

**EFFECTS OF WHEY PROTEIN SUPPLEMENT AND CONCURRENT  
TRAINING ON BODY COMPOSITION AND MUSCULAR FITNESS OF  
DEBRE-MARKOS TOWN MALE WEIGHT LIFTERS**

**MSc. THESIS**

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**MARCH, 2019**

**HARAMAYA UNIVERSITY, HARAMAYA**

**Effects of Whey Protein Supplement and Concurrent Training on Body  
Composition and Muscular Fitness of Debre-Markos Town Male Weight  
Lifters**

**A Thesis Submitted To Department of Sport Science  
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MASTER OF SCIENCE IN SPORT NUTRITION**

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## STATEMENT OF THE AUTHOR

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## **DEDICATION**

This thesis manuscript is dedicated to my brother Abraham Molla, who had committed with strong prayer for the betterment and success of my life.

## **BIOGRAPHICAL SKETCH**

The Author was borne South Goner East Estie town in 1985 E.C from her mother Anguach Wall and father Molla Sendekie. She completed her primary school education Genamemecha and secondary school education in Mekeray and Estie Mekan Eysuse preparatory school after she completed her higher education entrance exam she joined Debre Markos University in 2005 E.C and graduated in 2007 with BSC degree in sport science. After her graduation she employed in Debre-Markos University as graduated assistant for two years and in2010 she joined Haramaya university sport science academy, to pursue her post graduate program studies in sport nutrition.

## **ACKNOWLEDGEMENTS**

First and for most I would like to say thanks God with his mother who helps me not only for this paper but also throughout my life 2<sup>nd</sup> I would like to thanks for my advisors Doctor Negussie Bussa and Doctor Eyasu Merhatsidk for their constructive idea and comment from the start of this paper to the end. 3<sup>rd</sup> I would like thanks my study participant to their time and energy spent on study. Finally would like thank my parent for their wonderful support and encouragement.

## **ACRONYMS AND ABBVARIATION**

<b>AAS</b>	Amino Acid
<b>BCAAs</b>	Branched Chin Amino Acid
<b>BSA</b>	Bovine Serum Albumin
<b>CT</b>	Concurrent Training
<b>EAAS</b>	Essential Amino Acid
<b>END</b>	Endurance
<b>GMP</b>	Glycol Macro Peptide
<b>HSA</b>	Human Serum Albumin
<b>MPB</b>	Muscle Protein Breakdown
<b>MPS</b>	Muscle Protein Synthesis
<b>NPB</b>	Net Protein Balance
<b>RT</b>	Resistance Training
<b>WP</b>	Whey Protein
<b>WPC</b>	Whey Protein Concentrate
<b>WPI</b>	Whey Protein

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# **Effects of Whey Protein Supplement and Concurrent Training on Body Composition and Muscular Fitness of Debre-Markos Town Male Weight Lifters**

## **ABSTRACT:**

*The purpose of this study was to examine the combined effect of whey protein supplement and concurrent muscular endurance and strength training on body composition and muscular fitness of Debre Markos town male weight lifters. Twenty-two one year experienced male weight lifters with the age group between twenty to twenty-three years were selected by simple random sampling techniques from the total of forty one year experienced male weight lifters. Those selected twenty-two subjects completed the study from the initial to the end. This study was used Convenience and simple random sampling techniques to select the sample but control group continued only concurrent training. Both groups were performed concurrent training 4 days per a week and the duration of the training time was 50 minute. Pre test and post tests were conducted in all variables, such as body fat percentage by skin fold calipers and body mass index test, muscular endurance by push up test, abdominal strength by sit up test and upper body strength by 1RM test. Collected data from the subjects were analyzed by SPSS version 20 and comparison of mean value result was carried out by pared sample T test. The level of significance was  $p < 0.05$ . The result of this study indicated that all variables from pre test to post test showed significant change with the mean difference of: body fat percentage -1.39 and -0.22, body mass index -0.17 and 0.16, for sit up test was 5.4 and 1.16 push up test with 6.4 and 1.33 and upper body strength also 0.1 and 0.03 in experimental and control group respectively. In general from this study the researcher conclude that whey protein supplement with concurrent training have a positive effect to improved body composition and muscular fitness on experimental group than control group.*

**Key words;** whey protein, concurrent training, body composition, muscular fitness

# 1. INTRODUCTION

## 1.1. Background of the Study

The consumption of nutritional supplements is common among athletes especially weight lifters to improve performance. Supplements that promoted to improve exercise and athletic performances are sometimes called “ergogenic aids” or “performance supplements and studies have been shown that nutritional supplements with weight lifting can increase muscle fiber size and strength(Refine and Rahimi, 2015).

Protein supplement use is higher in athletes than sedentary individuals, with particularly high use seen in weightlifters and bodybuilders. Liquid meal supplements that are high in protein boost total energy and specific nutrient intake at a time when one’s appetite is often suppressed (Slater, 2013).

Whey protein supplements are a complete high quality and the richest known source of branched chain amino acids (BCAAs) as well as all essential amino acids. The BCAAs serve as direct precursors for muscle energy production and fuel for the immune system as well as activate the mechanisms that underline recovery (Anthony *et al.*, 2001).

The essential amino acids are crucial for stimulating a high rate of protein synthesis within adult muscle (Volpi *et al.*, 2003). At the molecular level, stimulating protein synthesis and minimizing protein breakdown are the two processes essential amino acid to efficient recovery after exercise (Rennie and Tipton, 2000).

Like most other protein supplements, whey protein powders claim to promote the maintenance of positive nitrogen balance athletes (Brooks *et al.*, 2000).Whey protein has a far superior capacity to stimulate the rate of muscle protein synthesis and decrease the rate of protein degradation after exercise. Compared to other forms of protein, whey has a great stimulatory effect – this has been attributed to its high leucine content and rapid rate of digestion (Campbell *et al.*, 2007).

**Concurrent Training (CT)** is the combination of resistance and endurance training in periodized program to maximize all aspects of physical performance. Unless an athlete is in a pure-power sport like Olympic Weightlifting, or a pure-endurance sport like long distance cycling; a combination of both power related and endurance related attributes are required to excel in mixed-type sports (Geoff, 2007).

Muscular fitness is the combination of muscular strength and muscular endurance exercise and endurance exercises lead to a significant increase in type I muscle fibers, since these fibers have a large amount of mitochondria (Maiorana, 2002; Izquierdo, 2005).

Strength exercise leads to muscle hypertrophy due to the increase in the number of fibril proteins (Mikkola *et al.*, 2007).

## **1.2. Statements of the Problem**

Whey protein is animal product, found in cow milk. Whey is extracted and isolated, to remove all of the fat and carbohydrates. Whey protein (WP) supplementation has recently gained popularity amongst athletes as it is improve athletic performance. WP is rapidly digested and contains a high content of branched chain and essential amino acids is a popular dietary protein supplement intended to provide improved muscle strength, body composition, decrease fat mass and facilitate recovery of force production between repeated bouts of exercise in resistance-trained individuals due to a greater compliment of essential amino acids and branched chain amino acids as a result of greater biological value (Burke, 2001).

Resistance exercise results in significant muscle protein turnover and the rate of muscle protein synthesis following exercise is elevated with consumption of amino acids (Tipton *et al.*, 2001). Many research finding indicates that Whey protein supplementation combined with resistance exercise helps a greater gain in muscle strength and muscle mass over just resistance exercise alone. However to the best of author's knowledge no study was found on the effect of whey protein supplement with concurrent training on muscular fitness and body composition of weight lifters living in Ethiopia in general and in Debre Markos town in particular among weight lifters, In addition to this other research was not conducted before this time on Debre Markos town in this area. Therefore this study tried to give awareness

about the effect of whey protein supplement to improve muscular and body composition sport performance and to examine the effect of Whey protein supplement and concurrent training on muscular fitness and body composition of weight lifters.

### **1.3. Hypothesis:**

#### **H<sub>0</sub>=Null Hypothesis and H<sub>a</sub>= Alternative Hypothesis**

H<sub>0</sub>: Whey protein supplement and concurrent training have not a significant effect for the improvement of muscular endurance, of Debre-Markos town male weight lifters

H<sub>a</sub>: Whey protein supplement and concurrent training have a significant effect for the improvement of muscular endurance, of Debre -Markos town male weight lifters.

H<sub>0</sub>: Whey protein supplement and concurrent training have not a significant effect for the abdominal strength improvement, of Debre-Markos town male weight lifters.

H<sub>a</sub>: Whey protein supplement and concurrent training have a significant effect for the improvement of abdominal strength, of Debre-Markos town male weight lifters.

H<sub>0</sub>: Whey protein supplement and concurrent training have not a significant effect to maintain body composition, of Debre -Markos town male weight lifters.

H<sub>a</sub>: Whey protein supplement and concurrent training have a significant effect to maintain optimum body composition of Debre-Markos town male weight lifters.

H<sub>0</sub>: Whey protein supplement and concurrent training have not a significant effect to improve upper body strength, of Debre-Markos town male weight lifters.

H<sub>a</sub>: Whey protein supplement and concurrent training have a significant effect to improve upper body strength, of Debre-Markos town male weight lifters.

### **1.4. Scope of the Study**

This study was conducted on weight lifters of Debre-Markos town and examined the effect of Whey protein supplement and concurrent training on muscular fitness and body composition of male one year experienced weight lifters within the age group between 20-23 years old.

## **1.5. Significance of the Study**

Some research finding indicated that whey protein supplement and resistance training played a great role to improve anaerobic performance of the athletes. But the finding of this study was helped:

- ❖ To investigate the effect of whey protein supplement and concurrent training on muscular fitness variables and body composition of Debre-Markos town male weight lifters.
- ❖ To identify whether whey protein supplement with concurrent training or concurrent training alone was improved body composition and muscular fitness variables of Debre-Markos town one year experienced male weight lifters.
- ❖ For any sport man and sport professionals, it helped to improve muscular fitness performance.
- ❖ To aware the purpose of whey protein supplement and also it was also helped as a reference for further study.

## **1.6. Objective of the Study**

### **1.6.1. General objective**

The general objective of this study was to examine the effect whey protein supplement and concurrent training on muscular fitness and body composition of male weight lifters.

### **1.6.2. Specific objective**

- ✓ To measure the effect of whey protein powder supplement and concurrent training on muscular endurance of Debre-Markos town weight male lifters
- ✓ To find out the effect whey protein supplement and concurrent training on core strength of Debre-Markos town weight male lifters.
- ✓ To measure the effect of whey protein supplement and concurrent training on body composition of Debre-Markos town weight male lifters.
- ✓ To measure the effect of whey protein supplement and concurrent training on upper body strength of Debre-Markos town weight male lifters.

## 2. RELATED REVIEW LITERATURE

### 2.1. Whey Protein

Whey protein is found in cow milk. Whey is extracted and isolated, and is then filtered to remove all of the fat and carbohydrates. The more it is filtered, the purer the protein becomes. Whey protein is undoubtedly the king of protein supplements. There is an enormous body of research suggesting that whey protein is shown to boost blood flow to muscle tissue, which is the secret to its protein-synthesis power. Increased blood flow enhances the delivery of nutrients, including glucose for energy, amino acids, and oxygen. These nutrients support muscle growth and spur recovery after a workout (Stoppani, 2011).

### 2.2. Structure of Whey Proteins

There are four main classes of proteins in whey:  $\beta$ -lacto globulin,  $\alpha$ -lactalbumin, serum albumin and several immune globins. Most of these proteins have a globular conformation and are susceptible to denaturation and aggregation induced by heat and high pressure. Comprehension of whey proteins structure and stability is crucial, as the effects of pressure and temperature are of great importance to facilitate the knowledge-based product design its biological function is related to the transport of fatty acids across membranes. Bovine serum albumin (BSA) accounts for approximately 5% of the protein in whey and 1% of the total protein in milk. Due to its low concentration, BSA does not have a large effect on functional properties (Baar, 2014).

The three dimensional structure of BSA has not been yet determined, although it shares 75% sequence identity with human serum albumin (HSA) which is well characterized. The structure consists of three domains stabilized by 17 disulfide bonds and one free thiol group. Each domain has two-domains, A and B. The structure is mainly  $\alpha$ -helix, with several lengthy loops connecting both sub-domains A and B. At temperatures above 60°C,  $\alpha$ -helices unfold irreversibly and the free thiol group catalyzes aggregation. When heated above 70°C gelation might occur due to the high concentration of disulfide bonds in BSA, as long as there is a concentration substantially higher than the naturally found in whey. BSA is relatively stable to high pressures, despite the presence of a free thiol group. BSA undergoes substantial

secondary structure changes but, contrary to  $\beta$ -lg, the changes are reversible, apparently due to the protection of the hydrophobic core of the protein by the large number of disulfide bonds (Putman *et al.*, 2004).

## **2.3. Whey Protein Products**

The majority of whey is processed into whey powder. Whey derivatives are used as ingredients in a wide range of products, with the lowest valuable ones used predominately by the feed industry. Derivatives with higher value, such as whey protein concentrate (WPC) and whey protein isolates (WPI) are produced for the food, cosmetic and pharmaceutical sectors. Upon concentration or isolation, water, lactose, fat and ash or dust are removed from the total solids of liquid whey in varying amounts. This yields a wide variety of whey protein products, including WPC, which contains 25-80% protein, and WPI containing  $\geq 90\%$  protein (Babcock *et al.*, 2012).

### **2.3.1. Powder manufacture**

There are two basic types of whey: sweet whey, originating from manufacture of cheese and casein production by the rennet coagulation of milk, and acid whey, resulting from processes based on destabilization of the milk casein colloid by acidification to below pH 5.0. Sweet whey and acid whey are generally distinguished by their pH values, which are pH $>6.4$  and pH 4.6- 6.4, respectively. The protein content of liquid whey streams is approximately 0.6-0.9% and it must be concentrated or isolated prior to drying into a powder form for use as a food ingredient. A dry powdered form of the WPC and WPI are often produced from the concentrated liquid whey by spray drying. Spray drying involves the atomization of the liquid whey, after which, it is introduced into a chamber with dehydrated hot gas, where water evaporation occurs (Apro *et al.*, 2013).

### **2.3.2. Whey protein concentrate**

WPC is defined by the United State Code of Federal Regulations as “the substance obtained by the removal of sufficient non protein constituents from whey so that the finished dry product contains not less than 25 percent protein”. Most WPCs on the market contain either 34–35% protein (WPC) or  $\sim 80\%$  protein (WPC) being the application dependent on the

protein content. WPC 35 is used in the manufacture of yogurt, processed cheese, infant formulae, and in various bakery applications, combining the effects of protein, lactose and minerals. These products are also marketed for use in stew and sauce because of their thickening properties, as well as nutritional benefit. WPC is designed for applications in which proteins play a dominant functional role. Applications such as gelation, emulsification and foam formation are often mentioned for these products. The low carbohydrate content of WPC makes it an ideal ingredient for sports nutrition and weight management products. Another application for WPC80 is in meat products, where high gel strength and good water-binding properties are required (Babcock *et al.*, 2012).

### **2.3.3. Whey protein isolate**

WPI contains ~90% protein and 4–6% water. The remaining 4–6% of the ingredient is a combination of fat, lactose, and ash. Because of their high protein purity, WPI is used extensively in nutritional supplements, sports and health drinks, and protein-fortified beverages. Ion exchange chromatography is one of the methods used in the manufacture of WPIs. It provides an additional level of selectivity above membrane processing, because factors other than molecular size determine protein adsorption. Because of the high protein content, WPI functions as a water-binding, gelling, emulsifying and foaming agent. There are several ways in which processors can adjust the composition and functionality of these ingredients. For example, the amount of individual proteins can be varied. Some isolates contain glycol macro peptide (GMP), while others do not. GMP is released to whey during cheese manufacturing when the process relies on the use of chymosin to form the casein curd (Babcock *et al.*, 2012).

### **2.3.4. Nutritional value of whey protein**

Whey proteins have an exceptional biological value, which is a measure of the percentage of a given nutrient (e.g. protein) that is utilized for the body. In the case of proteins, the BV represents the amount of nitrogen retained of the absorbed protein. The net protein utilization is a function of the nutritional value and the digestibility of the protein. Whey proteins are known to be of high nutritional value for their high concentration of essential amino acids and good digestibility, resulting in high. In this regard, whey proteins are the choice for body builders and elite athletes. Whey proteins are an optimal source for fortification,

predominantly because they are rich in several essential amino acids, including isoleucine, leucine, histidine, tryptophan and valine, one or more of which are lacking in most grain- and vegetable-based proteins (Wildman, 2000.)

## **2.4. Benefits of Whey Protein**

Whey protein (WP) supplementation has recently gained popularity amongst athletes as it is reported to improve athletic performance. Whey protein is a popular dietary protein supplement intended to provide improved muscle strength and body composition due to a greater complement of essential amino acids and branched chain amino acids and to result in greater biological value (Burke *et al.*, 2001). Additionally whey protein supplementation has shown to reduce oxidative stress through increasing endogenous glutathione production and improve compromised gut health associated with intense exercise (Lambert *et al.*, 2009).

### **2.4.1. Increase strength and lean body mass**

Skeletal muscle hypertrophy requires proper resistance training and nutritional status in which muscle protein synthesis (MPS) exceeds muscle protein breakdown (MPB). One of the major concepts in the literature surrounding skeletal muscle hypertrophy is the idea of net protein balance (NPB). NPB is defined as MPS minus MPB ( $NPB = MPS - MPB$ ). Thus, if MPS is greater than MPB, skeletal muscle hypertrophy will occur (Hulmi, 2010).

One of the critical factors influencing MPS and MPB is the availability of amino acids (Dickinson and Rasmussen, 2011). Supplementation is a source of high biological value amino acids and has been purported to increase muscle mass and strength. There is an extensive body of research surrounding the efficacy of WP supplementation in increasing strength and muscle mass. The results of the research are not entirely unequivocal; however, a significant amount of evidence suggests that WP increases both strength and muscle mass (Esmarck, 2001).

### **2.4.2. Building muscles**

The amino acids in protein are the building blocks of muscle. Whey protein is particularly effective at stimulating muscle protein synthesis because of its high concentration of the branched chain amino acid leucine. While all of the essential amino acids are needed to build

muscle, leucine is the key amino acid that turns on your body's muscle building machinery. Researchers have found that after ingesting isolated soy, casein and whey protein powder, muscle protein synthesis was greatest with whey protein both at rest and following exercise (Tang .,2009).

#### **2.4.3. Weight loss success**

Protein plays an important role when you are cutting back calories to lose weight. Restricted diets often lose muscle alongside the shedding of pounds. Whey protein powder has been shown to maximize this muscle loss in both active people. If you are looking to lose weight, keeping your muscles strong is especially important to maximize your calorie burning at rest. For continued success, combine the strength benefits of whey protein with emerging research showing that whey protein as well as casein (the milk proteins) may help to manage your appetite long term (Mevries, 2015).

#### **2.4.4. Stay strong as you age**

As you get older, the loss of muscle mass, strength and function is common and can result in a disease called sarcopenia. To fight this aging process, your body requires additional whey protein to stimulate muscle building and prevent this decline. Older adults need 25-30 grams of high quality protein at each meal to stop age-associated muscle mass loss (Hector AJ 2015). While total daily protein intake is important, well-spaced meals high in leucine-rich whey protein is key to staying strong as you age (Bauer, 2013).

### **2.5. Concurrent Training**

Performing strength and endurance training simultaneously in the same training period, typically called concurrent training, is a popular training strategy to develop various aspects of physiological capabilities. Combining strength and endurance training within the same programmed is common for athletes in many sports. Many endurance athletes recognize the performance benefits of supplementing their training programmed with strength training; athletes from intermittent sports, too, will often participate in prolonged technical or metabolic conditioning sessions within a programmed which also includes strength training. Concurrent training in this manner, when compared to strength training alone, has been shown

to compromise improvements in strength-related qualities and augment endurance-related adaptation (Jung, 2003).

## **2.6. The Concurrent Training Effect**

in the “real” world and for the general population, the combination of both resistance and endurance exercise in a training program leads to superior adaptations in health-related and body function variables, independent of age or sex, including increases and/or improvements of basal metabolic rates, insulin sensitivity, glucose/lipids metabolism, lipidemic profile and body composition, while both muscular hypertrophy/strength/power and endurance capacities are increased (Schumann, 2015). Additionally, the majority of sports are neither “endurance-based” nor “strength–power-based”, but of a mixed type, with performance to be determined by the specific contribution of muscle strength/power and endurance, which varies between sports. In addition, even in long-distance runners or cyclists, strength training routines result in a significant increase of their endurance performance (Berryman, 2017) Thus, coaches aim to maximize training adaptations from both training modules by what is known as “concurrent training” (e.g., simultaneously training for both strength and endurance regiment.

## **2.7. Concurrent Training of the Upper Body**

Despite decades of research on CT, very few have studied the effects of CT on the upper body musculature. Muscle has a number of different responsibilities due to their location on the body. Also, the percentage of the different muscle fibers (slow-twitch and fast-twitch) vary among muscles. The arm muscles have a higher percentage of type-II fibers, rely more heavily on carbohydrate utilization and extract less oxygen during exercise (Calbet *et al.*, 2005; Helga 2010). Moreover, some studies suggest that there might be a difference in the adaption to strength in the muscles of the upper and lower body. It was reported in a review from (Wernbom with colleagues, 2007) that there is an inverted curve relationship between volume on each exercise session and the hypertrophic response. Interestingly, Wernbom and his research group documented that the muscles of the upper body seem more sensitive to a higher volume, and the decrease in the hypertrophic response comes earlier compared to muscles of the lower body (Van Hall *et al.*, 2003). Concurrent muscular endurance and

resistance training helps to improve mostly upper body muscular endurance and muscular strength ability.

## **2.8. Sequence of Concurrent Training**

Amongst the concurrent training studies conducted thus far, various sequencing of the exercises has been implemented with strength before endurance training (Balabinis *et al.*, 2003; Bell *et al.*, 2000). To date, there have only been a limited number of concurrent training studies that have directly examined the sequence of the mode of training (Chtara *et al.*, 2008).

### **2.8.1. Successful concurrent training**

**a) Low Volumes:** Whereas high exercise volumes have indicated a negative effect on CT, low to moderate volumes have shown to be beneficial in improving both strength qualities and endurance or aerobic qualities (Alves *et al.*, 2016). Found success increasing strength and power measures in young children using same day training of RT and END protocols for two days a week (Davis *et al.*, 2008). Indicated strength increases close to 20% by employing a three-day schedule of RT work and subsequent treadmill running. In a similar study that utilized a three-day workweek encompassing subsequent END work after RT, Gravelle and Blessing (Bell *et al.*, 2000) indicated no strength interference effect.

**b) Strength before endurance:** In addition to lower volume, successful outcomes were seen in studies where RT training was performed before endurance training. Participants train three days a week and scheduled endurance work after resistance; one group four hours after and another group immediately after respectively (Laird *et al.*, 2016).

## **2.9. Intensity and Volume Training**

Different Intensities of strength and endurance training the type and extent of training adaptation is predominantly determined by training intensity and volume. For example, strength development predominantly occurs when strength training is performed at a high intensity and low volume (5-6 sets of 1-6 repetitions), hypertrophic adaptations are induced when performed at a moderate to high intensity and moderate volume (three to four sets of 8-12 repetitions) and muscular endurance increases when performed at low intensity and high volume or three to four sets of 15 repetitions or more (Kraemer, *et al.*, 2002).

As training adaptation is dependent on the intensity and volume of training (Kraemer, *et al.*, 2002), training variables within a concurrent training program may be set such that the interference of strength and/or endurance development is minimized, Proposed the “zone of interference” effect, suggesting that the degree of interference of strength performance may be dictated by the intensity and volume of strength and endurance training performed on the same muscle groups (Docherty *et al.*, 2000).

### 3. MATERIALS AND METHODS

#### 3.1. Description of the Study Area

The study was conducted at Debre Markos town. It is located in the North- west of the capital city of Ethiopia, Addis Ababa, at a distance of 300 kms and 265 kms to Bahir Dar. Based on the 2007 population and housing census, the total population size of the town was estimated to be 62,469 of which 47.9% were males and 52.1% were females. The geographical location of the study area was located between 10°17'00" to 10°21'30" N Latitudes and 37°42'00" to 37°45'30" E longitudes and its elevation 2350-2500 meters above the sea level. The town has 1380 mm average annual rainfall and minimum and maximum temperatures of 15<sup>0</sup>C and 22<sup>0</sup> C respectively (Dbere Markos, 2011).

#### 3.2. Study Materials

The following materials were used to measure muscular fitness variables and body composition for pre test and post test study as well as for training purpose. It includes Skin fold calipers, scale, tape measure, stop watch, elevated horizontal bars, floor mat; different weighted equipment were some of the materials were used in the study.

#### 3.3. Definition of terms

- **Concurrent Training (CT):** is defined as the combination of resistance and endurance training in a periodized program to maximize all aspects of physical performance. (Geoff, 2017).
- **Whey protein:** is extracted from whey, the liquid material created as a by-product of cheese production (Marshall, 2004).
- **Body Composition:** is the proportion of fat and fat-free mass in your body (Jennifer, 2018)
- **Training:** is a process in which sports activities and exercises are performed regularly, gradually and progressively and it increases the ability of individuals in achieving a better performance (Edwards, 2008).

### **3.4. Research Design**

The research was used true experimental the study was used pre test and post test design with control group and experimental group. The samples were selected by simple random sampling technique 30 from the total of 40 but 22 male weight lifters with age of 20-23 were selected from Deber Markos town male weight lifters after completed the health status questionnaire and divided into 2 groups i.e. control (12) and experimental (10) subjects.

Both groups were participated in eight week concurrent training; the experimental group was consumed extra whey protein in relation with exercise but not control group. Whey protein obtained in South Africa and it was too expensive. It was taken in the dose of 25g mixed with 250 ml of water per a day, during the treatment period and with in 30 minute after the exercise. Concurrent training was scheduled 4 times per a week. Dependent variables for this study were muscular endurance, core strength, body composition and upper body strength but the independent variables were whey protein supplement and concurrent training.

### **3.5. Sources of Data**

Primary sources were used, by collecting through the administration of experimental process (recording pretest result and post test result) from the sample was taken on Debre Markos town one year experienced weight lifters within the age range of 20-23 years old.

### **3.6. Study population**

The study population used was one year experienced Debre Markos town male weight lifters. The population of Debre Markos town beginner 60, six month experienced 50, and one year experienced was 40. The total population beginners to experienced weight lifters were 150.

### **3.7. Sample and Sampling Technique**

The study was used simple random sampling techniques to recruit the study subjects.. Useful results were obtained, from one year experienced. The study was selected one year experienced trainers by Convenience sampling technique and took from one year experienced weight lifters (22 males; within age (20– 23), by simple random sampling technique trainers who were included in Debre Markos town because one experienced trainers were mature to

fill the health status questionnaire and to applied supplementation and training protocol properly.

### **3.8. Inclusion and Exclusion Criteria**

#### **3.8.1. Inclusion criteria**

- ❖ The subjects in the study were a maximum of one year experienced healthy adults male
- ❖ The subjects were age between 20–23 years
- ❖ If they were volunteer to participate in 8 week concurrent training and supplementation intervention program.

#### **3.8.2. Exclusion criteria**

Subjects with any of the following conditions were excluded from the study

- ❖ If they had known metabolic disorder including heart disease, diabetes, hypertension, musculoskeletal disorders and any bleeding disorders.
- ❖ Those age was less than 20 and more than 23 years excluded from this study

### **3.9. Method and Procedure of Data Collection:**

Quantitative data were collected using body mass index, skin fold calipers and counted the maximum number of push up, sit up as well as upper body strength through one repetition maximum bench press test before and after applying whey protein supplement and concurrent training both control and experimental group of Dbere Markos town male weight lifter with the age of 20-23. Muscular endurance, core strength and body composition were assessed at baseline (week 0), and after week 8. Maximum core (abdominal) strength was measured by means of sit up test and for muscular endurance; push up, for body composition skin fold caliper test and body mass index and upper body strength by 1RM test. The data was recorded by the investigator with the help of assistant data recorders.

### **3.9.1. Procedure of data collection**

First the researcher obtained the ethical clearance from concerning body and meets the participants of the study, during the familiarization session; participants were informed all procedures and familiarized with all performance measured. Before the participants were started the training program and whey protein supplementation the participant were got awareness not to take other nutritional supplement during the study and not exercise for at least 24 hours prior to each trial. Next to this the participants were performed pre test process at base line week 0 and muscular fitness variables and body commotion were measured. Then the participants were grouped into control and experimental group. After that both groups were going to start concurrent training and the experimental group was consume whey protein supplement.

### **3.9.2. Data collection instrument**

The following fitness tests were used as parameter to measure muscular fitness variables and body composition was recorded for pre test and post test study.

#### **❖ Body fat measurement**

##### **1. Skin fold caliper test**

Skin fold measurement was used to assess the amount of trainers' body fat percentage by using Harpenden Skin fold Caliper, UK.

#### **Procedures**

First the trainers did warm up for 5 minute, the measurement was used Harpenden Skin fold Caliper and the test sites determined, it was measured on the right side of the body and index finger, then measuring tips of the calipers were Placed at a right angle (1 to 2 cm) below your fingers, Wait 2 seconds, and recorded the reading, then the calipers was released, Waited 1 to 2 seconds, and the testing procedures were repeated 2 more times, next 3 measurements were added at 3 site at calf ,chest and thigh then obtained the average by dividing the sum by 3, the averages was taken, after this the remaining was moved to test sites, and take 3 more readings at each spot, the average was recorded the readings for each test site finally an approved skin was used fold test scale to interpret the results of the test (Charles, 2000).

## **2. Body Mass Index Test**

### **Procedures**

First weight was measured in kilogram and height in meter, and then divided the subjects weight over height square, finally the result was interpreted with the standard.

## **3. Muscular Endurance Measurement**

### **Procedures**

First subjects' hands were placed slightly wider than shoulder width apart, with fingers pointing forward. Feet were together and not crossed. They started from the up position (front leaning rest), lowered the subjects' body until upper arms were parallel to the ground in the down position, after this subject then returned to the up position and in the up position subjects' elbows must be extended, in order to count. This is one repetition. Resting was done in the up (front leaning rest position). Both hands were remained in contact with the floor at all times. Finally the total numbers of correct pushups in one minute were recorded as the score (Charles, 2000).

## **4. Abdominal strength measurement**

### **Procedures**

Started by lying on the back, knees were bent, heels flat on the floor. Then partners were hold feet, if subject wished. After this the subject was performed as many correct sit-ups as possible in one minute. Next to this while in the up position, the subject was touch the elbows to his knees and then returned to a full lying position before starting the next sit-up. When returned to the down position the subject's shoulder blades touched the ground. Finally subject's score was the total number of correct sit-ups performed. Any resting was done in the up position (Charles, 2000).

### ***One repetition maximum bench press test***

#### **Procedures**

First the test procedures were explained to the subject and basic information such name, age, height, body weight were recorded and trainers were performed warm up with self selected load that will allow them to complete 6-10 rep. Then -3 minute rest and the trainers selected weight based on the previous efforts which allow them 3 reps and 1-minute rest and trainers' increased the load and attempted their 1RM until 1RM achieved. After that Rest period continued 1-3 minute 1RM was achieved 3-7 attempts.

**Scoring:** the maximum weight lifted was recorded as a score. The sequence of lifts was also recorded as these can be used in subsequent tests to help in determining the lifts to attempt. To standardize the score proportional to the person's bodyweight was calculated.

### **3.10. Method of Data Analysis**

The data was gathered through field workouts (fitness test) coded and arranged for analysis. The coded data was analyzed by using paired T- test and SPSS version 20.0 software to summarize changes. T test was used for this study a hypothesis testing tool, which allowed testing of an assumption applicable to a population. The level of significance was at  $p \leq 0.05\%$ .

### **3.11. Data Quality Control**

To ensure quality of the data of body composition and muscular fitness of the participant were selected and standardized fitness test were used with appropriate tools. To reduce the mistakes which occurred during data collection and to collect the appropriate data the assistant fitness test recorders were selected among technical assistance of sport science department and the researcher was created awareness in detailed to be committed and to get quality data.

### **3.12. Ethical issue**

The study was done in such way that an ethical issue was properly addressed. Privacy of the subjects was protected and confidentiality was strictly observed and maintained throughout the study.

## 4. RESULT AND DISCUSSION

### 4.1. Demographic Characteristics of the Subjects

From 30 participants who were initially enrolled 22 participants were completed the study. Eight participants were eliminated from this study due to different reason not related to the study there were no adverse effects from concurrent training. Age  $21.3 \pm 1.05$  years, height  $1.64 \pm 0.08$  meter, weight  $58.65 \pm 6.01$  in kilo gram.

### 4.2. Body Composition Test Result and Discussion

Table1: Mean and standard deviation values of body fat percentage in skin fold caliper and body mass index test result of study subject kilo gram per meter square.

Group	N	Variables	Pre test	Post test	P value	No of test
EG	10	Body fat percentage	$13.5 \pm 2.01$	$12.1 \pm 1.5$	0.004	1
CG	12		$13.09 \pm 2.44$	$12.87 \pm 2.42$	0.008	
EG	10	BMI	$21.2 \pm 1.95$	$21.03 \pm 1.95$	0.003	2
CG	12		$22.09 \pm 1.22$	$22.25 \pm 1.17$	0.019	

*Value (mean  $\pm$  SD), EG: experimental group, CG: control group, BMI: body mass index*

As indicated in the above table (table1) there was significance difference in body composition from pre test and post test of experimental group and control group at ( $P=0.004$ ) in experimental and control group ( $P =0.008$ ) in body fat percentage and but there was a little difference from pre test to post test of the control group with ( $P=0.003$ ) and  $P=0.019$ ) in body mass index experimental and control group respectively. Regarding the difference between the experimental and control group the study identified significant at ( $P<0.05$ ) within 8 week whey protein supplement and concurrent training program of weight lifters. Which indicated

that the mean values of skin fold caliper test from pre test to post test in both control and experimental group was vary but in experimental group there was greatly change. Thus mean value was  $13.5 \pm 2.01$  to  $12.1 \pm 1.5$  and  $13.09 \pm 2.44$  to  $12.87 \pm 2.42$  from pre test to post test on experimental and control group respectively. This Finding related with several studies have reported that whey supplementation promotes a reduction in fat mass in college-aged men over several months of resistance training (Gleeson, 2007). Whey protein supplementation also significantly reduced fat mass. Decreasing fat mass is an important and practical benefit to physical training when the intent is to optimize performance.

From this study with in the mean value difference where statically significance at  $p < 0.05$  hence based on this result 8 week whey protein supplement and concurrent training optimize on body fat percentage of Dbere Markos town male weight lifters and this study was indicated that concurrent training with whey protein supplement increased lean body mass an decrease fat body mass. It means that the null hypothesis was rejected and alternative hypostasis was accepted.

#### ❖ **Body composition**

From the above table in 8 week whey protein supplement and concurrent training program on body mass index of the study showed that whey protein supplement on the experimental group plays a great role for the decreasing of subjects' body weight due to this body mass index of experimental group change significantly from pre test to post test than control group. But body weight and body mass index increased in control group. Thus mean value was  $21.2 \pm 1.95$  to  $21.03 \pm 1.95$  and  $22.09 \pm 1.22$  to  $22.25 \pm 1.17$  on experimental and control group respectively. From this study with in the mean value difference where statically significance at  $p < 0.05$  hence based on this result 8 week whey protein supplement and concurrent training minimized body mass index of Dbere Markos town male weight lifters. This study also supported by other research (Mevries, 2015) for continued success, combine the strength training with whey protein may help to manage your appetite and loss body weight. in this case the study was indicates concurrent training with whey protein supplement was helped to optimize body weight of weight lifters and due to this that the null hypothesis was rejected and alternative hypostasis was accepted.

### Body mass index

Mean values of Body fat percentage subjects compared with the international standard norm with similar age range 20-23 mean value was 13.2 and 12.5 in pre and post test respectively. The international standard norm was 9.5-14.1 was good see from the appendix part. Body fat percentage of the trainers was at good level.

The standard norm of body mass index compared with the average mean values of this study result standard norm for this test range was 18.5-25 while the study result was found 21.68 and 21.69 in pre and post test respectively, so subjects in both group were found at normal level of body weight.

### 4.3. Muscular Fitness Test Result and Discussion

Table 2: descriptive statistics one minute sit up and push up test result of study.

Group	N	Variables	Pre test	Post test	P value	No test
EG	10	Sit up test	38.7±9.66	44.1±10.38	0.011	3
CG	12		34.75±3.54	35.9 ±2.98	0.012	
EG	10	Push up test	52.5±17.2	62.4±15.3	0.001	4
CG	12		46.08±7.05	47.4±7.66	0.003	

*Value (mean± SD), EG: experimental group, CG: control group*

*As depicted on the above table there were a great significant improvement observed sit up test and push up test in one minute on the experimental group pre- post tests training mean value score of 8 week exercise. The mean value of pre and post test training for experimental group was 38.7±9.66 to 44.1±10.38 and control group was 34.75±3.54 to 35.9 ±2.98 in sit up test and the mean values of push up test from pre to post test was 52.5±17.24 to 62.4 ±15.3 and 46.08 ±7.05 to 47.4±7.66 on experimental and control group respectively. From this result the*

researcher was observed significant improvement on the experimental group in both push up and sit up test. This Finding related from two previous study support the positive effect of high quality protein supplementation, including whey, to maximize the increased in muscle mass (Cermak 2012.,Miller.,2014) and strength when combined with prolonged greater than four weeks concurrent training interventions. Those data also suggested that whey protein supplementation significantly improved push-up performance compared to concurrent training alone. It was supported by previous study indicated that whey protein supplementation is beneficial for endurance performance (DOD Army,2018) this finding is practically relevant with soldiers in the WP group performing on average 7 more push-ups relative to those in the concurrent training post-intervention after controlling for initial push-up performance. With in the mean value difference where statically significance at  $p < 0.05$  for both sit up and push up test. Hence based on this result 8 week whey protein supplement and concurrent training have a positive effect abdominal strength and muscular endurance improvement of Dbere Markos town male weight lifters. Therefore the null hypothesis was rejected and alternative hypothesis was accepted.

The standard norm of sit up and push up test compared with the average mean values of this study result, standard norm for sit up test range was 33-37 and 38-41, While the study result was found 36.5 and 39.6 in pre and post test respectively, so subjects in both groups were found at poor and fair stage with international standard norms.

The standard norm of push up test with the average mean values of this study result and standard norm for push up test range was 47-61 and while the study result was found 49 and 52.6 in pre and post test respectively, so subjects in both pre and post test were found excellent level compared with the norms of international standard.

Table 3: Mean and standard deviation of one repetition maximum bench press test result of study subject in kilo gram.

Group	N	Variables	Pre test	Post test	P value	No of test
EG	10	1RM	1.14 ±0.08	1.24 ±0.05	0.001	5
CG	12		1.13 ±0.06	1.16 ± 0.6	0.008	

*1RM = 1 repetition maximum strength*

Within 8 week whey protein supplement and concurrent training program on upper body strength of the study subject indicated that mean values of 1RM test from pre test to post test was  $1.14 \pm 0.08$  to  $1.24 \pm 0.05$  and  $1.13 \pm 0.06$  to  $1.16 \pm 0.6$  on experimental and control group respectively. With in the mean value difference were statically significance at  $p < 0.05$ . Therefore based on this result 8 week whey protein supplement and concurrent training showed upper body strength improvement of Dbere Markos town male weight lifters on experimental group than control group. Other findings from previous meta-analyses of support the positive effect of high quality protein supplementation, including whey, maximize upper body muscle strength (Cermak., *et al* 2001) when combined with resistance training intervention. Other study also showed that whey protein after concurrent increases muscle protein synthesis 145% related with study healthy young men performed a bout of resistance exercise (8 sets of 5 repetitions), rested 15 minutes, and then performed 30 minutes of continuous cycling. On one occasion they were provided 25g of whey protein immediately after exercise, and on another occasion, they consumed only water (placebo). Compared to rest, the rate of muscle protein synthesis during 1-to-4 hours post-exercise was increased by 75% during placebo (water only) and by 145% when taking whey. Consumption of whey protein also resulted in lower expression of catabolic (muscle breakdown) gene expression. It indicated that the null hypothesis was rejected and alternative hypostasis was accepted.

The international standard norm 1RM test compared with the average mean values of this study result within the same age group 20-23. Standard norm for this test range was 0.99-1.13 and 1.14-1.31 while the study result was found 1.13 and 1.2 in pre and post test respectively, so subjects in both groups were found fair and good compared with the norms of international standard.

### 4.3. The mean difference values and significance levels of variable

Table 4: pre test to post test mean difference values and significance levels all variables

Variables	Group	Parameter A (pre test)	Parameter B (post test)	Mean difference (B-A)	Significance
Body fat percentage	Experimental	13.5	12.11	-1.39	0.004
	Control	13.09	12.87	-0.22	0.008
BMI	Experimental	21.20	21.03	-0.17	0.003
	Control	22.09	22.25	0.16	0.019
Sit up	Experimental	38.7	44.1	5.4	0.011
	Control	34.75	35.91	1.16	0.012
Push up	Experimental	52.5	62	6.4	0.001
	Control	46.08	47.41	1.33	0.003
1RM	Experimental	1.14	1.24	0.1	0.001
	Control	1.13	1.16	0.03	0.008

1RM: one repetition maximum strength

The above tables showed that all variables body composition and muscular fitness had a positive improvement on the experimental groups of subjects of the study in 8 week whey protein supplement and concurrent training program but there was a little change showed on control group in case of 8 week concurrent training and whey protein supplement of study in both parameters. Hence this study was significant to improve physiological and physical fitness aspects of study and statically significant with P values <0.05 in both experimental and control groups for all variables due to this null hypothesis rejected and alternative hypothesis was accepted.

## 5. SUMMARY CONCLUSIONS AND RECOMMENDATION

### 5.1 Summary

This study tried to investigate the effect of whey protein supplement and concurrent training on body composition and muscular fitness of Debre-Markos town male weight lifters. To achieved the goal of this study 22 male weight lifters within the age of 20 -23 were selected from the total of 40 based on health status questionnaire and divided into two sub group randomly 10 experimental and 12 control groups. Both groups participated in 8 week concurrent strength and endurance training program and experimental group consume whey protein supplement with in 30 minute after training. The training program was performed 4 days per a week and the duration of the training was 50 minute.

The sampling techniques used for this study were Convenience and simple random sampling techniques. Convenience sampling technique used to select one year experienced from other trainers and simple random sampling technique was used to select 30 trainers from 40 of one year experienced weight lifters. Data were collected before and after the treatment period by pre test and post test result and analyzed by SPSS version 20 within the significance level of  $p < 0.05\%$  and pared t test was used for compassion of mean.

Generally 8 week whey protein supplement and concurrent training have a positive effect body composition and muscular fitness performance of weight lifters on experimental group than control group.

### 5.2. Conclusions

Based on this study finding the researcher put the following points as conclusions:

The finding of this study showed that whey protein supplement and concurrent training of weight lifters, there were observed body composition, muscular strength, upper body strength and muscular endurance improvement on the experimental group than control group but there was also a little change on control group due to whey protein supplement intervention on experimental group because whey protein supplement contain all essential and branched chine amino acid which helped to increase lean body mass strength and improved body

composition. Based on the above finding in all variables of experimental and control group null hypothesis rejected and alternative hypothesis was accepted.

### **5.3. Recommendation**

Considering the major finding and conclusion of the study it is important to state the following recommendation:

- Based on the present and the past data the researcher recommended that coach and sport professionals should be apply whey protein supplement with both endurance and strength training to increase muscular fitness performance and to improve body composition.
- To empower muscular fitness and body composition performance of the trainers it was good if the responsible body provides financial support for whey protein supplement and to increase sport performance to thus trainers.
- Concurrent training allows becoming familiar with strength and endurance exercise and it might not more effective without protein supplement so trainers should be obtained it.

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## **7. APPENDIC**

## APPENDIX I

### Health history and physical readiness questionnaires

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

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

1. Age: - \_\_\_\_\_

2. Do you have recent physical injury such as bone, muscle, joint etc. will be affected by physical exercise?

A. yes

B. No

3. If your response is yes indicate the type of injury that you had before

\_\_\_\_\_

4. Do you have suffered with heart problem before?

A. yes

B. No

5. Are you taking any medication?

A. Yes

B. No

6. If your response is yes name them below the name of medicine

\_\_\_\_\_

7. Identify any medical problems that you had before

A. Musculoskeletal

B. Cardiovascular

C. Others

E. None

8. Identify any physical problems you had before

Leg bone broken

Head skull broken

Knee dislocation

Backbone dislocation

None

I hereby state I have read, understood and answered honestly the questions above. I also state that I wish to participate in this research project.

Subject's full name:                      Trainer's full name: \_\_\_\_\_

Subject's signature:                      Trainer's signature: \_\_\_\_\_

Date: \_\_\_\_\_

**Source:** (American College of Sport Medicine, 1997)

## APPENDIX II

### Consent to participate voluntarily in this research study

Researcher name: - Atalay Molla

Supervisor name: - Eyasu Merhatsidk (PhD) and Negussie Bussa (PhD)

**Research thesis Title: - Effects of whey protein supplement and concurrent training on body composition and muscular fitness of Debre Markos town male weight lifters, East Gojam Zone, Amhara Regional State.**

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

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

#### **1. Purpose and procedure**

The purpose of this research project is to investigate the effect of whey protein consumption with concurrent training on muscular fitness and body composition, of Debre Markos town one year experienced weight lifter with the age of 20-23 years. The subjects to be involved in this study will be 20 in number and participation on this study will require you to perform a certain test to measure the physical fitness variables.

#### **2. Risk and the safeguards**

The risks of this research study are small, while administering the tests and during test you may experience localized muscle fatigue in your upper body and abdominal muscle, you

might feel some muscle soreness and fatigue during the tests. But we do not expect any unusual risks as a direct result of the study, if any unexpected physical injury occurs, appropriate first aid will be provided, but no financial compensations will be given.

### 3. Confidentiality

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

### 4. Contact Address:

Atalay Molla----- 0986828156

Eyasu Merhatsidk (PhD) -----0911175336

Negussie Bussa (PhD) -----0910275526

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

Name of subject: \_\_\_\_\_

Signature of subject: \_\_\_\_\_

Address: \_\_\_\_\_

Date: \_\_\_\_\_

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

Date: \_\_\_\_\_

Signature of the investigator: \_\_\_\_\_

## APPENDIX III

### Description of training schedule for two month

Different intensities of strength and endurance training the type and extent of training adaptation are predominantly determined by training intensity and volume (Kraemer, et al., 2002). For example, strength development predominantly occurs when strength training is performed at a high intensity and low volume (5-6 sets of 1-6 repetitions), hypertrophic adaptations are induced when performed at a moderate to high intensity and moderate volume (three to four sets of 8-12 repetitions) and muscular endurance increases when performed at low intensity and high volume (three to four sets of 15 repetitions or more).

The following table includes different types of concurrent training which will be performed by the subjects within 8 weeks in order to improve muscular fitness variables. The exercises involve in this study are 15 min' warming up exercise 30' main work(strength endurance) and finally 5'cooling down exercise which help to develop athletes fitness level. Also FITT (frequency, Intensity, time and type of exercise) principle of training is applied in the schedule;

**1. Frequency of Training:** It is the repetition of exercise in one set. The training schedule will be performed 4 days per week Sunday, Tuesday, Thursday and Saturday.

**2. Intensity of Training:** is how hard the body exercising or how much energy is expended when exercising. In this study the researcher will use moderate to adapt the exercise to high intensity for increasing load for 8 week.

Exercise is categorized into two different intensity levels. These levels include

**Moderate** (50-65% MHR), and **Vigorous** (65-85% MHR) for aerobic exercise and are measured by the metabolic equivalent of task. The effects of exercise are different at each intensity level (i.e. training effect). Recommendations to lead a healthy lifestyle vary for individuals based on age, weight, and existing activity levels.

**3. Duration of Training:** the subjects perform the exercise for 50 min per day in each month.

**4.Type of Activity:** any activity that uses large muscle groups, which can be maintained continuously, E.g., push up, pull up, dips, deed lift, leg extension, jogging, , squat, chest press ,dumbbell, bar bell ,biceps curl, set up, shoulder press, back extension, and various endurance game activities.

### Planning the Session and the Training Weeks

Based on the above mentioned reasons and others the researchers will use the training principles, this training session is designed for two months, and based on the principles of frequency, intensity, type and principle of rest and recover it will be a four days per week, three day rest in between exercise session.

As training adaptation is dependent on the intensity and volume of training (Kraemer, et al., 2002), training variables within a concurrent training program may be set such that the interference of strength and/or endurance development is minimized. Docherty et al (2000) proposed the “zone of interference” effect, suggesting that the degree of interference of strength performance may be dictated by the intensity and volume of strength and endurance training performed on the same muscle groups.

### *Training schedule for the first month (December 2018)*

Day	Types of exercise	Time /min /session	Training volume/rest	Intensity	Total duration
Thus day	<b>Warming up:</b> walking, jogging, inward hip rotations, outward hip rotations forward arm circles, backward arm circles, walk-stretching	15 min			15min
	<b>Main part :</b> <ul style="list-style-type: none"> <li>✓ Dead lifts</li> <li>✓ Bench Press</li> <li>✓ Push-ups</li> <li>✓ Pull-ups</li> </ul>	30min	5x6 -8 5x6 -8 20-25 15-20 1min rest	moderate (50-65%)	30 min

	<b>Cool down:</b> ✓ Slow jogging, ✓ Brisk walking or ✓ Stretching	5mi			5min
Thursday	<b>Warm up</b> walking, jogging, inward hip rotations, outward hip rotations forward arm circles, backward arm circles walk-stretching	15min			15min
	<b>Main part:</b> ✓ Dumbbell Stiff ✓ Bar bell Dead lift ✓ Chin-ups ✓ Dip up	30min	5x6-8 5x6-8 15-20 15-20	Moderate (50%- 65%	30min
	<b>Cool down:</b> ✓ Slow jogging ✓ Brisk walk, ✓ Stretching	5min			
Saturday	<b>Warming up</b> :walking, jogging, inward hip rotations, outward hip rotations forward arm circles, backward arm circles walk stretching	15 min			

	<b>Main part:</b> <ul style="list-style-type: none"> <li>✓ set up</li> <li>✓ Squat</li> <li>✓ push up</li> <li>✓ chin up</li> </ul>	30min	5x6-8 5x6-8 3x15-20 3x15-20	Moderate (50%- 65% )	30min
	<b>Cool down:</b> <ul style="list-style-type: none"> <li>✓ Slow jogging</li> <li>✓ Brisk walking</li> <li>✓ Stretching</li> </ul>	5 min			5min
Sunday	<b>Warming up:</b> walking, jogging, inward hip rotations, outward hip rotations forward arm circles, backward arm circle walk- stretching	15min			15min
	<b>Main part:</b>				
	<b>Main part:</b> <ul style="list-style-type: none"> <li>✓ dead lift</li> <li>✓ shoulder press</li> <li>✓ pull up</li> <li>✓ chin up</li> </ul>	30min	5x6--8 5x6-8 3x15-20 3x 15-20	moderate 50%- 65%	30min
	<b>Cool down:</b> <ul style="list-style-type: none"> <li>✓ Slow jogging,</li> <li>✓ Brisk walking</li> <li>✓ Stretching</li> </ul>	5min			5min

**Training schedule for the second month (January 2019)**

Day	Types of exercise	Time /min /session	Frequency/res t	Intensity	Total duration
Tuesday	<b>Warming up:</b> walking, jogging, inward hip rotations, outward hip rotations forward arm circles, backward arm circles, walk-stretching	15 min			15min
	<ul style="list-style-type: none"> <li>✓ Dead lifts rep</li> <li>✓ Bench Press</li> <li>✓ Push-ups</li> <li>✓ Pull-ups</li> </ul>	30min	6x8 -10 6x8-10 3x20-35 3x15-20 1min rest	Moderate to high (65-85%)	30 min
	<b>Cool down:</b> <ul style="list-style-type: none"> <li>✓ Slow jogging,</li> <li>✓ Brisk walking</li> <li>✓ Stretching</li> </ul>	5min			5min
Thursday	<b>Warm up</b> walking, jogging, inward hip rotations, outward hip rotations forward arm circles, backward arm circles walk-stretching	15min			15min

	<b>Main part:</b> <ul style="list-style-type: none"> <li>✓ Dumbbell Stiff</li> <li>✓ Bar bell Dead lift</li> <li>✓ Chin-ups</li> <li>✓ Dip up</li> </ul>	30min	6x8-10 6x8 -10 3x25-30 3x25-30	Moderate to high (65%- 85%)	30min
	<b>Cool down:</b> <ul style="list-style-type: none"> <li>✓ Slow jogging</li> <li>✓ Brisk walking or</li> <li>✓ Stretching</li> </ul>	5min			5min
Saturday	<b>Warming up :</b> walking, jogging, inward hip rotations, outward hip rotations forward arm circles, backward arm circles walk ,stretching	15			15min
	<b>Main part:</b> <ul style="list-style-type: none"> <li>✓ set up</li> <li>✓ Squat</li> <li>✓ push up</li> <li>✓ Dip up</li> </ul>	30min	5x20-25 5x20-25 3x25-30 3x25-30 1min rest	Moderate to high (65%- 85%)	30min
	<b>Cool down:</b> <ul style="list-style-type: none"> <li>✓ Slow jogging</li> <li>✓ Brisk walking</li> <li>✓ Stretching</li> </ul>	5 min			5min

Sunday	<b>Warming up:</b> walking, jogging, inward hip rotations, outward hip rotations forward arm circles, backward arm circle walk, stretching	15min			15min
	<b>Main part:</b> <ul style="list-style-type: none"> <li>✓ dead lift</li> <li>✓ shoulder press</li> <li>✓ pull up</li> <li>✓ chin up</li> </ul>	30min	6x8-10 6x8-10 3x15-20 3x 25-30	Moderate to high 65%- 85%	30min
	<b>Cool down:</b> <ul style="list-style-type: none"> <li>✓ Slow jogging,</li> <li>✓ Brisk walking</li> </ul>	5min			5min

## APPENDIX V

### Physiological Fitness test Recorded Sheet of Subject

Group \_\_\_\_\_ (control or experimental group)

Name: \_\_\_\_\_

Initial high/m: \_\_\_\_\_ Initial Wight/kg \_\_\_\_\_ terminal height/m \_\_\_\_\_ terminal weight/ kg \_\_\_\_\_

Age: 18-23

Sex: male

No	Parameter to be measured	Types of test	Sex	Experimental group		Control group	
				Pre test	post test	Pre test	Post test
1	Body composition	Skin fold caliper test	Male				
2	Body composition	Body mass index test	Male				
3	Core strength	Sit up test	Male				
4	Muscular endurance	Push up test	Male				
5	Upper body strength	1RM test	Male				

## Appendix's VI

Code for Pre test and post test result of raw data for experimental group

	Age	height	wight1	wight2	Bf1	Bf2	Bmi1	Bmi2	set1	set2	push1	push2	1RM	1RM2
E1.	21	1.64	61.50	61.10	12	11.6	22.86	22.76	35	40	60	68	1.05	1.22
E2.	22	1.61	64.30	63.60	13	12.3	24.8	24.50	36	48	62.00	65.00	1.04	1.21
E3.	20	1.71	65	65	14	13	22.20	22.20	42	42	51	51.00	1.05	1.21
E4.	20	1.57	45.20	44.80	11	11	18.30	18.10	29	43	62	73	1.12	1.18
E5.	21	1.62	54.20	53.60	13.5	10.3	20.65	20.42	38	35	38	39	1.19	1.25
E6.	20	1.61	52	51	17.7	15.3	20.06	19.67	30	30	10	25	1.11	1.23
E7.	22	1.55	50.70	50.70	11.5	10	21.1	21.1	31	38	69	75	1.24	1.28
E8.	22	1.82	69.20	68.50	13	13	20.8	20.6	56	63	60	68	1.27	1.32
E9.	23	1.75	57.50	57.30	15.9	13.1	18.77	18.71	35	42	62	68	1.18	1.32
E10.	22	1.60	57.40	57	13.4	11.5	22.42	22.26	55	60	51	57	1.20	1.20

## Appendix's VII

### Code Pre test and post test result of raw data for control group

	Age	height	wight1	wight2	Bf1	Bf2	Bmi1	Bmi2	set1	set2	push1	push2	1RM1	1RM2
C1.	23.	1.75	69.5	69.5	13	13	22.69	22.69	35	37.6	60	63	1.17	1.22
C2.	23	1.62	62.1	62.2	12	11.5	23.6	23.7	29	30	38	40	1.14	1.22
C3.	20	1.61	53.90	54.00	10.70	10.70	20.79	20.83	35.00	35	41	41	1.07	1.12
C4.	21	1.58	61.00	61.00	16.00	15.30	24.43	24.43	39	39	52	53.00	1.08	1.08
C5.	21	1.76	66.7	67.00	11.00	10.70	21.53	21.62	35.00	37	48	51.00	1.10	1.14
C6.	21	1.65	57.60	58.50	17.40	17.10	21.15	21.48	35.00	35	45	46.00	1.09	1.12
C7.	20	1.70	59.50	60.40	9.00	8.80	20.58	20.89	30	32.0	40	40	1.13	1.22
C8.	20	1.60	53.80	54.00	15	15	21.01	21.09	39.00	39.00	50.00	53.00	1.09	1.12
C9.	21	1.65	57.7	59	14	14	21.19	21.67	30	33	36	37	1.1	1.15
C10.	22	1.62	59.60	61.00	14.00	13.80	22.70	23.24	39.00	38	48	50	1.14	1.11
C11.	21	1.58	57.00	57.00	11.00	10.60	22.83	22.83	34	37	53.00	53.00	1.24	1.24
C12.	20	1.60	57.7	57.7	14	14	22.53	22.53	37	39	42	42	1.26	1.26

**APPENDIX - VIII**  
 Pared sample t test parameter

Table 7: In all variables Pared sample test for experimental group

Parameters		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	body fat 1 - body fat 2	1.39	.15609	.36559	.56298	2.21702	3.802	9	0.004
Pair 2	body mass index 1 - body mass index 2	.1730	.13292	.04203	.07791	.26809	4.116	9	0.003
Pair 3	set up 1 – set up 2	5.400	5.31664	1.68127	-9.20330	-1.59670	-3.212	9	0.011
Pair 4	push up 1 – push up2	6.400	4.50185	1.42361	-9.62043	-3.17957	-4.496	9	0.001
Pair 5	one repetition max bench one – one repetition max bench two	.09700	.06201	.01961	-.14136	-.05264	-4.496	9	0.001

## APPENDIX - X

**Table 8: In all variables Pared sample test for control group**

Parameters		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95 % Confidence Interval of the Difference		T	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	body fat 1 - body fat 2	.21667	.23290	.06723	.06869	3.802	3.223	11	0.008
Pair 2	body mass index 1 - body mass index 2	-.15917	.20016	.05778	-.28634	4.116	-2.755	11	0.019
Pair 3	set up 1 - set up 2	- 1.16667	1.33712	.38599	-2.01623	-3.212	-3.023	11	0.012
Pair 4	push up 1 - push up2	- 1.33333	1.23091	.35533	-2.11542	-4.496	-3.752	11	0.003
Pair 5	one reptition max bench presss one one reptition max bench presss two	-.03250	.03519	.01016	-.05486	-4.496	-3.199	11	0.088

## APPENDIX – XI

### Norms of Dependent Variables Test Data Analysis

#### Body fat percentage

<i>Men</i>	<i>Very lean</i>	<i>excellent</i>	<i>Good</i>	<i>Fair</i>	<i>Poor</i>
<i>Age: 18-29</i>	<i>Below 5.3</i>	<i>5.3-9.4</i>	<i>9.5-14.1</i>	<i>14.2-17.4</i>	<i>17.5-22.4</i>

<b>Body mass index</b>	Norms
Under weight	18.5<
Normal	18.5-25
Over weight	25-30
Obesity	>30

(Charles, 2000)

#### Sit up

<i>Men</i>	<i>Very poor</i>	<i>Poor</i>	<i>Fair</i>	<i>Good</i>	<i>Excellent</i>	<i>Superior</i>
<i>20-29</i>	<i>Below 33</i>	<i>33-37</i>	<i>38-41</i>	<i>42-46</i>	<i>47-54</i>	<i>Above 54</i>

(Charles, 2000)

#### Push up

<i>Men</i>	<i>Very poor</i>	<i>Poor</i>	<i>Fair</i>	<i>Good</i>	<i>Excellent</i>	<i>Superior</i>
<i>Age: 18-29</i>	<i>Below 22</i>	<i>22-28</i>	<i>29-36</i>	<i>37-46</i>	<i>47-61</i>	<i>Above 61</i>

(Charles , 2000)

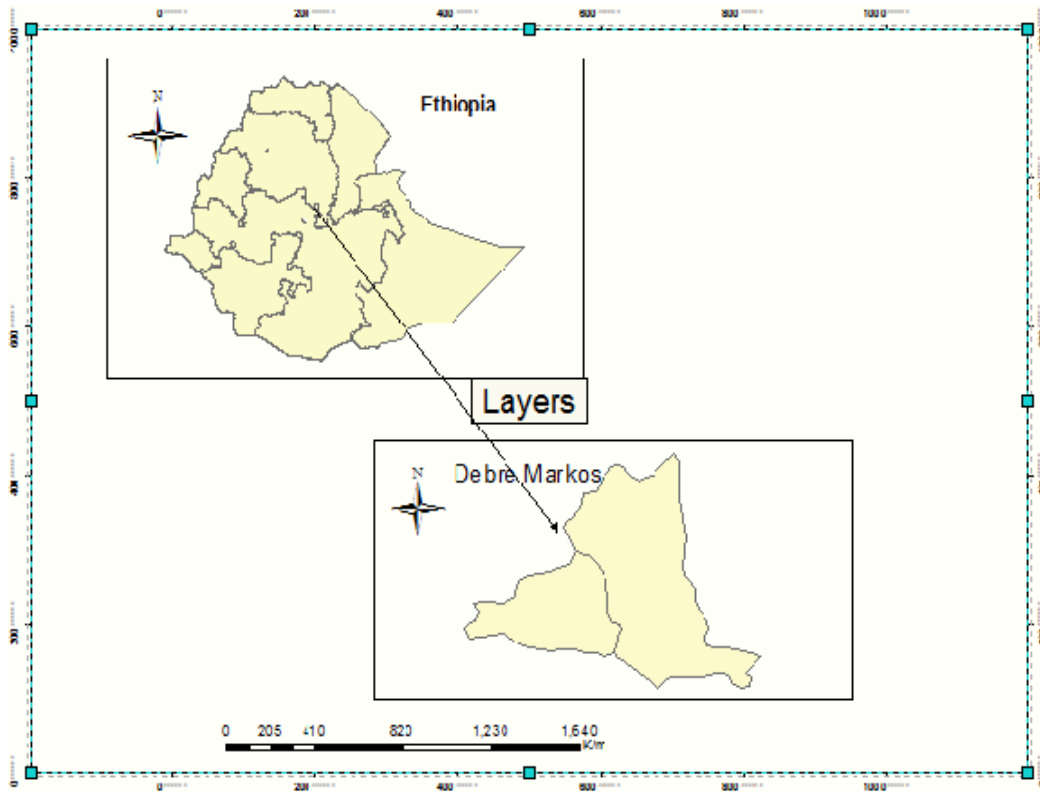
#### 1RM

<i>Men</i>	<i>Very poor</i>	<i>Poor</i>	<i>Fair</i>	<i>Good</i>	<i>Excellent</i>	<i>Superior</i>
<i>20-29</i>	<i>Below 0.88</i>	<i>0.88-0.98</i>	<i>0.99-1.13</i>	<i>1.14-1.31</i>	<i>1.32-1.62</i>	<i>Above 1.62</i>

(Charles, 2000)

## APPENDIX - XII

Figure 1: Map of the study area



Source :( Debre Markos, 2011