs, Colorado.

Seventy-six founding members organized the National Strength Coaches Association and by 1980, membership expanded to 2,250. In 1981, the organization's name changed to the National Strength and Conditioning Association. The membership expanded beyond strength coaches to encompass all professionals who contribute to the strength and conditioning field.

2.7. Physical activity guidelines

- Doing any physical activity is better than doing none. If an individual currently undertakes no physical activity, start buy doing some, and gradually buildup to the recommended amount.
- Be active on most, preferably all, days every week.
- Accumulate 150 to 300 minutes ($2\ ^{1}/2$ to 5 hours) of moderate intensity physical activity or 75 to 150 minutes ($1^{1}/4$ to $2^{1}/2$ hours) of vigorous intensity physical activity, or an equivalent combination of both moderate and vigorous activities, each week.
- Do muscle strengthening activities on at least two (2) days each week.
- You may choose to do a combination of moderate and vigorous intensity activity is equal to 20 minutes of moderate intensity activity (Len Hoy and Cyril Carter, 1980).

Here are the guidelines for maximal strength training (by Jacky Anderson, 1977):

- **Duration of Phase:** 3-9 weeks
- **Sessions per week:** 2-3
- **Load:** 85% to 100% 1-RM
- **No. Exercises:** 4-7
- **No. Reps per Exercise:** 1-4
- **No. sets per Exercise:** 3-5
- **Rest between Sets:** 3-5 minutes
- **Rest between sessions:** 48 hours

2.7.1 Principles of training:

Training should be matched to an individual's needs. By using the principles of training as a framework we can plan a personal training program that uses scientific principles to improve performance, skill, game ability and physical fitness.

A successful training program will meet individual needs which are personal fitness needs based on age, gender, fitness level and the sport for which we are training. A successful training program will also include exercise in the correct heart-rate target zone. The key principles when planning a program are:

- **Specificity**: Training must be matched to the needs of the sporting activity to improve fitness in the body parts the sport uses.
- **Overload**: Fitness can only be improved by training more than you normally do. You must work hard.
- **Progression**: Start slowly and gradually increase the amount of exercise and keep overloading.
- **Reversibility**: Any adaptation that takes place as a result of training will be reversed when you stop training. If you take a break or don't train often enough you will lose fitness (L mood Musker Rink. 12th edition).

In planning a program, use the **FITT** principles to add the detail:

- ✓ **Frequency**: Decide how often to train or the number of training sessions either daily or weekly.
- ✓ **Intensity**: Choose how hard to train, or the level of work, energy expenditure or physiological response in relation to the maximum.
- ✓ **Time**: Decide for how long to train or the amount of times spent training per session or per day.
- ✓ **Type**: Decide which methods of training to use.

You should also consider the principle of moderation. It is important to have rest periods which allow the body to adapt. Too much training (overtraining) can lead to injury (Kaye, 1978).

2.8. Upper body muscle groups:

The upper body comprises seven general muscle regions in the shoulders, chest and back. Each of these regions contains several muscle groups consisting of several muscle heads, or parts. The muscle regions also contain several individual muscles, which perform similar functions to the muscle groups and often act as assisting muscles. The main muscle groups that compose the upper body include; neck and shoulder, chest, abdominals, arms, and back.
Upper body exercises of value are; pushups, diamond press ups, clap pushups, sit-ups, sitting knee tucks, curl ups, and trunk lift (Cooper, 1968).

Press-up: Push-ups (press-up) is a common exercise performed in a prone position by raising and lowering the body using the arms. Push-ups are a basic exercise used in civilian athletic training or physical education and commonly in military physical training. They are also a common form of punishment used in the military, school sport, or in some martial arts disciplines.

According to Hakkinen and Pakarinan, (1994) there five benefit of pushups; target multiple muscle groups, you can do them anywhere, build core strength, burn loss of calories, and are easy to modify.

There are seven benefits of pushups for females. Women have less upper body strength and muscle mass than men. Pushups strengthen women's forearms, the biceps, and those hard-to-tone triceps on the back of the arms. The pectoral, or chest, muscles are also strengthened for a more firm breast area. There are also eight variations of pushups for women such as: girl pushups, simple pushups, wall pushups, ballistic pushups, diamond pushups, spider man pushups, and knuckle pushups.

Sit-ups: A physical exercise designed to strengthen the abdominal muscles, in which a person sits up from a supine position without using the arms for leverage. The sit-up (curl-up) is an abdominal endurance training exercise commonly performed to strengthen and tone the abdominal muscles. It is similar to a crunch, but sit-ups have a fuller range of motion and condition additional muscles.

Sits ups benefits: Sit ups are like crunches, but the two actually have some differences. While both exercises start out by lying flat on your back, a sit up requires you to lift your entire torso up into a semi-seated position, where as a crunch simply means lifting just your shoulders and upper back off the ground.

According to Cannon and Marino, (2010) there five benefits of sit ups: strengthen core, increase flexibility, range of motion, improve motion, reduce risk of back pain or injuries, and easily modified.

2.9. Lower body muscle groups:

In order to have an overall strong body, one must also place legs into their training regimen. It's important to train legs because they improve overall strength and wellbeing.
The main muscle groups that compose the lower body include; quadriceps, gluteus, calves, and harm strings. Lower body Leg Exercises of value are: jump squat, wall squat, one-legged squat, vertical jump, assisted squat, and leg strength(Brian Mac et al., 2000).

2.9.1. Body Weight Squat:

The body weight squat is a lower body strengthening exercise that can be performed virtually anywhere with no equipment and limited space .It's a highly functional movement working all the major muscles of the legs.

There are four benefits of the squatsTk Kim cited by, 2015.

- **Build muscle**: Squat hits your legs hard, requiring multiple muscles to work in unison and stimulates growth.
- **Increased strength**: squatting will strengthen your legs and the tendons in your knees like no other exercise.
- **Improved hip mobility**: The exercise builds and maintains mobility in the hip joint.
- **Fat burning/general health**: Body weight squats allow you to perform many controlled reps in succession, elevating the heart and burning fat.

2.9.2. Bodyweight Wall Squat:

Stand with your head and back against a wall. Position with your feet shoulder-width apart, about 18 inches from the wall, and keep your arms at your sides (A).Lower your body into a squat position until your thighs are parallel to the floor (B).Hold.

According to Haffand Nimphius, (2012), there are ten benefits of wall sit exercises; strengthen the muscles, helps in focusing, helps in gaining stamina, makes your thighs really strong, allows you to be more flexible with your body, helps in concentration, you learn the art of balancing, reduces the stress, increases the strength of the calf muscles and strengthen your Abs.

There three squat exercise variations as Schmottlach and Macmanamacited by, 1977.

- **Weighted squats**- barbell squat, kettle bell squat, goblet squat or use a weighted vest, dumbbells or medicine ball.
- **One-legged squat or pistol squat**- the intense, single leg version of the traditional squat exercise (single leg squat).
- **Assisted squats**- suspension trainers, resistance bands and rings can all be used for squat assistance (Suspended Single Leg Squat for example).

2.9.3. Standing broad jump:

Standing long jump, also known as the standing broad jump, is an athletics event. It was an Olympic event until 1912. It is one of three standing variations of track and field jumping events, which also include the standing high jump and standing triple jump (Bratislava, 1986).

The biggest benefit of the broad jump is that it helps athletes improve lower body power. Being categorized as a polymeric exercise, the broad jump will give you the same benefits as polymeric, such as: leg strength or power, acceleration, balance, and even bone density.
Long jumpers need to work their hamstrings, thighs, back, abs, hips, and gluteus for a powerful long jump. A strong core helps a long jumper maintain body control in order to utilize all the muscle power throughout the body (Kukenand Col, 1986).

2.9.4. Standing vertical jump:

The standing vertical jump is a popular test of leg power and it is routinely used to monitor the effectiveness of an athlete's conditioning program.

Types: The vertical jump is divided into two different types.

- **Standing vertical jump**: This refers to a vertical jump done from a standstill with no steps being involved at all.
- **Running vertical jump**: This refers to a vertical jump after an approach or run to help add energy to the jump in an effort to improve on the standing vertical jump.

In general, the standing vertical jump is the one that is used as an official measurement for athletes.

Facilities and Equipment

According to David Levinson and Karen Christensen (2005), availability of sport facilities and equipment has a tremendous effect on the development and popularity of a given sport. If the facilities and equipment were available in sufficient manner, it was too easy to produce a number of outstanding athletes who could show highest performance at national of international level.

CHAPTER THREE

3. STUDY PROCEDURE ANDMETHODOLOGY

3.1. Description of the Study Area

This study was conducted in KellemWollega Zone, Dambi Dolo town at Bethel Evangelical Secondary School (BESS). This school was found to the West of Addis Ababa around 632km.

3.2. Study design

A quasi-experimental design was implemented which Seeks to determine if a specific treatment influences an outcome. The prefix quasi means "resembling." Thus quasi-experimental research is research that resembles experimental research but is not true experimental research. Quasi-experiments are subject to concerns regarding internal validity, because the treatment and control groups may not be comparable at baseline (Gribbons, and Joan, 1979).

3.2.1. Comparison Group Pre-test/ Post-test Design

In quasi-experimental design, the research substitutes statistical "controls" for the absence of physical control of the experimental situation. The most quasi-experimental design is the Comparison Group Pre-test/ Post-test Design (Dinardo, 2008).

Due to the real-world setting, pre-test and post-test were created using matched pairs while as many threats to validity as possible were controlled. The reason why the researcher takes the pre-test and post-test was, to see statistically significant difference or not been difference between the physical fitness performances following the technique practice.

3.3. Population of the study

A study population is the entire group of people to which a researcher intends the results of a study to apply (Aron and Coups, 2008). Therefore the population of this particular study was comprised tenth (10^{th})grade, dormitory students of bethel evangelical secondary school in Dembi Dolo town. Depending on the nature of the study, target population would be delimited to one homogeneous classes of the school. Furthermore, they were similar in terms of their age, same nutritional diets and passed their time as sedentary life styles in one compound.

3.4. Sample and Sample techniques

Forty healthy students were selected, 27 (67.5%) of them were male studentsand13 (32.5%), were female students from grade ten (10). And the samples were selected purposively for manageability. This sampling method requires researchers to have prior knowledge about the purpose of their studies so that they can properly choose and approach eligible participants.

3.4.1. Inclusion criteria

Ritchie al., (2003) defines this sampling approach as a strategy where "members of a sample are chosen with a purpose to represent a location or type in relation to the criterion". The reason the investigator was used this technique due to its extremely time and cost effective when compared to other sampling methods. So elements of samples were included multiple criteria such as; height (1.59-1.78cm), weight (46-62kg), HBMI (18.38-24.60), NRHR (60-78), and the age of 16-17.This criterion of selection was helped students to check the current health related to their physical fitness.

3.4.2. Exclusion criteria

Similarly, muscular strength physical exercises were systematically excluded students with heart failure problem, females during menstrual cycle, pregnant women, and behavioral problem. This test is suitable for active individuals, but not for those where the test would be contraindicated as cited by Davis (2000).

Additionally, the selected students were similar in terms of age, taking same nutritional diets. Dormitory students were increased in body weight because of lack of activity. Furthermore, they were also sedentary life styles.

3.5. Sources of Data

Data was obtained from both primary and secondary data sources. The primary sources of data were those obtained from field test which was through pre-test and post-test. Test is something which proves information regarding individual's ability, knowledge, performance, and achievement (Ritchieet al., 2000).

The reason for the investigator was used field test; to administer a group of individuals (time effective), less precise than laboratory test of the same characteristics. Additionally, relevant literatures would consult for the availability of data.

3.6. Data collecting instruments

The quantitative data was collected through eight muscular strength physical tests. The reason needed to select these eight exercises was due to their cheapness or required little space and performed without equipment anywhere. Experimental material, such as; paper, pen, pencil, stopwatch, simple weight machine, common meter, traditional exercise mats and simple plastic ruler were used for collecting and recording data.

3.7. Muscular strength physical fitness training procedure

The procedures were conducted using the following phases;

3.7.1 Muscular strength physicalpre-test phase

In this phase students were given pre-test treatment to check the current muscle strength performance. This was helped to cross check their performance with post-test treatment given after twelve-week strength training. In this pre-test phase the test would include both upper and lower body muscular strength exercise.

Pre-test results were recorded on check list based on fitness standard norms. This fitness standard norms were also stated, on the below table (appendix II, page 68-69).

3.7.2 Muscular strength physical treatment phase

In this phase students were given muscular strength training treatment for three months. This treatment program was arranged between first semester final exam and second semester final

exam for three days per week (i.e. Monday, Wednesday and Friday) after their regular class program.

During the period of maintenance program, each session of maintenance was alternated according to the course planning designed by the researcher. Forty (40) students were classified into two (2) groups of students; one group was selected from male students 27 (67.5%) and thirty 32.5% other students were from females. Hence, the intensity for exercise was low to moderate (7 to 12) 1-RM, the number of sets and repetitions (3×4), and number of attempts or time trials three (3), rest between sessions (48 hours). First of all the researcher was introducing himself. After getting willing of the students the researcher was describe purpose of the study to the trainers. There were practice eight strength exercise techniques that students going to trained in, so ten minute (10') was used from all forty minute (40') allocated for physical education period, ten minute (10') was taken for warming up five minutes (5') and five minutes (5') for cooling down at the end of the task. However, twelve-12 periods were under the normal class and the other twenty four (24), classes were additional class of physical exercise program.

Furthermore, all exercises were fully explained and demonstrated previously by the investigator, and students were asked to try them a few minutes before starting the first session of the intervention. Although, the name of sampled students were alphabetically (numerically) arranged and the test was started from number one (1), to the last forty (40), or ascending order. However, the testers' were taken a rest until their number was rounded to the back for next tested of variables. However, the selected subjects were tested firstly by the investigator himself.

3.7.3 Muscular strength physical post-test phase

In this phase data was collected quantitatively through post-test. And the test result records were compared with pre-test results of students' performance.

The data was recorded by the investigator with the help of one assistant data recorder. Then, the results were compared with pre-test result and discussed in chapter four.

3.8. Muscular strength physical test analysis

In quasi-experimental study, quantitative data analysis was used. In order to identify effect of 12-week muscular strength-training exercises, the data was collected as numerical form of Statistical Package for Social Science (SPSS) and it was analyzed using through quantitative forms. The paired sample t-test was used to compare the data among pre-test and post-tests. Level of significance was < 0.05%.T-test will be employed to check whether there exists any significant difference between the mean scores of the study with respect to their post-test results. The full preview of the Paired-Sample T-test results was displayed and the analysis was supported by table's presentation. Furthermore, it was discussed in chapter four.

$$t = \frac{\overline{D}}{\sqrt{\frac{\sum(D-\overline{D})^2}{n(n-1)}}} \text{ or } \quad t = \frac{(\sum D)/N}{\sqrt{\frac{\sum D^2 - \left(\frac{(\sum D)^2}{N}\right)}{(N-1)(N)}}}$$ T-test Formula

Where:-

- t = repeated measure sample t-test value
- $\overline{D} = \frac{\Sigma D}{n}$
- D = (X-Y) is the difference between mean of posttest and pretest result
- n = no of sample participants.

3.9. Ethical Consideration

The research would be conducted by an individual with a post-graduate for the fulfillments of masters of physical education thesis in Jimma University. The people whom they were used for the sample would not be inanimately mentioned and were confidential for the information they would give in a respondent. The information of the students would be done in a right, ethical and responsible procedure. The study would be free from any sort of political, religious, and personal +biases.

CHAPTER FOUR

4. RESULT AND DISCUSSION

The collected data on students' performance through the strength training has been analyzed and presented in this chapter. The purpose of the study was to examine effect of twelve-week muscular strength fitness training on upper and lower body muscle strength performance of students'. The variables selected for the study were upper body values (i.e. simple pushups, sit up, sitting tucks and trunk lift) and lower body values (i.e. squat jumps, wall sits, standing broad jumps, and standing vertical jumps) performance of selected students were from BESS students. The participation rate was 100%, i.e. there was no dropout due to physical or some healthy related problem.

4.1 Demographic characteristics of the sample

The muscular strength group training was included 27(67.5%) male students and 13 (32.5%)female students with the age of 16-17. Total mean of the students 'accordingly their height (cm), weight (kg), BMI, and RHR was 1.68, 54.10, 19.5, and 70.05respectively. Additionally, students those where with heart failure problem, females during menstrual cycle, pregnant women and behavioral problem would be excluded.

4.2. The Analysis and interpretation result of upper-body muscular strength fitness test.

4.2.1. Analysis and interpretation of pushups strength exercise test

4.2.1. Table2: Sampled students' fitness status of pushups test performance (reps)

Students	Sex	Performance result (Mean)		Difference (D= X - Y)	$(D - \overline{D})^2$	df	t-value	Sig.
		Pre-test (Y)	Post-test (X)					
001	M	11	14	3	1.38	39	26.12	0.01
002	M	9	12	3	1.38			
003	M	12	16	4	0.03			
004	M	11	17	6	3.33			
005	M	8	12	4	0.03			
006	M	12	16	4	0.03			
007	M	9	14	5	0.68			
008	M	13	17	4	0.03			
009	M	10	16	6	3.33			
010	M	8	13	5	0.68			
011	M	10	14	4	0.03			
012	M	9	14	5	0.68			
013	M	12	16	4	0.03			
014	M	8	13	5	0.68			
015	M	7	13	6	3.33			
016	M	9	14	5	0.68			
017	M	10	14	4	0.03			
018	M	9	15	6	3.33			
019	M	11	14	3	1.38			
020	M	10	15	5	0.68			
021	M	8	12	4	0.03			
022	M	9	13	4	0.03			
023	M	7	12	5	0.68			
024	M	8	14	6	3.33			
025	M	7	11	4	0.03			
026	M	8	14	6	3.33			
027	M	7	10	3	1.38			
028	F	7	12	5	0.68			
029	F	8	12	4	0.03			
030	F	7	10	3	1.38			
031	F	8	13	5	0.68			
032	F	9	13	4	0.03			
033	F	9	12	3	1.38			
034	F	8	11	3	1.38			
035	F	7	13	6	3.33			
036	F	9	12	3	1.38			
037	F	8	12	4	0.03			
038	F	7	10	3	1.38			
039	F	6	10	4	0.03			
040	F	6	9	3	1.38			
Total		Mean 8.78	Mean 13.10	$(\Sigma D)=173$	$\Sigma(D-\overline{D})^2 =$ 43.68			

As shown in the above table 2, pre-test and post-test performance results of individual students' in upper-body muscle strength physical exercise on pushups were given. Before giving pushups strength physical training, students have showed lower performance with total mean value of 8.78 relative to their performance observed, after the pushups training exercises were given with total mean score 13.10.In conformity with this t-test result, the p-value 0.01 was less than 0.05 confidence level.

Therefore, the mean post-test performance of forty students was significantly different from that of pre-test. Thus, the t-test value computed to show probability of statistical significant differences between the means of pre-test and post-performance test of students on pushups strength training exercise at alpha (0.05) level was indicated as t-value = 26.12, df= 39 and P-value = 0.01. Accordingly, the change or the difference in behavior observed before and after the test were statistically significant. Hence, the null hypothesis is accepted and the alternative hypothesis was rejected. Similarly, after 12-week pushups strength physical training was given the investigator was observed that, students were good improved performance and increased their progression with mean difference in upper muscular strength.

The rationale behind the improvement in pushups strength training was due to the exercise, which they took in the training schedule. The Paired-Sample T-test results were clearly showing that training would have great effect on their muscular strength physical fitness.

In this study comparison was made between pushups mean post-test results and health standard pushups test under 17 repetitions among similar age groups, that range from 15 to 19 years old (Golding et., al. (1986). Hence, the study results revealed was fair improvement of performance for both sexes (norms found on appendix II, table 20).This test result indicated that giving appropriate training for the learners was highly important to improve or develop their performance in pushups. As Millar was indicated in 1960, comparison of physical fitness tests results to health standards and improvement of your fitness is more important than comparisons to results of other students.

Furthermore, the study subjects were improved their pushups performance and developed intensity of their exercise from low to moderate (7-12) 1-RM. This indicates that giving appropriate training for the learners is highly important to improve or develop learners' performance in muscular strength training exercises.

4.2.2. Analysis result and interpretation of sit ups strength exercise test

Table3: Sampled students' fitness status of sit-ups test performance (reps)

ID No.	Sex	Performance results		Difference (D= X - Y)	$(D-\overline{D})^2$	df	t-value	Sig.
		Pre-test (Y)	Post-test (X)					
001	M	11	15	4	0.56	39	12.81	0.01
002	M	15	18	3	0.06			
003	M	15	17	2	1.56			
004	M	14	17	3	0.06			
005	M	13	16	3	0.06			
006	M	14	17	3	0.06			
007	M	11	14	3	0.06			
008	M	13	13	0	7.98			
009	M	13	16	3	0.06			
010	M	14	16	2	1.56			
011	M	14	14	0	7.98			
012	M	15	18	3	0.06			
013	M	16	19	3	0.06			
014	M	13	13	0	7.98			
015	M	16	19	3	0.06			
016	M	13	15	2	1.56			
017	M	14	17	3	0.06			
018	M	14	16	2	1.56			
019	M	15	15	0	7.98			
020	M	13	16	3	0.06			
021	M	12	16	4	0.56			
022	M	13	16	3	0.06			
023	M	12	15	3	0.06			
024	M	11	15	4	0.56			
025	M	10	15	5	3.06			
026	M	12	16	4	0.56			
027	M	13	17	4	0.56			
028	F	9	9	0	7.98			
029	F	8	12	4	0.56			
030	F	7	11	4	0.56			
031	F	7	12	5	3.06			
032	F	8	8	0	7.98			
033	F	9	13	4	0.56			
034	F	8	11	3	0.06			
035	F	7	10	3	0.06			
036	F	8	11	3	0.06			
037	F	8	12	4	0.56			
038	F	7	11	4	0.56			
039	F	6	9	3	0.06			
040	F	6	10	4	0.56			
Total		Mean 11.43	Mean 14.25	(ΣD)= 113	$\Sigma(D-\overline{D})^2$ = 67.51			

As illustrated the above table 3 sample students' pre-test and post-test performance result of muscle strength fitness on sit-ups strength physical exercises were given. During pre-test performance of students in sit-ups exercises were repeatedly tested and their mean result was taken. Similarly, during post-test i.e. after thirty-six days strength training the same procedure was taken. As it was also indicated in the table majority of students 34 (85%), were showed performance improvement in their sit-ups physical strength exercise. From total, only six 15% students were failed to showing improvement after thirty six days strength training.

However, total mean result of all students' during pre-test was 11.43 and 14.25 at post-test, which revealed that there was very good performance improvement sit-ups strength exercises (found on appendix I table 13). In conformity with this test result, from the t-test result the p-value 0.01 was less than 0.05 confidence level. Therefore, the mean (average) post-test performance of forty students was significantly different from that of pre-test.

In this study comparison was made between sit ups mean post-test results and fitness sit ups test standard norms that found less than 17 of men and < 9 of females sit up, number per 30 seconds among similar age groups that ranges from 16 to 19 years old(Davis 2000).

Hence, the study results clearly showed was poor for male and below average for female students (found on appendix II, table 21).As Millar was indicated 1960, comparison of physical fitness tests results to health standards and improvement of your fitness is more important than comparisons to results of other students.

After 12-week sit ups strength training was given the investigator was continuously observed that, students were improved and developed progression of their sit-ups by increasing number of repetitions with average difference.

From this result it was possible to concluded, that training program had positive effects on increments of performance efficiency in sit ups due to the exercise training. This result was similar with the reports of (Edgerton, 1976).Hence, during sit ups test, the investigator was made the training according to the following procedure. First subjects were laid on back, hands on back of neck with fingers clasped, knees bent less than 90^0, feet on floor and heels no more than 12 inches from buttocks. Secondly, the students were encouraged to perform one or two trial repetitions before rest(Davis 2000).

4.2.3. Analysis result and interpretation of sitting tucks strength exercise test

Table 4: Sampled students 'fitness status of sitting tucks test performance (reps)

ID No.	Sex	Performance results		Difference (D = X - Y)	$(D-\overline{D})^2$	df	t-value	Sig.
		Pre-test (Y)	Post-test (X)					
001	M	13	18	5	0.68	39	26.83	0.01
002	M	14	17	3	1.38			
003	M	14	18	4	0.03			
004	M	15	18	3	1.38			
005	M	13	17	4	0.03			
006	M	13	18	5	0.68			
007	M	15	19	4	0.03			
008	M	15	18	3	1.38			
009	M	14	19	5	0.68			
010	M	14	17	3	1.38			
011	M	13	18	5	0.68			
012	M	16	19	3	1.38			
013	M	14	17	3	1.38			
014	M	15	19	4	0.03			
015	M	17	21	4	0.03			
016	M	17	20	3	1.38			
017	M	13	19	6	3.33			
018	M	15	19	4	0.03			
019	M	16	20	4	0.03			
020	M	14	19	5	0.68			
021	M	13	17	4	0.03			
022	M	14	19	5	0.68			
023	M	13	17	4	0.03			
024	M	14	18	4	0.03			
025	M	13	18	5	0.68			
026	M	12	16	4	0.03			
027	M	13	18	5	0.68			
028	F	10	13	3	1.38			
029	F	9	14	5	0.68			
030	F	12	16	4	0.03			
031	F	10	13	3	1.38			
032	F	9	15	6	3.33			
033	F	10	15	5	0.68			
034	F	9	15	6	3.33			
035	F	9	12	3	1.38			
036	F	10	14	4	0.03			
037	F	11	16	5	0.68			
038	F	12	14	2	4.73			
039	F	9	14	5	0.68			
040	F	11	16	5	0.68			
Total		Mean = 12.83	Mean= 17.00	$(\Sigma D)= 167$	$\Sigma(D-\overline{D})^2 = 37.77$			

As it was illustrated above in table 4, pre-test and post-test performance results of individual students in muscle strength fitness on sitting tucks strength exercise were given. The mean result of each students showed that there is an improvement in their performance after the strength training were given. That is each students have showed lower performance before giving any training and all students have showed a remarkable improvement in upper-body muscle strength fitness using sitting tucks strength exercise with total mean value of 12.83 during pre-test and with mean value 17.00 after the post-test.

In line with this, the statistical significance test was computed using t-test to see if there was significance difference in the two-performance test regarding the issue under consideration. In conformity with this, the computed t-test for equality of means with 39 df at calculated t-value of 26.83 the obtained p-value is 0.01 which is less than 0.05. Accordingly, the change or the difference in behavior observed before and after the test were statistically significant. Hence, the null hypothesis is accepted and the alternative hypothesis was rejected.

Therefore, the t-test result indicates that there was statistically significant difference between the means of pre-test and post-test. After seated knee tucks strength training exercises were given the investigator was continuously observed that, students were very good improved and developed progression of sitting tucks by increasing number of their repetitions.

In this study comparison was made between sitting tucks post-test results and sitting tucks health standard norms among similar age groups, that range from 17 to 26 years old (Davis 2000). Hence, the study post-test results revealed was marginal zone for both sexes (norms found on appendix II, table 22). As cited by Millar in 1960, comparison of physical fitness tests results to health standards and improvement of your fitness is more important than comparisons to results of other students.

During strength training the investigator also observed that, assistant was counting number of sitting tucks the subjects were able to perform. Additionally, the study subjects were increasing number of their sitting tucks with mean difference. The rationale behind the improvement in sitting strength training was due to the exercise, which they took in the training schedule. The test results were clearly showing that exercise would have great effect on their muscular strength fitness.

4.2.4. Analysis result and interpretation of Trunk lift strength exercises test

Table 5: Sampled students' fitness status of trunk lifts test performance (reps)

ID No.	Sex	Performance results		Difference (D= X–Y)	$(D - \overline{D})^2$	df	t-value	Sig.
		Pre-test (Y)	Post-test (X)					
001	M	8	11	3	0.005	39	15.33	0.01
002	M	9	13	4	0.855			
003	M	8	11	3	0.005			
004	M	7	11	4	0.855			
005	M	8	11	3	0.005			
006	M	10	13	3	0.005			
007	M	11	13	2	1.155			
008	M	10	10	0	9.455			
009	M	8	11	3	0.005			
010	M	9	11	2	1.155			
011	M	10	13	3	0.005			
012	M	9	9	0	9.455			
013	M	6	9	3	0.005			
014	M	7	10	3	0.005			
015	M	8	11	3	0.005			
016	M	7	9	2	1.155			
017	M	6	9	3	0.005			
018	M	8	10	2	1.155			
019	M	7	11	4	0.855			
020	M	8	11	3	0.005			
021	M	7	10	3	0.005			
022	M	8	11	3	0.005			
023	M	8	12	4	0.855			
024	M	7	11	4	0.855			
025	M	8	12	4	0.855			
026	M	7	12	5	3.705			
027	M	8	11	3	0.005			
028	F	10	10	0	9.455			
029	F	9	13	4	0.855			
030	F	8	12	4	0.855			
031	F	9	12	3	0.005			
032	F	8	12	4	0.855			
033	F	10	14	4	0.855			
034	F	9	13	4	0.855			
035	F	11	11	0	9.455			
036	F	10	14	4	0.855			
037	F	9	13	4	0.855			
038	F	8	13	5	3.705			
039	F	9	13	4	0.855			
040	F	8	12	4	0.855			
Total		Mean 8.38	Mean 11.45	(ΣD)= 123	$\Sigma(D-\overline{D})^2$ = 5687.77			

As depicted above in table five, sample student's pre-test and post-test performance result of muscle strength fitness on trunk lift strength exercise were given. During pre-test performance of students in trunk lift were repeatedly tested and their mean result were taken. Similarly, during post-test i.e. after thirty six days strength training the same procedure was taken.

As it was indicated in the table above majority of students 36 (90.0%), were showed performance improvement in trunk lift strength training exercises. From total students only four 10.0%, were failed to showing improvement after twelve-week muscular strength training. However, the total mean result of all students during pre-test was 8.38 and 11.45 at post-test, which revealed that there was very good performance improvement as the study was conducted between the students (norms found on appendix I table 15).In conformity to this, from the t-test result the p-value 0.01 was less than 0.05 confidence level. Therefore, the average post-test performance of forty, (40) students was significantly different from that of pre-test.

In this study, comparison was made between trunk lift health standard norms and post-test results of this finding for the age group ranges from 16 to 17 years old. But, the standard test norms for this age are 17-26 according to Gezahegne Abate and ArayDechasa, 2006).Fitness standard norm trunk lifts test is 10-14 repetitions for 17-26 age groups. Hence, the study results showed was good for both sexes (norms found on appendix II, table 23). Therefore, comparison of physical fitness tests results to health standards and improvement of your fitness is more important than comparisons to results of other students (Millar and Cawsey, 1960).

During trunk lift test, the investigator was made the training according to the following procedure. First students were laid on the mat in a face down position, with toes pointed back behind the body and hands placed under the thighs. Secondly, students were place a marker on the floor in line with the student's eyes which they must maintain focus on throughout the movement. Finally, the head should be maintained in a straight alignment with the spine. During training, the investigator also observed that, the assistant score recorder was recorded the distance from the floor to the students' chin. Two trials were allowed; with the best score was recorded (Ashe, J. 1997).Furthermore, this result indicates that giving appropriate training for the learners is highly important to improve or develop learners' performance in trunk lift.

4.3. Analysis and interpretation of lower-body muscle strength fitness training

4.3.1. Analysis result and interpretation of frog squats strength exercise test

Table 6: Sampled students' fitness status of squats test performance (reps)

ID No.	Sex	Performance results		Difference (D=X-Y)	$(D-\overline{D})^2$	df	t-value	Sig.
		Pre-test(Y)	Post-test (X)					
001	M	14	17	3	0.600	39	11.02	0.01
002	M	13	17	4	0.050			
003	M	11	16	5	1.500			
004	M	10	16	6	4.950			
005	M	12	12	0	14.25			
006	M	9	14	5	1.500			
007	M	13	18	5	1.500			
008	M	8	13	5	1.500			
009	M	9	9	0	14.25			
010	M	11	15	4	0.050			
011	M	13	18	5	1.500			
012	M	11	17	6	4.950			
013	M	13	16	3	0.600			
014	M	10	16	6	4.950			
015	M	12	12	0	14.25			
016	M	10	15	5	1.500			
017	M	9	15	6	4.950			
018	M	13	16	3	0.600			
019	M	10	15	5	1.500			
020	M	9	14	5	1.500			
021	M	9	14	5	1.500			
022	M	9	14	5	1.500			
023	M	11	11	0	14.25			
024	M	10	15`	5	1.500			
025	M	8	11	3	0.600			
026	M	10	10	0	14.25			
027	M	9	11	2	3.150			
028	F	8	13	5	1.500			
029	F	8	11	3	0.600			
030	F	9	9	0	14.25			
031	F	9	12	3	0.600			
032	F	8	14	6	4.950			
033	F	7	7	0	14.25			
034	F	10	15`	5	1.500			
035	F	8	14	6	4.950			
036	F	8	8	0	14.25			
037	F	9	15	6	4.950			
038	F	7	12	5	1.500			
039	F	7	13	6	4.950			
040	F	7	12	5	1.500			
Total		Mean=9.78	Mean=13.55	$(\Sigma D)=151$	$\Sigma(D-\overline{D})^2=182.98$			

As shown above in table six, (6) sample students' pre-test and post-test performance result of lower-body muscle strength fitness on frog squat strength physical exercises were given. During pre-test performance of students in squat strength exercise were repeatedly tested and their mean result were taken. Similarly, during post-test i.e. after thirty six days strength training the same procedure was taken.

As it was indicated in the table majority of students 32 (80%), were showing performance improvement in jump squat strength training exercises. From total students only 8 (20%), were failed to showing improvement after thirty six days muscle strength physical exercise. However, the total mean result of all students during pre-test was 9.78 and 13.55 at post-test, which revealed that there was good performance improvement as the study was conducted (norms found on appendix I table 16).In conformity to this Paired-Sample T-test, the p-value 0.01 was less than 0.05 confidence level. Therefore, the mean (average) post-test performance of forty, (40) students was significantly different from that of pre-test.

In this study, comparison was made between the health standard squat norms and the post-test result of this finding for the age group ranges from 16 to 17 years old. But, the standard test norms for this age are not known or mentioned according to Boot Camp, (2013). As supported by Millar and Cawsey in 1960, comparison of physical fitness tests results to health standards and improvement of your fitness is more important than comparisons to results of other students. Hence, after 12-week squatting physical strength training were given the investigator was continuously observed that, study subjects were improved and developed progression of squat frog by increasing number of their repetitions'.

The frog squat is a lower body strengthening exercise that can be performed virtually anywhere with no equipment and limited space. It's a highly functional movement working all the major muscles of the legs. During squatting test, the investigator was made the training according to the following procedure.

First subjects stood in front of a chair, facing away from it, with their feet shoulder width apart. Secondly, the subjects 'were squatted down lightly pushes down and jump up, repeats this sequence of movements until they are unable to continue with no rest in one minute. During training, the investigator also observed that, assistant data recorder was counting and recording the number of successfully completed squats (Fry et al., 2014).

4.3.2. Analysis result and interpretation of wall sits strength exercise test

Table 7: Sampled students' fitness status of wall sits test performance (reps)

ID No.	Sex	Performance results		Difference (D= X-Y)	$(D-\overline{D})^2$	df	t-value	Sig.
		Pre-test (Y)	Post-test (X)					
001	M	69	74	5	2.03	39	20.53	0.01
002	M	66	73	7	0.33			
003	M	70	75	5	2.03			
004	M	73	78	5	2.03			
005	M	70	78	8	2.48			
006	M	69	74	5	2.03			
007	M	67	76	9	6.63			
008	M	71	76	5	2.03			
009	M	67	74	7	0.33			
010	M	59	64	5	2.03			
011	M	67	75	8	2.48			
012	M	75	83	8	2.48			
013	M	71	76	5	2.03			
014	M	68	74	6	0.18			
015	M	70	77	7	0.33			
016	M	66	73	7	0.33			
017	M	72	78	6	0.18			
018	M	75	82	7	0.33			
019	M	71	77	6	0.18			
020	M	70	77	7	0.33			
021	M	68	76	8	2.48			
022	M	59	70	11	20.9			
023	M	68	77	9	6.63			
024	M	67	75	8	2.48			
025	M	69	76	7	0.33			
026	M	65	74	9	6.63			
027	M	64	73	9	6.63			
028	F	44	47	3	11.7			
029	F	43	47	4	5.88			
030	F	44	50	6	0.18			
031	F	43	47	4	5.88			
032	F	39	43	4	5.88			
033	F	44	47	3	11.7			
034	F	43	48	5	2.03			
035	F	40	46	6	0.18			
036	F	45	49	4	5.88			
037	F	46	51	5	2.03			
038	F	43	51	8	2.48			
039	F	48	55	7	0.33			
040	F	47	56	9	6.63			
Total		Mean= 60.37	Mean= 66.80	(**Σ**D)= 257	**Σ**$(D-\overline{D})^2$ =137.77			

As it was illustrated in the above table seven showed, that pre-test and post-test performance result of individual students in muscular strength training on wall sits exercises were given. The

mean result of the majority students revealed, that there was very good improvements in their performance after strength training were given.

While the wall sits test mean value result of this study was 60.37 at pre-test and 66.80, post-test for students respectively. In line with this, the statistical significance test was computed using t-test to see if there was significance difference in the two-performance test regarding the issue under consideration. In conformity with this, the computed t-test for equality of means with 39 df at calculated t-value of 20.53 the obtained p-value is 0.01 which is less than 0.05. Accordingly, the change or the difference in behavior observed before and after the test were statistically significant. Hence, the null hypothesis is accepted and the alternative hypothesis was rejected.

Therefore, the t-test result indicates that there was statistically significant difference between the means of pre-test and post-test. After 12-week strength training exercises were given the investigator was observed that, students were very good improved and developed intensity of their wall squat low to moderate exercise.

In this study comparison was made between wall sits post-test result with health standard wall sits norms among similar age groups that range from 16 to 17 years old(Arnos and Gaines 1984). Hence, the study post-test result showed was average for male and excellent for female students (norms found on appendix II, table 25). As Millar and Cawsey were indicated in 1960,comparison of physical fitness tests results to health standards and improvement of your fitness is more important than comparisons to results of other students.

Thus, study subjects were increased developed progression their exercise by increasing number repetitions' with average difference. The result indicates that giving appropriate training for the learners is highly important to improve or develop learners' performance in wall squats.

After wall squat strength exercises were given the investigator was continuously observed that, during wall squats test, the investigator was made the training according to the following procedure. First, the subject was assumed a sitting position with their back against wall feet flat on the ground and a 90^0 angle at the hips and knees. Finally, the subjects were repeated the test for the left foot following a short rest (Arnos and Gains 1984).

4.3.3. Analysis result and interpretation of standing broad jump strength exercise test

Table 8: Sampled students' fitness status of standing broad jumps test performance

ID No.	Sex	Performance results		Difference (D= X - Y)	$(D-\overline{D})^2$	df	t-value	Sig.
		Pre-test (Y)	Post-test (X)					
001	M	1.28	2.30	1.02	0.336	39	11.54	0.01
002	M	1.70	2.40	0.70	0.067			
003	M	1.62	2.30	0.68	0.057			
004	M	1.50	2.30	0.80	0.129			
005	M	1.80	2.20	0.40	0.001			
006	M	1.60	2.20	0.60	0.025			
007	M	1.56	2.25	0.69	0.062			
008	M	1.45	2.20	0.75	0.096			
009	M	1.70	2.33	0.63	0.036			
010	M	1.50	1.50	0.00	0.193			
011	M	1.61	2.15	0.54	0.010			
012	M	1.40	2.12	0.72	0.078			
013	M	1.48	2.30	0.82	0.144			
014	M	1.82	2.39	0.57	0.017			
015	M	1.58	2.26	0.68	0.057			
016	M	1.75	2.21	0.46	0.000			
017	M	1.63	2.23	0.60	0.025			
018	M	1.73	2.33	0.60	0.025			
019	M	1.90	2.30	0.40	0.001			
020	M	2.11	2.41	0.30	0.019			
021	M	2.10	2.40	0.30	0.019			
022	M	1.97	2.35	0.38	0.003			
023	M	1.71	2.38	0.67	0.053			
024	M	1.89	2.28	0.39	0.002			
025	M	1.76	1.76	0.00	0.193			
026	M	2.11	2.41	0.30	0.019			
027	M	2.10	2.40	0.30	0.019			
028	F	1.60	1.91	0.31	0.016			
029	F	1.50	1.90	0.40	0.001			
030	F	1.62	1.91	0.29	0.022			
031	F	1.57	1.89	0.32	0.014			
032	F	1.60	1.81	0.21	0.052			
033	F	1.55	1.83	0.28	0.025			
034	F	1.61	1.91	0.30	0.019			
035	F	1.58	1.80	0.22	0.048			
036	F	1.53	1.78	0.25	0.035			
037	F	1.61	1.61	0.00	0.193			
038	F	1.59	1.79	0.20	0.057			
039	F	1.60	1.80	0.20	0.057			
040	F	1.61	1.91	0.30	0.019			
Total		Mean 1.67	Mean 2.11	(**Σ**D)=17.58	**Σ**$(D-\overline{D})^2$ = 2.264			

As indicated in the table eight, pre-test and post-test performance result of muscle strength fitness on broad jump exercise were given for sampled students. During pre-test performance of students in standing broad jump, exercises were repeatedly tested and their mean results were taken. Similarly, during post-test strength training the same procedures were taken. As it was also depicted in the table majority of students 37 (92.5%), were showed performance improvement in muscular strength training using standing long jump exercise. From total students forty (40), only 3 (7.5%), students were showed difficulty to improve their performance after thirty six days training. In conformity to this, from the t-test result the p-value 0.01was less than 0.05 confidence level. Therefore, the average post-test performance of forty(40) students was significantly different from that of pre-test.

Thus, after 12-week strength exercises were given the investigator was observed that,the total mean result all students' during pre-test was1.67 and 2.11 at post-test, which revealed that there was excellent performance improvement.

In this study comparison was made between healthy standard norms and standing broad jump post-test result of this finding, among similar age groups. Based on fitness test norms for the age group greater than 16 years old broad jumps (Hede et al. 2011). Hence, the study results revealed was below average for male and excellent for female students (norms found on appendix II, table 26). As supported by Millar in 1960,comparison of physical fitness tests results to health standards and improvement of your fitness is more important than comparisons to results of other students

The standing broad jump test is to monitor the development of the athlete's elastic leg strength. After broad jump strength exercises were given the investigator was continuously observed that, students were improved and developed progression of their standing broad jumps length of their jumps with average difference. Furthermore, during standing broad jump strength exercises, the investigator also observed that, assistant was measured and recorded the longest distance to assessing the subjects' leg strength. As well as during standing long jump muscle strength training exercises, the study subjects were repeated the test three times (Hede et al. 2011).

The rationale behind the improvement in sitting strength training was due to the exercise, which they took in the training schedule. The test results were clearly showing that exercise would have great effect on their muscular strength fitness.

4.3.4. Analysis result and interpretation of standing vertical jump strength exercise test

Table 9: Sampled students' pre-test and post-test performance result of standing vertical jump

ID No.	Sex	Performance results		Difference (D= X - Y)	$(D - \overline{D})^2$	df	t-value	Sig.
		Pre-test (Y)	Post-test (X)					
001	M	39	44	5	2.640	39	14.26	0.01
002	M	43	47	4	0.390			
003	M	43	46	3	0.140			
004	M	36	39	3	0.140			
005	M	37	42	5	2.640			
006	M	39	42	3	0.140			
007	M	38	42	4	0.390			
008	M	39	42	3	0.140			
009	M	41	41	0	11.39			
010	M	35	39	4	0.390			
011	M	37	40	3	0.140			
012	M	39	42	3	0.140			
013	M	40	43	3	0.140			
014	M	42	45	3	0.140			
015	M	44	47	3	0.140			
016	M	39	43	4	0.390			
017	M	45	45	0	11.39			
018	M	44	47	3	0.140			
019	M	45	48	3	0.140			
020	M	42	46	4	0.390			
021	M	39	45	6	6.890			
022	M	37	42	5	2.640			
023	M	41	46	5	2.640			
024	M	38	42	4	0.390			
025	M	40	45	5	2.640			
026	M	35	41	6	6.890			
027	M	38	43	5	2.640			
028	F	43	43	0	11.39			
029	F	42	45	3	0.140			
030	F	39	41	2	1.890			
031	F	35	38	3	0.140			
032	F	41	43	2	1.890			
033	F	39	42	3	0.140			
034	F	38	38	0	11.39			
035	F	41	44	3	0.140			
036	F	42	46	4	0.390			
037	F	43	47	4	0.390			
038	F	39	42	3	0.140			
039	F	38	43	5	2.640			
040	F	35	39	4	0.390			
Total		Mean 39.75	Mean 43.13	(ΣD)= 135	$\Sigma(D-\overline{D})^2$ = 87.38			

From above table nine pre-test and post-test performance result of muscle strength fitness on standing vertical jump strength exercise was given for sampled students. During pre-test

performance of students in standing vertical jump, exercises were repeatedly tested and their mean results were taken. Similarly, during post-test (i.e. after 36 days) strength training the same procedure was taken.

As it was indicated in the table majority of students 36(90.0%), were showed performance improvement in lower-body muscular strength using standing vertical jump technique. From total students only 4 (10%), were showed difficulties to improve their performance after three month of training.

However, the total mean result of all students during pre-test was 39.75 and 43.13 at post-test, which revealed that there was a very good performance improvement comparison to their peers. In conformity to this, from the t-test result the p-value 0.01was less than 0.05 confidence level. Therefore, the average post-test performance of forty (40), students was significantly different from that of pre-test.

In this study comparison was made between standing broad jumps post-test result with health standard norms among similar age groups that range from 16 to 17 years old(Davis 2000).Hence, the studypost-test results revealed was average for both sexes (norms found on appendix II, table 27). Comparison of physical fitness tests results to health standards and improvement of your fitness is more important than comparisons to results of other students (Millar and Cawsey, 1960).

This result indicates that giving appropriate training for the learners is highly important to improve or develop learners' performance in standing vertical jump exercise..

After wall squat strength exercises were given the investigator was continuously observed that, students were improved and developed progression their vertical jump by increasing height of jumps, with mean difference. And as, the study subjects were performed correct sequence of movements, due to standing vertical jump strength training exercises were given twelve-week consecutively.

The rationale behind the improvement in sitting strength training was due to the exercise, which they took in the training schedule. The test results were clearly showing that exercise would have great effect on their muscular strength fitness. Generally, the training program had positive effects on increments of performance efficiency in vertical jumps due to the exercise training (Davis, 2000).

Table 10: Correlation coefficients, mean differences and significant level of each test resulted findings

No.	Variables	Pre-test	Post-test	Mean difference	Standard deviation	Correlation	Sig.
1	Pushups	8.78	13.10	4.33	1.05	0.85	0.01
2	Sit-ups	11.43	14.25	2.81	1.39	0.89	0.01
3	Sitting tucks	12.83	17.00	4.18	0.98	0.90	0.01
4	Trunk lifts	8.38	11.45	3.08	1.26	0.84	0.01
5	Frog squats	9.78	13.55	3.78	2.16	0.66	0.01
6	Wall sits	60.38	66.80	6.43	1.88	0.98	0.01
7	Standing-broad jumps	1.67	2.11	0.44	0.24	0.47	0.01
8	Standing-vertical jumps	39.75	43.13	3.38	1.49	0.85	0.01

As it was illustrated in the above table 10, the finding of the study results showed there were significant improvements of performance. As supported by Hopkins et al., (1999) significance results showed that students were improved their performance due to participation of physical exercises.

The correlation coefficient of upper body exercises (i.e., pushups, sit-ups, sitting tucks, and trunk lifts) on the students' pre-test result was showed very high positive significant relationships (i.e. between 0.80-1.00) with their post-test result exercises. Similarly, correlation coefficient of lower-body muscular strength exercises on the students' pre-test result (i.e., wall sits and standing vertical jump) was showed very high positive significant relationships, where the result has been found in between 0.80-1 with post-test results of their exercise.

With the exception of squat frogs at pre-test was showed high moderate positive relationships (i.e. 0.66) with its post-test result of exercise. On the other hand, the standing broad jump at pre-

tests result was showed moderate positive relationships (i.e. 0.47) with its post-test result of exercise.

In other hand the test results indicated that there was slight significant improvement had been observed on the students' muscular strength exercises. As it was also depicted in the table 10 most students were showed fair improvement of performance on pushups when compared to other upper body exercises with total mean value of 8.78 during pre-test and total mean value of 13.10 during post-test with mean difference of 4.33.

In wall sits students were showed average for male and excellent for female improvement of performance when compared to other lower body exercises with total mean value of 60.38 during pre-test and total mean value of 66.80 during post-test with 6.43 mean differences. In standing broad jump male students were showed below average for male and excellent for female students. Total mean value recorded was 1.67 during pre-test and 2.11 during post-test with 0.44 mean differences.

When, we compare the mean differences of pushups, wall sits and standing broad jumps, there was better improvement in pushups and wall sits. This indicates that there is an improvement of performance, as discussed by (Bennech et al, 2013) activity practice can cause enhancement in performance, but the level of performance improvement was not satisfactory depending on the result interpreted

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATION

This chapter deals with the summary, conclusions and recommendations.

5.1. Summary

This study was intended to examine the effect of twelve-week muscular strength training on upper and lower muscle strength of students.

In order to test effect of muscular strength training exercise, the subjects were allowed to participate in this training. Forty healthy students were selected. 27 (67.5%), of them were male students and 13 (32.5%), were female students from Bethel Evangelical Secondary School during the year of 2010 E.C.

The selected subject was under the quasi-experimental design of one group before training (pre-test) and post-test after twelve-weeks of strength training period. The training periods of these groups were twelve-weeks, three, (3) days per week with duration of 40 minutes in one session. The data were collected on some selected muscular strength exercises, namely pushups, sit-ups, sitting tucks, trunk lift, squat frog, wall sits, standing broad jump and standing vertical jump.

Physical fitness variables were statistically analyzed by using Paired-Samples T-test. The finding of this study results showed there were significant improvements. There was significant change in pre-test and post-test results. The mean value of the students' after three month of strength physical training was significantly improved. Significance results showed that muscular strength training group improved their performance due to participation of physical exercises. In other hand the results indicated that there was slight improvement had been observed on their muscular strength physical fitness. In all the cases, the level of confidence is fixed at 0.05 to test the significance.

Furthermore, most students have showed relatively fair performance improvement in upper-body muscular strength on pushups strength exercises from total mean value of 8.78 during pre-test and total mean value of 13.10 during post-test relative to other upper-body muscular strength exercises. It deviates from the mean only by 1.05 and students were showed relatively greater difference of 4.33 from their prior exercise to perform pushups. However, as it was indicated in

table 10, majority of students were showed relatively poor performance in upper-body muscle strength fitness on sit-ups in both pre-test and post-test with mean value of 11.43 and 14.25 respectively. The standard deviation of sit-ups is also 1.39 that indicates greater deviation from the mean of the rest exercises. Thus, students have showed difficulty in sit-ups during training. Additionally, the mean differences were 2.83 lower mean values of sit up sand 4.33 higher mean values of pushups. The rationale behind improvement in upper body muscle strength fitness performance was due to the exercise that they took in the muscle strength training schedule (Magil, 1993). Furthermore, the results clearly showed that exercise can have great effect on their muscular strength fitness.

Similarly, most students have showed relatively good performance improvement in lower-body muscle strength fitness on wall sits strength physical exercise from total mean value of 60.38 during pre-test and total mean value of 66.80 during post-test relative to other muscular strength exercises. It deviates from the mean only by 1.88 and students were showed relatively greater mean difference of 6.43from their prior to perform wall sits strength exercise. However, majority of students were showed relatively poor performance improvement in lower-body muscle strength fitness on standing broad jumps strength exercises in both pre-test and post-test with mean value of 1.67 and 2.11 respectively. The standard deviation of standing broad jump strength exercises was also 0.24, that indicated greater deviation from mean (average) of the rest techniques. Thus, students have showed difficulty in standing broad jump exercises during muscle strength training exercises. And also, the mean difference were 0.44 lower mean values in standing broad jump strength exercises and 6.43 higher mean values in wall sit strength exercises lower-body muscle strength fitness. As study reveals that, the mean differences were 0.44 with lower mean value of standing broad jumps and 6.43 higher mean value of wall sits respectively, during muscular strength fitness exercises for twelve-week strength training consecutively. This indicates that there is an improvement of performance, as discussed by (Bennech et al, 2013) activity practice can cause enhancement in performance; but the level of performance improvement was not satisfactory depending on the result interpreted.

From the selected exercises, some were simple to improve, or develop and some were difficulties to improve:

- **In pushups**: Students were showed fair improvement of performance relative to other upper body exercises with total mean value of 8.78 during pre-test and total mean value of 13.10 during post-test with mean difference of 4.33 (according to the table 10).
- **In wall sits**: Students were showed average for male and excellent for female improvement of performance when compared to other lower body exercises with total mean value of 60.38 during pre-test and total mean value of 66.80 during post-test with 6.43 mean differences.
- **In standing broad jump**: Students were showed below average for male and excellent for female. Total mean value recorded was 1.67 during pre-test and 2.11 during post-test with 0.44 mean differences.

When, we compare the mean differences of pushups, wall sits and standing broad jumps, there was better improvement in pushups and wall sits because of its simplicity. Still the improvement was not satisfactory. In addition, the study proved that, there was no adequate improvement with three, (3) sessions per week and 40 minutes each session in three-months.

5.2. Conclusion

Based on the major finding of this study and discussion made, the following conclusions were drawn.

- As reported in the study pushups post-test result was showed fair improvement of performance zone for both sexes.
- As showed by the results of sit-ups in post-test the males results were poor and females were below average of standard norms.
- Comparison was made between sitting tucks standard norms and sitting tucks post-test. The results of these finding was in marginal zone for both sexes.
- Trunk lift standard norms for upper-body muscular strength in post-test were in good performance zone for both sexes.
- The results of this study showed that, frog squats post-test groups were revealed there was good performance improvement as reported from their norm samples.
- The study was showed wall sits post-test results were average for male and excellent for female students.

- As reported in the study standing broad jump post-test was below average for male and excellent for female students.
- The results were indicating that, standing vertical jump was in average for both sexes.

This study reports that there was significance difference between pre-test and post-test of muscular strength physical exercise test.

The study reveals that 12-week muscular strength enhances muscular strength of upper and lower body of the students.

The result of the study showed improvement by all test results increase the performance the subjects who took part in three months exercise program of this study. It showed that, the thirty six days physical fitness training program have effects on the muscular strength performance of the participants.

5.3. Recommendation

The investigator was suggested the following recommendations in light of the summary and the conclusions made:

- ✓ Students have to perform their pushups exercise in regular manner.
- ✓ Sit-ups strength exercise is necessary important for students to strengthen their abdominal muscle, so they would train properly.
- ✓ Students would train to perform sitting tucks exercise appropriately to strengthen their upper body.
- ✓ Students have to train squat jump properly, to strength their leg muscle.
- ✓ It is advisable to improve students' muscular strength followed with scientific method.
- ✓ Strength training must be attractive and use appropriate way to improve students' upper and lower body muscular strength.
- ✓ The school should provide appropriate environment for students to do their exercise.
- ✓ The BESS should give consideration for physical education facilities.
- ✓ Students should aware about importance of regular physical exercise for their healthy.
- ✓ Students would have to participate in regular physical exercise.

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Table 11: Physiological data of sampled students' (muscular strength group)

Students	Sex	Age	Grade	Height	Weight	BMI	RHR	MHR	WHR	EHR.80%
001	M	17	10	1.70M	58KG	20.06	66	203	144	181.2
002	M	16	10	1.65M	46KG	18.38	72	204	132	177.6
003	M	17	10	1.60M	55KG	21.48	78	203	125	178.0
004	M	17	10	1.67M	48KG	19.00	72	203	131	176.8
005	M	17	10	1.65M	49KG	18.70	72	203	131	176.8
006	M	17	10	1.75M	61KG	19.91	66	203	143	180.4
007	M	16	10	1.60M	49KG	19.14	72	204	132	177.6
008	M	16	10	1.60M	50KG	19.53	78	204	126	178.8
009	M	17	10	1.65M	56KG	20.57	66	203	137	175.6
010	M	17	10	1.70M	54KG	19.10	60	203	143	174.4
011	M	17	10	1.72M	50KG	18.68	72	203	131	176.8
012	M	16	10	1.78M	60KG	24.60	72	204	129	175.2
013	M	16	10	1.65M	59KG	21.70	66	204	138	176.4
014	M	17	10	1.70M	56KG	19.37	66	203	137	175.6
015	M	17	10	1.77M	61KG	19.48	60	203	141	172.8
016	M	17	10	1.64M	51KG	18.95	66	203	137	175.6
017	M	16	10	1.62M	49KG	18.70	72	204	132	177.6
018	M	17	10	1.72M	55KG	18.64	78	203	125	178.8
019	M	16	10	1.60M	50KG	19.50	78	204	126	178.8
020	M	17	10	1.75M	58KG	18.95	72	203	131	176.0
021	M	16	10	1.59M	51KG	20.23	72	204	132	176.8
022	M	17	10	1.71M	55KG	18.82	66	203	136	174.8
023	M	17	10	1.78M	62KG	19.27	72	203	135	174.0
024	M	17	10	1.66M	53KG	20.19	72	203	130	176.0
025	M	17	10	1.74M	61KG	19.66	66	203	130	177.6
026	M	17	10	1.67M	55KG	19.70	72	203	131	176.8
027	M	17	10	1.75M	58KG	18.95	66	203	136	174.8
028	F	17	10	1.74M	60KG	19.86	66	203	137	175.6
029	F	16	10	1.73M	56KG	18.72	60	204	143	174.4
030	F	16	10	1.62M	49KG	18.70	60	204	146	176.8
031	F	16	10	1.65M	51KG	18.75	72	204	132	177.6
032	F	16	10	1.64M	52KG	19.33	72	204	132	177.6
033	F	16	10	1.65M	53KG	19.48	78	203	125	125.0
034	F	17	10	1.70M	55KG	19.03	78	202	124	177.2
035	F	17	10	1.66M	52KG	18.90	72	203	131	176.8
036	F	17	10	1.68M	55KG	18.64	72	203	131	176.4
037	F	17	10	1.60M	48KG	18.75	66	204	138	176.8
038	F	16	10	1.68M	54KG	19.14	66	202	136	174.8
039	F	17	10	1.65M	53KG	19.48	78	203	125	178.0
040	F	17	10	1.72M	56KG	18.98	72	202	130	176.0

APPENDIXI

JIMMA UNIVERSITY

COLLEGE OF NATURAL SCIENCE

DEPARTMENT OF SPORT SCIENCE

BESS students' fitness norms performance level for 16-17 years old

Table 12: Students' normative data for the pushups test (endurance)

Excellent	Very good	Good	Fair	Poor
> 17	14-17	10-13	6-9	< 6

Table 13: Students' normative data for sit ups test (reps per 30 second)

Excellent	Very good	Good	Fair	Poor
>17	14-17	10-13	6-9	< 6

Table14: Students' normative data for the sitting tucks test (reps)

Excellent	Very good	Good	Fair	Poor
> 17	14-17	10-13	7-9	< 7

Table15: Students' normative data for the trunk lift test (repetitions)

Excellent	Very good	Good	Fair	Poor
> 16	12–15	9-11	6–8	< 6

Table 16: Students' norms of the frog squat test for men and women (repsper minute)

Excellent	Very good	Good	Fair	Poor
> 18	14-18	10-14	7-9	< 7

Table 17: Student'normsfor the wall sit test (seconds)

Excellent	Very good	Good	Fair	Poor
>71	61-70sec	51-60sec	40-50sec	< 39 sec

Table 18: Students' normative datafor the standing broad jump test(meters)

Excellent	Very good	Good	Fair	Poor
> 1.81m	1.66-1.81m	1.51-1.65m	1.29-1.50m	< 1.29m

Table 19: Students' normative datafor standing vertical jump test (centimeters)

Excellent	Very good	Good	Fair	Poor
>47cm	44-47cm	40-43cm	36-39cm	<35cm

APPENDIXII

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The fitness rating of standard norms performance level of the samples

Table 20: Normative data for the pushups test (reps/ minute)

Age	Excellent	Good	Average	Fair	Poor
15-19	> 47	35-46	19-34	11-18	<11

Source :(Golding ET .al. (1986)

Table 21: Normative data for 16 to 19 years old for the sit ups test (reps per 30 second)

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	>30	26-30	20-25	17-19	<17
Female	>25	21-25	15-20	9-14	<9

Source: (Davis 2000)

Table22: Normative data for the sitting tucks test (reps)

Gender	High performance zone	Good fitness zone	Marginal zone	Low zone
Male	35^{+}	20-34	15-19	<15
Female	25^{+}	20-24	10-19	<10

Source: Sahile Michael Bizuneh and AbebawKelkay, (2001).

Table23: Normative data for the trunk lift test (reps)

Age	Excellent	Very good	Good	Fair	Poor
17 – 26	>20	15 – 19	10 -14	5 – 9	<5

Source: Gezahegne Abate and ArayDechasa, (2006).

Table 24: Normative of the squat test for men and women (reps/ minute)

Age	Excellent	Good	Average	Fair	Poor
18 – 25	> 33	29 – 32	25 – 28	18 – 24	< 18

Source: (Boot Camp, 2013)

Table 25: National norms for the 16 to 19 of the wall sit test (centimeters)

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	>102 sec	102-76secs	75-58secs	57-30ses	<30 sec
Female	>60 sec	60-46 sec	45-36 sec	35-20secs	<20 sec

Source: (Arnos and Gaines 1984)

Table 26: Normative data for > 16 years old athletes for the standing broad jump test

Sex	Excellent	Above average	Average	Below average	Poor
Male	> 2.44m	2.44 – 2.29m	2.28 – 2.16m	2.15 – 1.98m	< 1.98m
Female	>1.91m	1.91 – 1.78m	1.77 – 1.63m	1.62 – 1.50m	< 1.50m

Source: (adapted from Hede et al. 2011)

Table 27: The following are national norms for 16 to 19 year olds standing vertical jump test

Gender	Excellent	Above average	Average	Below average	Poor
Male	>65cm	50-65cm	40-49cm	30-39cm	<30cm
Female	>58cm	47-58cm	36-46cm	26-35cm	<26cm

Source: (Davis 2000)

APPENDIX III

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Students' fitness status of upper-body muscle strength exercises test performance

Table 28: Rating scale of selected students' simple pushups (repetition/ minute) performance

No	Age	Pretests						Posttests					
			Rating scale						Rating scale				
		Result	Excellent	Good	Average	Fair	Poor	Result	Excellent	Good	Average	fair	Poor
001	17	11			✓			14		✓			
002	16	9				✓		12			✓		
003	17	12			✓			16		✓			
004	17	11			✓			17		✓			
005	17	8				✓		12			✓		
006	17	12			✓			16		✓			
007	16	9				✓		14		✓			
008	16	13			✓			17		✓			
009	17	10			✓			16		✓			
010	17	8				✓		13			✓		
011	17	10			✓			14		✓			
012	16	9				✓		14		✓			
013	16	12			✓			16		✓			
014	17	8				✓		13			✓		
015	17	7				✓		13			✓		
016	17	9				✓		14		✓			
017	16	10			✓			14		✓			
018	17	9				✓		15		✓			
019	16	11			✓			14		✓			
020	17	10			✓			15		✓			
021	16	8				✓		12			✓		

022	17	9				✓		13			✓		
023	17	7				✓		12			✓		
024	17	8				✓		14		✓			
025	17	7				✓		11			✓		
026	17	8				✓		14		✓			
027	17	7				✓		10			✓		
028	17	8				✓		12			✓		
029	16	8				✓		12			✓		
030	16	7				✓		10			✓		
031	16	8				✓		13			✓		
032	16	9				✓		13			✓		
033	16	9				✓		12			✓		
034	17	8				✓		11			✓		
035	17	7				✓		13			✓		
036	17	9				✓		12			✓		
037	17	8				✓		12			✓		
038	16	7				✓		10			✓		
039	17	6				✓		10			✓		
040	17	6				✓		9				✓	

Table 29: Rating scale of sampled students' sit-ups tests performance (reps/ 30 seconds)

No	Age	Pretests						Posttests					
			Rating scale						Rating scale				
		Result	Excellent	V. good	Good	Fair	Poor	Result	Excellent	V. good	good	fair	Poor
001	17	11			✓			15		✓			
002	16	15		✓				18	✓				
003	17	15		✓				17		✓			
004	17	14		✓				17		✓			
005	17	13			✓			16		✓			
006	17	14		✓				17		✓			
007	16	11			✓			14		✓			

008	16	13			✓			13			✓		
009	17	13			✓			16		✓			
010	17	14		✓				16		✓			
011	17	14		✓				14		✓			
012	16	15		✓				18	✓				
013	16	16		✓				19	✓				
014	17	13			✓			13			✓		
015	17	16		✓				19	✓				
016	17	13			✓			15		✓			
017	16	14		✓				17		✓			
018	17	14		✓				16		✓			
019	16	15		✓				15		✓			
020	17	13			✓			16		✓			
021	16	12			✓			16		✓			
022	17	13			✓			16		✓			
023	17	12			✓			15		✓			
024	17	11			✓			15		✓			
025	17	10			✓			15		✓			
026	17	12			✓			16		✓			
027	17	13			✓			17		✓			
028	17	9				✓		9				✓	
029	16	8				✓		12			✓		
030	16	7				✓		11			✓		
031	16	7				✓		12			✓		
032	16	8				✓		8				✓	
033	16	9				✓		13			✓		
034	17	8				✓		11			✓		
035	17	7				✓		10			✓		
036	17	8				✓		11			✓		
037	17	8				✓		12			✓		

038	16	7				✓		11			✓		
039	17	6				✓		9				✓	
040	17	6				✓		10			✓		

Table 30: Rating scale of selected students' sitting tuckstests performance(repetition)

No	Age	Pretests-Posttests									
		Result	Rating scale				Result				
			Very good	Good	Fair	Poor		Very good	Good	Fair	Poor
001	17	13				✓	18			✓	
002	16	14				✓	17			✓	
003	17	14				✓	18			✓	
004	17	15			✓		18			✓	
005	17	13				✓	17			✓	
006	17	13				✓	18			✓	
007	16	15			✓		19			✓	
008	16	15			✓		18			✓	
009	17	14				✓	19			✓	
010	17	14				✓	17			✓	
011	17	13				✓	18			✓	
012	16	16				✓	19			✓	
013	16	14				✓	17			✓	
014	17	15			✓		19			✓	
015	17	17			✓		21		✓		
016	17	17			✓		20		✓		
017	16	13				✓	19			✓	

018	17	15			✓		19			✓	
019	16	16			✓		20		✓		
020	17	14				✓	19			✓	
021	16	13				✓	17			✓	
022	17	14				✓	19			✓	
023	17	13				✓	17			✓	
024	17	14				✓	18			✓	
025	17	13				✓	18			✓	
026	17	12				✓	16			✓	
027	17	13				✓	18			✓	
028	17	10				✓	13			✓	
029	16	9				✓	14			✓	
030	16	12				✓	16			✓	
031	16	10				✓	13			✓	
032	16	9				✓	15			✓	
033	16	10				✓	15			✓	
034	17	9				✓	15			✓	
035	17	9				✓	12			✓	
036	17	10				✓	14			✓	
037	17	11				✓	16			✓	
038	16	12				✓	14			✓	
039	17	9				✓	14			✓	
040	17	11				✓	16			✓	

Table 31: Rating scale of selected students' trunk lifts test performance (repetitions)

No	Age	Pretests						Posttests					
			Rating scale						Rating scale				
		Result	Excellent	v. good	Good	Fair	Poor	Result	Excellent	v. good	good	fair	Poor
001	17	8				✓		11		✓			
002	16	9				✓		13		✓			
003	17	8				✓		11		✓			
004	17	7				✓		11		✓			
005	17	8				✓		11		✓			
006	17	10			✓			13			✓		
007	16	11			✓			13			✓		
008	16	10			✓			10			✓		
009	17	8				✓		11			✓		
010	17	9				✓		11			✓		
011	17	10			✓			13			✓		
012	16	9				✓		9				✓	
013	16	6					✓	9				✓	
014	17	7				✓		10			✓		
015	17	8				✓		11			✓		
016	17	7				✓		9				✓	
017	16	6				✓		9				✓	
018	17	8				✓		10			✓		
019	16	7				✓		11			✓		
020	17	8				✓		11			✓		
021	16	7				✓		10			✓		
022	17	8				✓		11			✓		
023	17	8				✓		12			✓		
024	17	7				✓		11			✓		
025	17	8				✓		12			✓		
026	17	7				✓		12			✓		
027	17	8				✓		11			✓		
028	17	10			✓			10			✓		

029	16	9				✓		13			✓		
030	16	8				✓		12			✓		
031	16	9				✓		12			✓		
032	16	8				✓		12			✓		
033	16	10			✓			14			✓		
034	17	9				✓		13			✓		
035	17	11			✓			11			✓		
036	17	10			✓			14			✓		
037	17	9				✓		13			✓		
038	16	8				✓		13			✓		
039	17	9				✓		13			✓		
040	17	8				✓		12			✓		

APPENDIX IV

Sampled students 'fitness status of lower-body muscle strength exercises test performance

Table 32: Rating scale of sampled subjects' squattest performance (endurance)

No	Age	Pretests						Posttests					
			Rating scale						Rating scale				
		Result	Excellent	Good	Average	Fair	Poor	Result	Excellent	Good	Average	Fair	Poor
001	17	14		✓				17		✓			
002	16	13			✓			17		✓			
003	17	11			✓			16		✓			
004	17	10			✓			16		✓			
005	17	12			✓			12			✓		
006	17	9				✓		14		✓			
007	16	13			✓			18	✓				
008	16	8				✓		13			✓		
009	17	9				✓		9				✓	
010	17	11			✓			15		✓			
011	17	13			✓			18	✓				
012	16	11			✓			17		✓			
013	16	13			✓			16		✓			
014	17	10			✓			16		✓			
015	17	12			✓			12			✓		
016	17	10			✓			15		✓			
017	16	9				✓		15		✓			
018	17	13			✓			16		✓			
019	16	10			✓			15		✓			
020	17	9				✓		14		✓			
021	16	9				✓		14		✓			
022	17	9				✓		14		✓			
023	17	11			✓			11			✓		
024	17	10			✓			15		✓			

025	17	8				✓		11			✓		
026	17	10			✓			10			✓		
027	17	9				✓		11			✓		
028	17	8				✓		13			✓		
029	16	8				✓		11			✓		
030	16	9				✓		9				✓	
031	16	9				✓		12			✓		
032	16	8				✓		14		✓			
033	16	7				✓		7				✓	
034	17	10			✓			15		✓			
035	17	8				✓		14		✓			
036	17	8				✓		8				✓	
037	17	9				✓		15		✓			
038	16	7				✓		12			✓		
039	17	7				✓		13			✓		
040	17	7				✓		12			✓		

Table 33: Rating scale of selected students' on wall sits test performance (seconds)

No.	Age	Pretests						Posttests					
			Rating scale						Rating scale				
		Result	Excellent	A.A	Average	B.A	Poor	Result	Excellent	A.A	Average	B.A	Poor
001	17	69		✓				74	✓				
002	16	66		✓				73	✓				
003	17	70		✓				75	✓				
004	17	73	✓					78	✓				
005	17	70		✓				78	✓				
006	17	69		✓				74	✓				
007	16	67		✓				76	✓				
008	16	71		✓				76	✓				
009	17	67		✓				74	✓				
010	17	59			✓			64	✓				

011	17	67		✓				75	✓				
012	16	75	✓					83	✓				
013	16	71		✓				76	✓				
014	17	68		✓				74	✓				
015	17	70		✓				77	✓				
016	17	66		✓				73	✓				
017	16	72		✓				78	✓				
018	17	75		✓				82	✓				
019	16	71			✓			77	✓				
020	17	70			✓			77	✓				
021	16	68			✓			76	✓				
022	17	59			✓			70		✓			
023	17	68			✓			77	✓				
024	17	67			✓			75	✓				
025	17	69			✓			76	✓				
026	17	65			✓			74	✓				
027	17	64			✓			73	✓				
028	17	44			✓			47				✓	
029	16	43				✓		47				✓	
030	16	44				✓		50				✓	
031	16	43				✓		47				✓	
032	16	39				✓		43				✓	
033	16	44				✓		47				✓	
034	17	43				✓		48				✓	
035	17	40				✓		46				✓	
036	17	45				✓		49				✓	
037	17	46				✓		51			✓		
038	16	43				✓		51			✓		
039	17	48				✓		55			✓		
040	17	47				✓		56			✓		

Table 34: Rating scale of sampled subjects ‘standing broadjumps test performance (meter)

No	Age	Pretests						Posttests					
			Rating scale						Rating scale				
		Result	Excellent	A.Av	Average	B.Av	Poor	Result	Excellent	A.Av	Average	B.Av	Poor
001	17	1.28					✓	2.30		✓			
002	16	1.70					✓	2.40		✓			
003	17	1.62					✓	2.30		✓			
004	17	1.50					✓	2.30		✓			
005	17	1.80					✓	2.20			✓		
006	17	1.60					✓	2.20			✓		
007	16	1.50					✓	2.25			✓		
008	16	1.45					✓	2.20			✓		
009	17	1.70					✓	2.33			✓		
010	17	1.50					✓	1.50					✓
011	17	1.61					✓	2.15				✓	
012	16	1.40					✓	2.12				✓	
013	16	1.48					✓	2.30		✓			
014	17	1.82					✓	2.39		✓			
015	17	1.58					✓	2.26			✓		
016	17	1.75					✓	2.21			✓		
017	16	1.63					✓	2.23			✓		
018	17	1.73					✓	2.33		✓			
019	16	1.90					✓	2.30		✓			
020	17	2.11				✓		2.41		✓			
021	16	2.10				✓		2.40		✓			
022	17	1.97					✓	2.35		✓			
023	17	1.71					✓	2.38		✓			
024	17	1.89					✓	2.28			✓		
025	17	1.76					✓	1.76				✓	
026	17	2.11				✓		2.41		✓			
027	17	2.10				✓		2.40		✓			

028	17	1.60				✓		1.91		✓			
029	16	1.50				✓		1.90		✓			
030	16	1.62				✓		1.91		✓			
031	16	1.57				✓		1.89		✓			
032	16	1.60				✓		1.81		✓			
033	16	1.55				✓		1.83		✓			
034	17	1.61				✓		1.91		✓			
035	17	1.58				✓		1.80		✓			
036	17	1.53				✓		1.78		✓			
037	17	1.61				✓		1.61				✓	
038	16	1.59				✓		1.79		✓			
039	17	1.60				✓		1.80		✓			
040	17	1.61				✓		1.91		✓			

Table 35: Rating scale of sampled students' standing vertical jumps test performance (centimeters)

No	Age	Pretests						Posttests					
			Rating scale						Rating scale				
		Result	Excellent	A.Av	Average	B.Av	Poor	Result	Excellent	A.Av	Average	B.Av	Poor
001	17	39				✓		44			✓		
002	16	43			✓			47			✓		
003	17	43			✓			46			✓		
004	17	36				✓		39				✓	
005	17	37				✓		42			✓		
006	17	39				✓		42			✓		
007	16	38				✓		42			✓		
008	16	39				✓		42			✓		
009	17	41			✓			41			✓		
010	17	35				✓		39				✓	
011	17	37					✓	40			✓		
012	16	39				✓		42			✓		
013	16	40			✓			43			✓		

014	17	42			✓			45			✓		
015	17	44			✓			47			✓		
016	17	39				✓		43			✓		
017	16	45			✓			45			✓		
018	17	44			✓			47			✓		
019	16	45			✓			48			✓		
020	17	42			✓			46			✓		
021	16	39				✓		45			✓		
022	17	37				✓		42			✓		
023	17	41			✓			46			✓		
024	17	38				✓		42			✓		
025	17	40			✓			45			✓		
026	17	35				✓		41			✓		
027	17	38				✓		43			✓		
028	17	43			✓			43			✓		
029	16	42			✓			45			✓		
030	16	39			✓			41			✓		
031	16	35				✓		38			✓		
032	16	41			✓			43			✓		
033	16	39			✓			42			✓		
034	17	38			✓			38			✓		
035	17	41			✓			44			✓		
036	17	42			✓			46			✓		
037	17	43			✓			47		✓			
038	16	39			✓			42			✓		
039	17	38			✓			43			✓		
040	17	35				✓		39			✓		

Table 37: Training Schedule: Month One-threePlace: physical practical class/ field

No. student: 40

Day	Physical-quality enhancement	Types of exercise	Duration	Reps	Rest	Intensity
Friday	Preparation exercise for a lower body strength	Walking, jogging and different types of aerobic exercise Different types of stretching exercise Squat frog, squat kick, leg strength, wall sit, pistol squat Ham-string stretching, hip and thigh stretching Different types of stretching exercise	5’ 30’ 5’	1x5 3x4 1x5	30 seconds active in between each set	Low to moderate (-17-12) 1RM)
Wednesday	Preparation exercise for abdominal muscle strength, endurance	Walking, jogging and d/t types of aerobic exercise Circling hip, curl-up, back sit-up, trunk lift and sitting tucks Leg-hug, lateral trunk stretching Stretching exercise for trunk, hip and back muscles	5’ 30’ 5’	1x5 3x4 1x5	30 seconds active in between each set	Low to moderate (-17-12) 1RM)
Monday	Preparation exercise for upper body strength	Walking, jogging and synchronized movement of hands and legs Simple push-up, trunk lift and back sit-up Neck stretch, arm stretch, lateral trunk stretch Other stretching exercise and with breathing mediation.	5’ 30’ 5’	1x5 3x4 1x5	30 seconds active in between each set	Low to moderate (-17-12) 1RM)