

**A COMPARATIVE STUDY OF MALE GYMNASIUM TRAINEES AND NONE-  
TRAINEES OF CARDIORESPIRATORY AND MUSCULAR ENDURANCE  
FITNESS IN ATHLETICS OF COMMERCIAL BANK OF ETHIOPIA**

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**Addis Ababa, Ethiopia**

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A thesis summated to the school of graduated student of Addis Ababa  
University in the partial fulfillments of the requirement for Master  
program in sport science (coaching Athletics)

**July, 2017**

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TRAINEES OF CARDIORESPIRATORY AND MUSCULAR ENDURANCE  
FITNESS IN COMMERCIAL BANK OF ETHIOPIA EMPLOYEES**

**By  
Esayas Yalew**

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## **Abstract**

*The study conduct by a comparative study on cardio respiratory and muscular Endurance Fitness between male Gym. Trainees and none-Trainees of Athlete Commercial bank of Ethiopia. Selected 60 by using stratified sampling technique and grouped into two group of strata Gym. After that using simple random sampling selected 12 Athlete from Gym-Trainees and in IT, HRD, business development, Transaction department.*

*This study was the data collecting from selected sample through questioner and physical fitness test the data analyzed through general survey method, the data analysis procedure that in table & statement forms.*

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# CHAPTER ONE

## 1. Introduction

### 1.1. Back Ground

As the fitness concept grew during 1970s, it e come clear that several specific component contribute to an individual's overall level of fitness. Physical fitness can be classified into health related and skill related fitness. The five health related fitness component are cardio-respiratory (aerobic) endurance, muscular strength, muscular endurance, flexibility and body composition. Skill related fitness components consists of agility, balance, coordination, power, reaction time and speed. The later are aimed primarily at succeeding in athletics and may not be as crucial to better health in terms of preventive medicine. The main emphasis, of Fitness program should be on the health related component the focus of this study cardio-respiratory and muscular endurance. Cardio respiratory endurance measures in terms of the maximal amount of oxygen the body is able to utilize per minute of physical activities (maximal oxygen uptake or  $\text{Vo}_2\text{max}$ )-essentially a measure of how efficiently your heart. Lungs and muscles can operate during aerobic exercise.  $\text{Vo}_2\text{max}$  commonly expressed in milliliter (ml) of oxygen (volume of oxygen) per kilogram (Kg) of body weight per minute (ml/Kg/min). Individual values can range from about 10 ml /kg/mm cardiac patients to over 80ml /kg/min in world class runners cyclist and cross country skiers. Research data from the study presented interpreted that achieving  $\text{Vo}_2\text{max}$  values of 35 and 32.5ml/Kg/min for men and women, respectively, may be sufficient. Although greater improvement, in fitness yield a slightly lower risk for per minute death. The largest drop is seen between the last fit and moderately fit. Therefore, the 35and 32.5ml/Kg/min values could be selected as the health fitness standards. Muscular endurance is the ability of muscle to exert sub maximal force repeatedly overtime. Muscular endurance (also referred to as localized muscular endurance) depends to a large extent on muscular strength. Weak muscle cannot repeat an action several times or sustain it. Based up on these principle strength tests and training programs have been designed to measure and develop absolute muscular strength. Muscular endurance or a combination of the two muscular endurance a typically established by the number of repetitions an individual can perform against a sub maximal resistance or by the length of time given contraction can be sustained.

## **1.2. Statement of the Problem**

Cardiovascular and muscular endurance are the essential components of physical Fitness for an Individual. The enable the individual to normal way of life and also be able to perform his/her work and accomplish tasks effectively. However, these physical Fitness components cannot be achieved without continuous Training and practice it is assumed that commercial bank of Ethiopia Gym trainers have better knowledge about the benefits of physical fitness exercise.

On top of this, the purpose of this study is to compare and contrast the cardiovascular and muscular Endurance of male Gym Trainees and Non-Trainees of Commercial bank of Ethiopia. To this end the study will try to answer the following basic research questions.

1. Do the Gym Trainees of commercial bank of Ethiopia Gym-trainers out perform in their cardio respiratory and muscular endurance capacity than non-Gym Trainees of commercial bank of Ethiopia?
2. What seems like the participation of Gym Trainees of Commercial bank of Ethiopia in physical activity?
3. Is there any variation on the performance (CRE and ME) among the Gym Trainees of different regions?
4. Is there any signification difference on the performance of this physical Fitness component between Gym Trainees and non-Trainees of commercial bank of Ethiopia?

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

### **1.3.1. General Objective**

The general objective of the study is the compare the CRE and ME ability of Gym Trainees and none-Trainees of Athlete commercial bank of Ethiopia. This study has the following

### **1.3.2. Specific Objective**

1. To identify the problems that hinders the performance of CRE and M.E abilities.
2. To create awareness about the Importance CRE and ME Physical Fitness components for non-Gym Trainees in Athlete of Commercial bank of Ethiopia. So that they can apply and practice these components.

3. To create and Facilitate a conducive condition to use CRE and ME abilities especially for non-Gym Trainees in Athlete of Commercial bank of Ethiopia.

#### **1.4. Significance of the study**

The study will contributed a lot of benefits for both Gym-Trainees and non-Trainees in Athletes of commercial bank of Ethiopia it may provide useful in sight regarding the importance of cardiorespiratory and muscular endurance physical Fitness abilities. It may also encourage that Athlete to practice and apply CRE and ME Physical Fitness abilities.

Besides the study will provide a foundational base for subsequent detailed studies on the same Topic. Furthermore, it is expected that an Individual may get a better chance of motivation of Performing and participating in cardio respiratory and muscular endurance abilities.

#### **1.5. Delimitation of the Study**

Although it is essential and paramount to examine the application and usage of CRE and ME abilities. A wider coverage of this is conceivable. This because mainly time and budget constrains to conduct the study on more. Commercial bank of Ethiopia Gym center and Gym trainees.

Thus this research is limited to assess and compare the CRE and ME abilities between male Gym-Trainees and non-Trainees in Athlete of commercial bank of Ethiopia.

Although there are different elements of CRE and ME this study will limited to assess.

#### **1.6. Limitation of the study**

In the course of the study the researcher encountered several problems some of them were.

- Shortage time, Financial and materials constraint.
- Some trainees were refrain to fill the question properly and completely.
- Unable to use more information from internet, books and other services due to shortage of Transport service.
- Shortage imperial researches that are conducted on the Topic in Ethiopia.

## 1.7. Operational Definitions

1. **Body composition:** the relative percentage of muscle fat, bone and other tissues that comprise the body.
2. **Cardio vascular endurance:** the ability of the heart blood vessel and respiratory system to supply fuel and oxygen to the muscle and the ability of the muscle to utilize fuel to a low sustained exercise.
3. **Fitness:** the ability to meet the demand of the environment.
4. **Flexibility:** the range of motion available in joints it is affected by muscle length joint structure and other factors.
5. **Health:** the general well-being of an individual i.e. mental, physical and social well-being.
6. **Muscular endurance:** the ability of muscle to repeatedly exert them.
7. **Muscular strength:** the ability of the muscle to exert an external force or to lift a heavy weight.
8. **Physical fitness:** is the body's ability to function efficiently and effectively.

## 1.8. Organization of the study

This study will have four chapters the first chapter will discuss about introduction of the study review of literature about will explained under chapter two. Chapter three will explained about the findings and discussion of the research. Conclusion and recommendation are will be forwarded under chapter four. Finally reference and appendixes will attached to the paper.

## **CHAPTER TWO**

### **2. Review of related literature**

#### **2.1. Definition of physical fitness**

Physical fitness is a set of physical attributes that allows the body to respond or adapt to the demands and stress of physical effort-that is, to perform moderate to vigorous level of physical activity without becoming overly tired, physical fitness has many components. Some related to general health and other related to particular sports or activities. The five components of fitness most important of health care are cardiorespiratory endurance, strength, muscular endurance flexibility and body composition (Paulm. Insel et.al., 2004).

##### **2.1.1. Cardiorespiratory Endurance**

Is the ability to perform prolonged, large muscle, dynamic exercise at moderate - to- high level ' Intensity, cardiorespiratory fitness are low the heart has to work hard enough to sustain high intensity physical activities. In an emergency, as cardiorespiratory endurance improve the heart begins to function more effectively it doesn't have to work as hard at rest or during low level of exercise. The heart pumps more blood per heart beats. Resting heart rate slow down, blood volume increase blood supply to the tissue improves and resting blood pressure decrease a healthy heart can better with stand the strains of everyday life, the stress of occasional emergencies, and the wear and tear of time (Walton T. Roth et. al., 2004)

Cardiovascular endurance is also frequently called cardio-respiratory endurance, cardio vascular fitness, aerobic capacity, aerobic fitness or is sometimes more broadly termed "endurance" although endurance may also refer to the ability of the muscle to do repeated work without fatigue. It is also one of the five component of physical fitness, while all physical activities involve some level of cardiovascular support. Cardiovascular endurance typically refers to the ability of a person to perform activities that raise the heart to a training level and maintain that level for a sustained period of time typically 10-15 minute. A "training level" is typically expressed as percentage of a person maximum heart rate (MHR) usually between 60- 80 percent of an individual MHR.

- Lowered blood pressure

- More efficient pulmonary function: because the body can better utilize available oxygen, a person with better cardio-respiratory endurance doesn't need to take as many breaths during exercise. This keeps you from getting "winded" -whether that's climbing stairs or running sprints.

## **2.2. How to Improve Cardiovascular Endurance**

Improving cardiorespiratory endurance is typically just a matter of practice, like training your muscles, continuously challenging your cardiovascular system with increased level of aerobic activity will generally result in gains in cardiovascular endurance and fitness. This can be duration running, biking, swimming, skating, cardio at the gym. Or even higher intensity activities like sprinting or interval training, which have been shown to increase  $\text{VO}_2$  max.

Cardio respiratory fitness can be developed in three to six days per- week

Unlike less intense life style physical activities, the types of activities that promotes cardiorespiratory fitness may be done as few as three days of activity of a week. Additional benefits occur with added days of activities. However because more vigorous physical activity has been shown to increase risk of orthopedic injury if done too frequently, most experts recommended at least one day a week off (Sharon A, Hoeger et.al. 2005)

### **2.2.1. Cardiovascular Endurance Test**

Five exercise tests used to assess cardiorespiratory fitness are introduced in this chapter : 1.5 mile Run test, 1.0 mile walk test, step tests, Astrand- Rhyming, test and 12 minute swim test. Multiple tests are provided in this chapter so that you may choose one test depending on time, equipment and individual physical limitations, for example, people who can't jog or walk could take the bike or swim test. You may perform more than one of these tests, but because these different tests and they estimate maximal oxygen uptake. They will not necessarily yield the same result. Therefore to make valid comparisons, you should take the same test when doing pre and post assessment (Werner W.K HOEGER et.al., 2005)

#### **2.2.1.1. 1.5 Mile Run Test**

The 1.5. mile run test is used most frequently to predict maximal oxygen uptake according to the time the person takes to run or walk a 1.5 mile course maximal oxygen uptake is estimated based on the time the person takes to cover the distance. The only equipment necessary to

conduct this test is a stop watch and a track or premeasured 1.5 mile course. This perhaps is the easiest test to administer, but a note of caution is in order when conducting the test. Given that the objective is to cover the distance in the shortest time is considered a maximal exercise test. The 1.5 mile run test should be limited to conditioned individuals who have been cleared for exercise. The test is not recommended for unconditioned beginners, men average 40, or women over age 50 without proper medical clearance. Symptomatic individuals; or those with known disease or coronary heart diseases risk factors. A program of at least 6 weeks of aerobic training is recommended before unconditioned individuals take this test.

#### **2.2.1.2. 1.0 Mile Walk Test**

This test can be used by individuals who are unable to run because of low fitness level of injuries. All that is required is a brisk 1-mile walk that will elicit an exercise heart rate of at least 120 beats per minute at the end of the test. You will need to know how to take your heart rate by counting your pulse. This can be done by gently placing the middle and index fingers over the radial artery on the wrist (inside the wrist on the side of the thumb) or over the carotid artery in the neck just below the jaw, next to the voice box. The thumb should not be used to check the pulse, because it has a strong pulse of its own which can make you miscount. When checking the carotid pulse, do not press too hard because it may cause a reflex action that slows the heart. Some exercise leader recommends that when you check the pulse over the carotid artery the hand on the same side of the neck (left hand over left carotid artery) be used to avoid excessive pressure on the artery. With minimal experience however, you can be accurate using either hand as long as only gentle pressure is applied.

#### **2.2.1.3. Step Test**

The step test requires little time and equipment and can be administered to almost anyone, because a submaximal work load is used to estimate maximal oxygen uptake. This test is significantly over weight individuals and those with joint problems in the lower extremities may have difficulty performing the test, the actual test takes only 3 minutes. A 15 second recovery heart rate is taken between 5 and 20 seconds following the test. The equipment required consists of a bench or gymnasium bleacher 16 inches high, a stop watch, and a metronome you will also need to know how to take your heart rate by counting your pulse (Explained under the 1.0-

mile walk test). Once people learn to take their own heart rate, a large Group of people can be tested at once, using gymnasium bleachers for the steps.

#### **2.2.1.4. A strand - Rhyming Test**

Because of its simplicity and practicality, the A strand-Rhyming test is one of the most popular tests used to estimate maximal oxygen uptake in the laboratory setting. The test is conducted on a bicycle ergometer and, similar to the step test, it requires only sub maximal workloads and little time to administer. The caution given for the step test also applies to the A strand - rhyming test. Nevertheless, because the participants do not have to support his or her own body weight while riding the bicycle, overweight individuals and those with limited joint problems in the lower extremities can take this test.

#### **2.2.1.5. 12-minute Swim Test**

Similar to the 1.5 mile run test, the 12 minutes swim test is considered a maximal exercise test, and the same precautions apply. The objective is to swim as far as possible during the 12 minute test. Unlike land-based tests, predicting maximal oxygen uptake through a swimming test is difficult. A swimming test is practical only for those who are planning to take part in a swimming program or who cannot perform any of the other tests. Differences in skill level, swimming conditioning, and body composition greatly affect the energy requirements (oxygen uptake) of swimming. Novice and unconditioned swimmers can expect lower cardiorespiratory fitness ratings than those obtained with a land based test.

### **2.3. Methods for Measuring Cardiorespiratory Endurance**

Cardiorespiratory endurance can be measured using a number of formal clinical methods including: -

- $\dot{V}O_2$  max test
- Ventilator threshold or lactate threshold test
- Graded exercise test
- Exercise electro cardiograph

Non- clinical test for cardio respiratory endurance:-

- Resting heart rate (RHR)
- Copper test
- Estimated  $\dot{V}O_2$  max



- Rate at which heart returns to RHR post-cardiovascular Exercise.

## **2.4. Benefits of cardiorespiratory Endurance**

As a person improves their cardiovascular endurance, a number of beneficial adaptations take place in the body including:

- Increased heart size (volume and weight): improves the strength and pumping capacity of the heart.
- Increased blood plasma Volume: Enhances oxygen transport and temperature Regulation during exercise.
- Decrease in Heart Rate: Lower both resting and exercise heart rate, reducing stress on the heart.
- Increase stroke Volume: allows the heart to eject more oxygen-rich blood during each "pump".
- Increase cardiac output: Improves the ability of the heart to pump blood throughout the body. This represents the most significant overall adaptation in cardiovascular function due to improvements in cardiorespiratory endurance.
- Improved oxygen extraction: increases the amount of oxygen tissues are able to extract from circulating blood.
- Better blood flow and distribution: muscle and tissue requires less blood because of improved delivery, extraction and utilization of oxygen. Less blood is needed by the muscles because their ability to deliver, extract and use oxygen increases.

Circuit training on weight or hydraulic machines has been found to be more effective than standard set weight training for caloric consumption during and After exercise and for improving cardiovascular endurance, although it is not as effective as aerobic exercise, such as cycling or bench stepping.

Programs intended to slim the figure/physique should be of the muscular endurance type.

Many men and women are interested in exercise designed decrease girth measurements, high repetition, low -resistance exercise is suitable for this because it usually brings about some strengthening and may decrease body fatness, which in turn, changes body contour, Exercise do not spot-reduce fat but they do speed up metabolism so more calories are burned. However, if weight or fat reduction is desired, aerobic ( Cardiovascular) exercise are best, to increase girth, use strength exercise (Ruth Linases et.al.,2000).

## **2.5. Endurance**

Is the ability to exercise at a steady rate without a rest, for a long of time is dependent on the efficiency and performance of your heart lungs and muscle, low endurance may result in muscle fatigue and poor coordination. To improve your overall endurance you need to exercise vigorously for a period of at least 20 minute three times a week. There is no perfect exercise, but any energetic activity will improve your level of fitness to succeed in your quest for health you must find a sport that you enjoy, otherwise you are unlikely to exercise enough. Your flexibility and your endurance (Stephen carroll et.al, 1993).

Upon investigation in to the sport of wind surfing, very little research has been conducted in to the training requirements of such full sports. Courses are readily available for anyone with an interest. Some even guarantee you to qualify with only an hour of tuition. Notice ably, this increased popular exciting sport is not without its drawbacks. A major hazardous point identified is poor physical conditioning: the body quickly becomes fatigued, which increases the risk of injury, due to lack of training (Rosenbaum et.al., 1999) .

### **2.5.1. Muscular Endurance**

Is the ability to sustain a given level of muscle tension that is to hold a muscle contraction for a long period of time or to contract a muscle over again, muscular endurance Is important for good posture and for injury Prevention it helps people cope with physical demands of everyday life and enhances performance in sport and work like muscular strength, muscular endurance is developed by stressing the muscle with a greater load (weight) than they are used to the degree to which strength or endurance develops depends on the type and amount of stress that is applied (stephncarol;,1995).

Threshold of training and target zone for muscular endurance development. There is a frequency, intensity, and time at which a training effect for muscular Endurance will begin to take place .(threshold). There is also an optimal range, or target zone, where the most effective and efficient improvement will occur, we do not know the exact range, but studies suggest that it has wide limits. The intensity, or resistance (load), is less important than the number of repetitions or the length of time muscle contract (freg welk et.al.,2000).

### **2.5.2. Circuit resistance Training (CRT) is an Effective way to build muscular Endurance and cardio vascular Endurance**

Circuit resistance training consists of the performance of high repetitions of an exercise with low to moderate resistance, progressing from one station to another, performing a different exercise at each station. The stations are usually placed in a circle to facilitate movement. CRT typically employs about 20 to 25 reps against a resistance that is 30 to 40 percent of 1RM for 45 seconds. Fifteen seconds of rest is provided while changing stations approximately for exercise stations are used, and the participant repeats the circuit two or three times (sets). Because of the short rest periods, significant cardiovascular benefits have been reported. In addition to muscular endurance gains (Charles B. Carbin, et al. 2000).

### **2.5.3. Endurance Training**

Muscular endurance is the ability of the muscle to sustain repeated muscle action or a single static action. Endurance training involves low resistance with high repetition that adapts the following physiological changes: increased aerobic enzymes and mitochondria, increased capillaries, improved oxygen intake and fat utilization and more efficient contraction Starkey B.J., (1997) fitness and health 4<sup>th</sup> edition chapter 10 pp 173.

Documented effects on muscular endurance is mainly focused on the muscle fibers. Suggesting the aerobic enzymic improvement may be a stage in the transformation of fast twitch to slow twitch fibers. This was identified in a study conducted by Pettit (1984). On rats and rabbits, but it is not proven if these fiber changes occur in humans. Starkey B.J.(1997). Fitness and health 4<sup>th</sup> edition chapter 8, pp. 142.

Muscular endurance is reliant on muscle glycogen stores. In order to maintain and replenish these stores, in order to maintain and replenish these stores an anti-carbohydrate diet is required. Concept of physical fitness (2000). Muscle fitness, concept 11, pp.179.

## **2.6. Muscular Endurance Test**

Three exercises were selected to assess the endurance of the upper body, lower body, and mid-body muscle groups. The advantage of this test is that it does not require strength training equipment-only a stop watch, a metronome, a bench or gymnasium bleacher 16 1/4 "high", a card

board strip 3V<sub>k</sub> wide by 30, long and partner. A percentile rank is given for each exercise according to the number of repetitions performed. An overall endurance rating can be obtained by totaling the number of points obtained on each exercise. Record the results of this test in activity. Three exercises are conducted on the test; bench jumps, modified dips (men) or modified dips (Women), and bent leg curl-ups or abdominal crunches. All exercise should be conducted with the aid of a partner. The correct procedure for performing each exercise is as follows (Sharon A. Hogey et.al., 2005).

### **2.6.1. Bench-jump**

Using a bench or gymnasium bleacher 16% high, attempt to jump up and down the bench as many times as possible in 1 minute. If you cannot jump the full minute, you may step up and down. A repetition is conducted each time both feet return to the floor.

### **2.6.2. Modified dip**

Men only using bench or gymnasium bleacher, place the hands on the bench with the fingers pointing forward. Have a partner hold your feet in front of you. Bend the hips at approximately 90° (you also may use their study chairs: put your hands on two chairs placed by the sides of your body and place your feet on the third chair in front of you) . lower your body by flexing the elbows until the reach a 90° angle, then return to the starting position. Perform the repetitions to a two-step cadence (down-up) regulated with a metronome set at 56 beats per minute. Perform as many continuous repetitions as possible. Do not count any more repetitions if you fail to follow the metronome cadence.

### **2.6.3. Modified push-up**

Women lie down on the floor (face down), bend the knees (feet up in the air), and place the hands on the floor by the shoulders with the fingers pointing forward. The lower body will be supported at the knees (as opposed to the feet) throughout the test. The chest must touch the floor on each repetitions as with the modified dip exercise, perform the repetitions to a two a step cadence (up down). (Werner W.k. Hoeger et.al. 2005)

Regulated with a metronome set at 56 beats per minute, perform as many continuous repetitions s possible. Do not count any more repetitions. If you fail to follow the metronome cadence.

#### **2.6.4. Bent-leg Curl-up**

Lie down the floor (face up) and bend both at the knees at approximately 100°. The feet should be on the floor, and you must hold them in place yourself throughout the test. Cross the arms in front of the chest, each hand on the opposite shoulder. Now raise the head of the floor, placing the chin against the chest. This is the starting and finishing position for each curl-up.

#### **2.6.5. Abdominal Crunch**

This test is recommended only for individuals who are unable to perform the bent-leg curl-up test because of susceptibility to low-back injury. Exercise from must be carefully monitored during the test. Several authors and researchers have indicated that proper form during this test is extremely difficult to control. Subjects often slide their bodies, bend their elbows, or shrug their shoulders during the test. Such actions facilitate the performance of the test and misrepresent the actual test results. Biomechanical factors also limit the ability to perform this test. Allow a brief practice period of 5 to 10 seconds to familiarize yourself with the cadence. Initiate the up movements with the first beat and the down movement with the next beat. Accomplish one repetitions every two beats of the metronome. Count as many repetitions as you are able to perform following the cadence. You may not count a repetition if the fingertips fail to reach the distant edge of the cardboard (Sharon A. Hoegr et.al. 2009)

### **2.7. Testing procedures**

A sequence of steps in a "decision tree" leading to participating in a fitness program. The first step in the evaluation of CRE is to identify those who might need a physician's clearance prior to talking an exercise test or participating in an exercise program. These procedures include obtaining written in-formed consent. From the potential participant, a review of the person's health history, the administration of selected resting physiological measures, and then the use of sub maximal or maximal, GXTs. The exercise test can be stopped by the subject at any time, and the taster, has the right to terminate any of procedures if the subject displays abnormal response or experience symptoms suggestive of an in appropriate adaptation to the GXT. Depending on the outcome at each of these steps, the person might be admitted to a fitness

program with little or no supervision, or referred for additional tests that might lead to an exercise at program. In which the participants are monitored and supervised. The following sections will explore these steps in more detail (Scott, Powers et al., 1994).

### **2.7.1. Informed Consent**

The person being tested must understand all the procedures involved in the tests. The potential risks and benefits, that their data will be held confidential, and that the tests can be terminated at any time at the person's request this information is stated in writing in a consent form that the potential participant signs before participating in any tests.

### **2.7.2. Review of the Health History**

A health risk appraisal was used to develop an overall profile of health status with regard to a wide variety of factors. The health histories used screen people for GXTs of fitness program can be as simple as the physical activity readiness questionnaires (PAR-Q), or a detailed form such as the PARx which highlights its absolute and relative contraindications for participating in exercise (Edward T. Howley, 1994).

### **2.7.3. Resting physiological measures**

The next step in the screening process requires that physiological measures be taken at rest prior to the GXT. Abnormal values would be a rationale for referral to a medical doctor. Heart rate and blood pressure are always taken prior to a GXT be it a sub maximal fitness test or a diagnostic test taken to maximum. Diagnostic GXTs are always preceded by a resting ECG (3). In addition, blood sample may be taken for analysis of blood lipids and glucose. Abnormal values for HR, BP or the ECG would require medical consultation prior to taking the GXT. In centers that are using the GXT for diagnostic purposes. These abnormal values are expected in the population they serve, and since a physician is present decisions to proceed are made on the spot. However, in fitness centres where non-medical personnel are involved, an abnormal response at rest requires medical referral before testing is conducted (Edward T. Howley et al. 1994).

## 2.8. Principle of Exercise

There are certain basic principle that needed to be followed if a good exercise program is to result. According to V. Hockey (page, 87-189 eight principle are stated as follow

- a) It takes time and effort to develop an adequate level of physical fitness. No. 'Short cut' easy methods exist. If will take three methods of hard work possibly the hardest work of your life before you see significant changes. For this reason the development of physical fitness should be a life time matter. Ideally, and adequate level of physical fitness should be developed early and be maintained throughout life. If exercise is not continued through life, there will be a decrease in the level of physical fitness.
- b) The program should be designed to meet he present need of the "individual much time and energy can be wasted unless certain specific goals are established for a program. These goals should be based on the needs of each individual. Some person needs a much high level of physical fitness than other after an individual has established his specific goals. He must be able to evaluate carefully his progress as he strives to attain his objectives. There is no exercise program that is good for ever one. Each has to be designed to suit the need abilities and goals of each person.
- c) A well-planned program will be directed towards the improvement of each component of physical fitness. It has been emphasized the physically fitness involves strength, flexibility and muscular and cardiovascular endurance body composition. A good exercise program must be directed towards the development of all four components. It has also been stressed that of these five components cardiovascular endurance is the most important health benefit. Therefore the development of this component should occupy position in any exercise program.
- d) The program must be systematic: All also to frequency exercise is perfumed irregularly, with little through give to the reason for specific exercise. Exercise must be organized in to a systematic program designed to meet the basic need of each individual.
- e) Regular participation: in any exercise program is necessary. To achieved specific objectives participation must be on a regular basis. Persons who wait until they find tome to exercise do not exercise very often. If they believe strong enough in the importance of exercise, they will make time available to a regular basis. Exercise should be comes habit and

possible, it should be scheduled at a regular time each day an exercise program can be considered regular when participation occurs at least four times a week.

- f) An over load is the key to a successful program. For significant improvement to take place, all over load is necessary, meaning simply that it is necessary to subject the body to a task slightly beyond it is 'necessary to subject the body to task slightly beyond it is necessary to subject the body to task slightly beyond its normal level. Varies indicate that whether we are concerned with strength, muscular endurance or cardiovascular endurance improvement in function occurs only when the system involved is challenged. Improvements occur when and only when, the work load is greater than that to which the individuals is accustomed. It should be stressed that over load is not the same as over loading, over work involves placing enough stress on the body to stimulate the desired response without resulting in exhaustion.
- g) Progression is an important part of every exercise program. The body will adapt to an increase level of resistance as important takes places. For this reason it is necessary to measure progress and to increase the work load frequently. It should also be emphasized that it is not wise to commence vagarious program if one is accustomed to a sedentary way of life. The program should be moderate at first, and then progression will be incorporated as the body is able to adapt to the increased stress level. Students should not be discouraged by lack of progress at different times during the program. Progress is quickest and most apparent at the start of a program, particularly if the person has been in active prior to the if the start program progress slows as one approaches his maximal potential since the more he progress, the harder it is to keep improving, it is only through increasing the work load that progression will be possible.
- h) A training program will result in specifically of improvement, an exercise program is specific and will result in improvement only in the area or areas that it is designed to develop. For example, a person who lifts weights regularly will develop strength and muscular endurance only. Similarly unless a person includes activities that involves large muscle group and that result in heart rate that exceed 150 beats per minute for extended period of time, he should not expect to experience notable improvement in cardiovascular or endurance. The active that makes up the program will determine the result attained. A person who engages in a bicycle becomes fit for walking, while a person who engages in a



walking becomes a better bicyclist. A person who runs gets in shape for running there is little carry-over from one activity to another.

## **2.9. Exercise Prescription**

Before beginning an aerobic or aerobic exercise program you must be aware of three important principles. Intensity, time/duration and frequency. Intensity refers to the work load, or level of the exercise. Duration/times is the amount of time utilized for each exercise session and frequency is the number of exercise sessions per week. Generally and within limits, the more intensive, the longer and the more frequent the training program, the greater the aerobic and an aerobic benefits Gerry T. Moran and Georg H. Meglynn (1997 p15)

### **2.9.1. Intensity**

As previously mentioned for a training effect to accrue within the cardio respiratory and muscular system the program must consist of activities that procedures' an over load on those systems. For aerobic training, the intensity level should be 70 to 90% of the maximum heart rate reserved be maintained throughout the exercise period. Your desired exercise intensity should be gauged by your age and relative fitness. An exercise pulse rate of 110 to 120 bpm for middle age individuals may be an effective training stimulus where as younger people may have to work at a steady pulse rate of 140 to 160bpm. Be aware that high intensity level of exercise may lead to over training problems.

### **2.9.2. Time/duration/**

According to Garry T. Moran and Georg H. Meglynn (1997 p16). How Long you exercise depends primary on the intensity of exercise and your long range goals. Beginner should exercise for minimum of 15 to 20 minutes for each exercise sessions. As Fitness level Improves, the exercise session can be increased to 30 minutes of experience will improve your cardio respiratory endurance.

### **2.9.3. Frequency**

For general fitness, the American college of sport medicine recommends a frequency of 2-3 days per week for weight training. Allow your muscles won't be able to work at a high enough

intensity to improve their fitness, and soreness and injury are more likely to result. If you enjoy weight training and would like to train more often, try working different muscle groups on alternate days. For example, work your arms and upper body exercise on the third day.

#### **2.9.4. Measuring Exercise Intensity**

There are numerous method for monitoring exercise intensity, most trainers will use one or more of these five methods. According to books (1998 p.99).the most one's are as follows

- Percentage of maximal heart rate (MHR) counting heart beats and using formal based on age related norms to estimate a preferred intensity level.
- Rating perceived exertion (RPE), using the trainers perception of effort measured on a scale.
- Talk test identifying the level of breathlessness, often used in combination with RPE.
- Preferred exertion (PE) a concept where the exercise choose the preferred exertion level, often used in combination with rating perceived exertion (RPE).
- These method are used 1:0 estimate a target heart rate (THR) training heart raterane (THRR)

#### **2.9.5. How Much Physical Activity Is Enough?**

According to curb in Lindsey and walk (2000 P.50) just as there is a correct dosage of medicine for treating an illness, there is a correct dosage of physical activity for promoting health benefits and developing physical fitness. Several important principles of physical activity provides the basis for determining the correct does or amount of physical activity necessary for developing metabolic fitness, and its associated health benefits, it is different from the amount of physical activity necessary for developing health related fitness and other performance benefits. Research findings also show that the amount of activity or exercise necessary for maintain fitness may differ from the amount needed to develop it.

Exercise experts have long emphasized the importance of cardiovascular fitness. Other physical fitness factors, such as muscle strength and flexibility, were mentioned almost as an afterthought. As more was learned about how the body responds to exercise, however, it became obvious that these other factors are vital to health, wellness, and overall quality of life.

Muscles make up more than 40% of your body mass. You depend on them for movement, and, because of their mass, they are the site of a large portion of the energy reactions (metabolism) that take place in your body. Strong, well-developed muscles help you perform daily activities with greater ease, protect you from injury, and enhance your well-being in other ways.

As described in Chapter 2, muscular strength is the ability to generate force during a maximal effort; muscular endurance is the ability to resist fatigue while holding or repeating a muscular contraction. This chapter explains the benefits of strength training (also called resistance training) and describes methods of assessing muscular strength and endurance. It then explains the basics of weight training and provides guidelines for setting\* your own strength training program.

## **BASIC MUSCULYSIOLOGY AND THE EFFECTS OF STRENGTH TRAINING**

Muscles move the body and enable it to exert force because they move the skeleton. When a muscle contracts (shortens), it moves a bone by pulling on the tendon that attaches the muscle to the bone. Muscles consist of individual muscle cells, or **muscle fibers**, connected in bundles (Figure 4.1). A single muscle is made up of many bundles of muscle fibers and is covered by layers of connective tissue that hold the fibers together. Muscle fibers, in turn, are made up of smaller units called **myofibrils**. When your muscles are given the signal to contract, protein filaments (**actin** and **myosin**) within the myofibrils slide across one another, causing the muscle fiber to shorten.

Strength training causes the size of individual muscle fibers to increase by increasing the number of myofibrils. Larger muscle fibers mean a larger and stronger muscle. The development of large muscle fibers is called **hypertrophy**; inactivity causes **atrophy**, the reversal of this process. In some species, muscles can increase in size through a separate process called **hyperplasia**, which involves an increase in the number of muscle fibers rather than the size of muscle fibers. In humans, hyperplasia is not thought to play a significant role in determining muscle size.

Muscle fibers are classified as fast-twitch or slow-twitch fibers according to their strength, speed of contraction, and energy source. **Slow-twitch fibers** are relatively fatigue resistant, but they don't contract as rapidly or strongly as fast-twitch fibers. But principle energy system that fuels slow-twitch fibers is aerobic (oxidative). **Fast-twitch fibers** contract more rapidly and forcefully than slow-twitch fibers but fatigue more quickly. Although oxygen is important in the energy system that fuels fast-twitch fibers, they rely more on anaerobic (nonoxidative) metabolism than do slow-twitch fibers (see Chapter 3 for a discussion of energy systems).

Most muscles contain a mixture of slow-twitch and fast-twitch fibers. The proportion of the types of fibers varies significantly among different muscles and different individuals, and that proportion is largely fixed at birth. The type of fiber that acts depends on the type of work required. Endurance activities like jogging tend to use slow-twitch fibers, whereas strength and **power** activities like sprinting use fast-twitch fibers. Strength training can increase the size and strength of both fast-twitch and slow-twitch fibers, although fast-twitch fibers are preferentially increased.

To exert force, the body recruits one or more motor units to contract. A **motor unit** is made up of a nerve connected to a number of muscle fibers. The number of muscle fibers in a motor unit varies from two to hundreds. When a motor nerve calls on its fibers to contract, all fibers contract to their full capacity. The number of motor units recruited depends on the amount of strength required: When a person picks up a small weight, he or she uses fewer motor units than when picking up a large weight. Strength training improves the body's ability to recruit motor units—a phenomenon called muscle learning—which increases strength even before muscle size increases.

In summary, strength training increases muscle strength because it increases the size of muscle fibers and improves the body's ability to call on motor units to exert force. The physiological changes and benefits that result for strength training are summarized in Table 4.1.

## **BENEFITS OF MUSCULAR STRENGTH AND ENDURANCE**

Enhanced muscular strength and endurance can lead to improvements in the areas of performance, injury prevention, body composition, self-image, lifetime muscle and bone health, and chronic disease prevention.

### **Improved Performance of Physical Activities**

A person with a moderate-to-high level of muscular strength and endurance can perform everyday tasks— such as climbing stairs and carrying books or groceries— with ease. Muscular strength and endurance are also

important in recreational activities: People with poor muscle strength tire more easily and are less effective in activities like hiking, skiing, and playing tennis. Increased strength can enhance your enjoyment of recreational sports by making it possible to achieve high levels of performance and to handle advanced techniques. Strength training also results in modest improvements in maximal oxygen consumption.

### **Injury Prevention**

Increased muscle strength and endurance provides protection against injury because it helps people maintain good posture and appropriate body mechanics when carrying out everyday activities like walking, lifting, and carrying. Good muscle strength and, particularly, endurance in the abdomen, hips, lower back, and legs support the back in proper alignment and help prevent low-back pain, which afflicts more than 85% of all Americans at some time in their lives. (Prevention of low-back pain is discussed in Chapter 5.) Training for muscular strength and endurance also makes the **tendons, ligaments**, and cartilage cells stronger and less susceptible to injury.

### **Improved body Composition**

As Chapter 2 explained, healthy body composition means that the body has a high proportion of fat-free mass (primarily composed of muscle) and a relatively small proportion of fat. Strength training improves body composition by increasing muscle mass, thereby tipping the body composition ratio toward fat-free mass and away from fat. Building muscle mass through strength training also helps with losing fat because metabolic rate is related to muscle mass: The

more muscle mass, the higher the metabolic rate. A high metabolic rate means that a nutritionally sound diet coupled with regular exercise will not lead to an increase in body fat. Strength training can boost resting metabolic rate by 0-15%, depending on how hard you train.

### **Enhance Self-Image and Quality of Life**

Strength training leads to an enhanced self-image by providing stronger, firmer-looking muscles and a toned, healthy-looking body. Men tend to build larger, stronger muscles. Women tend to lose inches, increase strength, and develop greater muscle definition. The larger muscles in men combine with high levels of the hormone **testosterone**, the principal androgen, for a strong tissue-building effect; see the box “Gender Differences in Muscular Strength.” Strength training improves body image in both men and women.

Because strength training involves measurable objectives (pounds lifted, repetitions accomplished), a person can easily recognize improved performance, leading to greater self-confidence and self-esteem. It’s especially satisfying to work on improving one’s personal record. Strength training also improves quality of life by increasing energy, preventing injuries, and making daily activities easier and more enjoyable.

### **Improved Muscle and Bone Health with Aging**

Research has shown that good muscle strength helps people live healthier lives. A lifelong program of regular strength training prevents muscle and nerve degeneration that can compromise the quality of life and increase the risk of hip fractures and other potentially life-threatening injuries. In the general population people begin to lose muscle mass after age 30, a condition called **sarcopenia**. At first they may notice that they can’t play sports as well as they could in high school. After more years of inactivity and strength loss, people may have trouble performing even the simple movements of daily life—getting out of a bathtub, or automobile,. Walking, up a flight of stairs, or. doing yard work. By age 75 about 25% of men and 75% of women can’t lift more than 10 pounds. Although aging contributes to decreased strength, inactivity causes most of the loss. Poor strength makes it much more likely that a person will be injured during everyday activities.

As a person ages, motor nerves can become disconnected from the portion of muscle they control. Muscle physiologists estimate that by age 70, 15% of the motor nerves in most people are no longer connected to muscle tissue. Aging and inactivity also cause muscles to become slower and therefore less able to perform quick, powerful movements. Strength training helps maintain motor nerve connections and the quickness of muscles.

Osteoporosis is common in people over age 55, particularly postmenopausal women. Osteoporosis leads to fractures that can be life-threatening. Hormonal changes from aging account for much of the bone loss that occurs, but lack of bone stress due to inactivity and a poor diet are contributing factors. Strength training can lessen bone loss even if it is taken up later in life, and if practiced regularly, strength training can even build bone mass in postmenopausal women. Increased muscle strength can also help prevent falls, which are a major cause of injury in people with osteoporosis. (Additional strategies for preventing osteoporosis are described in Chapter 8.)

### **Prevention and Management of Chronic Disease**

Strength training helps in the prevention and management of several major chronic diseases. Strength training improves glucose metabolism, an important factor in the prevention of the most common form of diabetes (type 2 diabetes). It also modifies risk factors for cardiovascular disease. Regular strength training is associated with Men are generally stronger than women because they typically have larger bodies overall and a larger proportion of their total body mass is made up of muscle. But when strength is expressed per unit of cross-sectional area of muscle tissue, men are only 1-2% stronger than women in the upper body and about equal to women in the lower body. (Men have a larger proportion of muscle tissue in the upper body, so it's easier for them to build upper-body strength than it is for women.) Individual muscle fibers are larger in men, but the metabolism of cells within those fibers is the same in both sexes.

Two factors that help explain these disparities between the sexes are testosterone levels and the speed of nervous control of muscle. Testosterone is responsible for the development of secondary sex characteristics in males (facial hair, deep voice, and so forth). Testosterone also promotes the growth of muscle tissue in both males and females. Testosterone levels are about 6-10 times higher in men than in women, so men' tend to have larger muscles. Also, because the

male nervous system can activate muscles faster, men tend to have more power.

Some women are concerned that they will develop large muscles from strength training. Because of hormonal differences, most women do not develop big muscles unless they train intensely over many years or take anabolic steroids. Women do gain muscle and improve body composition through strength training, but they don't develop bulky muscles or gain significant amounts of weight: A study of average women who weight trained 2-3 days per week for 8 weeks increased maximal oxygen consumption, decreased diastolic blood pressure, and, in some people, positive changes in blood fat levels (increased HDL cholesterol and decreased LDL cholesterol). Improvements in body composition and glucose metabolism are also beneficial for cardiovascular health. As described earlier, strength training also boosts bone mineral density, helping to prevent osteoporosis and associated bone fractures. Found that the women gained about 1.75 pounds of muscle and lost about 3.5 pounds of fat.

Losing muscle over time is a much greater health concern for women than small gains in muscle weight in response to strength training, especially since any gains in muscle weight are typically more than balanced with loss of fat weight. Both men and women lose muscle mass and power as they age, but because men start out with more muscle when they are young and don't lose power as quickly, older women tend to have greater impairment of muscle function than older men. This may partially account for the higher incidence of life-threatening falls in older women.

The bottom line is that both men and women can increase strength through strength training. Women may not be able to lift as much weight as men, but pound for pound of muscle, they have nearly the same capacity to gain strength as men. The lifetime wellness benefits of strength training are available to everyone. Strength training is particularly beneficial for women because it helps prevent bone and muscle loss with aging and maintains fat-free weight during weight control programs.

*SOURCE: Fahey, T. D. 2004. Weight Training for Men and Women, 5th ed. New York: McGraw-Hill. IDEA. 2001. Fitness Tip—Why Women Need Weight Training (<http://www.ideafit.com/ftwomen.htm>; retrieved October 22, 2002). Krivickas, L. S., et al. 2001. Age and gender-related differences in maximum shortening velocity of skeletal muscle fibers. American Journal of Physical Medicine and Rehabilitation 80:447-455.*



Effort, is usually assessed by measuring the maximum. Amount of weight a person can lift one time. This single maximal movement is referred to as a **repetition maximum (RM)**. You can assess the strength of your major muscle groups by taking the one-repetition -maximum (1 RM) tests for the bench press and the leg press. You can measure 1 RM directly or estimate it by doing multiple repetitions with a submaximal (lighter) weight. Refer to Lab 4.1 for guidelines on taking these tests. Instructions for assessing grip strength using a dynamometer are also included in Lab 4.1. For more accurate results, avoid any strenuous weight training for 48 hours beforehand.

Muscular endurance is the ability of a muscle to exert a submaximal force repeatedly or continuously over time. This ability depends on muscular strength because a certain amount of strength is required for any muscle movement. Muscular endurance is usually assessed by counting the maximum number of **repetitions** of a muscular contraction a person can do (such as in pushups) or the maximum amount of time a person can hold a muscular contraction (such as in the flexed-arm hang).

You can test the muscular endurance of major muscle groups in your body by taking the curl-up test and the push-up test. Refer to Lab 4.2 for complete instructions on taking these assessment tests.

Record your results and your fitness rating from the assessment tests in Labs 4.1 and 4.2. If the results show that improvement is needed, a weight training program will enable you to make rapid gains in muscular strength and endurance.

## **CREATING A SUCCESSFUL STRENGTH TRAINING PROGRAM**

Strength training develops muscular strength and endurance in the same way that endurance exercise develops cardiovascular fitness: When the muscles are stressed by a greater load than they are used to, they adapt and improve their function. The type of adaptation that occurs depends on the type of stress applied. To get the most out of your strength training program, you must design it to achieve maximum fitness benefits with a low risk of injury. Before you begin, seriously consider the type and amount of training that's right for you.

## Static Versus Dynamic Strength Training Exercises

Strength training exercises are generally classified as static or dynamic. Each involves a different way of using and strengthening muscles.

**Static Exercise** Also called **isometric** exercise, **static exercise** involves a muscle contraction without a change in the length of the muscle or the angle in the joint on which the muscle acts. To perform an isometric exercise, a person can use an immovable object like a wall to provide resistance, or just tighten a muscle while remaining still (for example, tightening the abdominal muscles while sitting at a desk). In isometrics, the muscle contracts, but there is no movement. Isometric exercises aren't as widely used as isotonic exercises because they don't develop strength throughout a joint's entire range of motion. However, static exercises are useful in strengthening muscles after an injury or surgery, when movement of the affected joint could delay healing. Isometrics are also used to overcome weak points in "an individual's range of motion. Statically strengthening a muscle at its weakest point will allow more weight to be lifted with that muscle during dynamic exercise. For maximum strength gains, hold the isometric contraction maximally for 6 seconds; do 5-10 repetitions.

**Dynamic Exercise** Also called **isotonic** exercise; **dynamic exercise** involves a muscle contraction with a change in the length of the muscle. Dynamic exercises are the most popular type of exercises for increasing muscle strength and seem to be most valuable for developing strength that can be transferred to other forms of physical activity. They can be performed with weight machines, free weights, or a person's own body weight as in sit-ups or push-ups).

There are two kinds of dynamic muscle contractions: concentric and eccentric. A **concentric muscle contraction** occurs when the muscle applies enough force to overcome resistance and shortens as it contracts'. An **eccentric muscle contraction** (also called a plyometric contraction) occurs when the resistance is greater than the force applied by the muscle and the muscle lengthens as it contracts. For example, in an arm curl, the biceps muscle works concentrically as the weight is raised toward the shoulder and eccentrically as the weight is lowered.

Two of the most common dynamic exercise techniques are constant resistance exercise and variable resistance exercise. Constant resistance exercise uses a constant load (weight) throughout a joint's entire range of motion. Training with free weights is a form of constant resistance exercise. A problem with this technique is that, because of differences in leverage, there are points in a joint's range of motion where the muscle controlling the movement is

stronger and points where it is weaker. The amount of weight a person can lift is limited by the weakest point in the range. In variable resistance exercise, the load is changed to provide maximum load throughout the entire range of motion. This form of exercise uses machines that place more stress on muscles at the end of the range of motion, where a person has better leverage and is capable of exerting more force. The Nautilus pull-over machine is an example of a variable resistance exercise machine. Constant and variable resistance exercises are both extremely effective for building strength and endurance.

Four other kinds of isotonic techniques, used mainly by athletes for training and rehabilitation, are eccentric loading, plyometric, speed loading, and isokinetic.

- **Eccentric (plyometric) loading** involves placing a load on a muscle as it lengthens. The muscle contracts eccentrically in order to control the weight. Eccentric loading is practiced during most types of resistance training. For example, you are performing an eccentric movement as you lower the weight to your chest during a bench press in preparation for the active movement. You can also perform exercises designed specifically to overload muscle eccentrically, a technique called negatives.

- **Plyometric** is the sudden eccentric loading and stretching of muscles followed by a forceful concentric contraction. An example would be the action of the lower-body muscles when jumping from a bench to the ground and then jumping back onto the bench. This type of exercise is used to develop explosive strength; it also helps build and maintain bone density.

- **Speed loading** involves moving a weight as rapidly as possible in an attempt to approach the speeds used in movements like throwing a softball or sprinting. In the bench press, for example, speed loading might involve doing 5 repetitions as fast as possible using a weight that is half the maximum load you can lift. You can gauge your progress by timing how fast you can perform the repetitions.

- **Isokinetic** exercise involves exerting force at a constant speed against an equal force exerted by a special strength training machine. The isokinetic machine provides variable resistance at different points in the joint's range of motion, matching the effort applied by the individual, while keeping the speed of the movement constant. In other words, the force exerted by the individual at any point in the range of motion is resisted by an equal force from the isokinetic machine. Isokinetic exercises are excellent for building strength and endurance, but the equipment is expensive and less commonly available than other kinds of weight machines.

***Comparing the Different Types of Exercise*** Static exercises require no equipment, so they can be done virtually anywhere. They build strength rapidly and are useful for rehabilitating injured joints. On the other hand, they have to be performed at several different angles for each joint to improve strength throughout the joint's entire range of motion. Dynamic exercises can be performed without equipment (calisthenics) or with equipment (weight lifting). They are excellent for building strength and endurance, and they tend to build strength through a joint's full range of motion.

Most people develop muscular strength and endurance using dynamic exercises. Ultimately, the type of exercise a person chooses depends on individual goals, preferences, and access to equipment.

### **Weight Machines Versus Free Weights.**

Your muscles will get stronger if you make them work - against a resistance. Resistance can be provided by free weights, by your own body weight, or by sophisticated exercise machines. Weight machines are preferred by many people because they are safe, convenient, and easy to use. You just set the resistance (usually by placing a pin in the weight stack), sit down at the machine, and start working. Machines make it easy to isolate and work specific muscles. You don't need a **spotter**, someone who stands by to assist when free weights are used, and you don't have to worry about dropping a weight on yourself.

Free weights require more care, balance, and coordination to use, but they strengthen your body in ways that are more adaptable to real life. They are also more popular with athletes for developing explosive strength for sports. Unless you are training seriously for a sport that requires a great deal of strength, training on machines is probably safer, more convenient, and just as effective as training with free weights. However, you can increase strength with either weight machines or free weights. Information listed in the box "Exercise Machines Versus Free Weights" can help you make a decision about which equipment you may prefer.

Don't forget that you don't need a fitness center or expensive equipment to strength train. Resistance can be provided by your own body weight—as in sit-ups, pushups, chair dips, lunges, and so on—or by using such inexpensive home equipment as resistance bands or exercise balls. Examples of strength training programs that can be done at home without equipment can be found on the *Fit and Well* Online Learning Center.

## **Applying the FITT Principle:**

### **Selecting Exercises and Putting Together a Program**

A complete weight training program works all the major muscle groups. It usually takes about 8-10 different exercises to get a complete workout. Use the FITT principle— frequency, intensity, time, and type—to set the parameter of your program.

***Frequency of Exercise*** For general fitness, the American College of Sports Medicine recommends a frequency of 2-3 days per week for weight training. Allow your muscles at least 1 day of rest between workouts; if you train too often, your muscles won't be able to work at high enough intensity to improve their fitness, and soreness and injury are more likely to result. If you enjoy weight training and would like to train more often, working different muscle groups on alternate days—; training plan called a split routine. For example, work your arms and upper body one day, work your lower body the next day, and then return to upper-body exercises on the third day.

### ***Intensity of Exercise: Amount of Resistance***

amount of weight (resistance) you lift in weight training; exercises is equivalent to intensity in cardiorespiratory endurance training. It determines the way your body will adapt to weight training and how quickly these adaptations will occur. Choose weights based on your current level of muscular fitness and your fitness goals. To build strength rapidly, you should lift weights as heavy as 80% of your maximum capacity (1 RM). If you're more interested in building endurance, choose a lighter weight (perhaps 40—60% of 1 RM) and do more repetitions. For example, if your maximum capacity for the leg press is 160 pounds, you might lift 130 pounds to build strength and 80 pounds to build endurance. For a general fitness program to develop both strength and endurance, choose a weight in the middle of this range, perhaps 70% of 1 RM.

Because it can be tedious and time-consuming to continually reassess your maximum capacity for each exercise, you might find it easier to choose a weight based on the number of repetitions of an exercise you can perform with a given resistance.

***Time of Exercise: Repetitions and Sets*** To improve fitness, you must do enough repetitions of each exercise to fatigue your muscles. The number of repetitions needed to cause fatigue depends on the amount of resistance: the heavier the weight, the fewer repetitions to reach fatigue. In general, a heavy weight and a low number of repetitions (1-5) build strength, whereas

a light weight and a high number of repetitions (15-20) build endurance (Figure 4.2). For a general fitness program to build both strength and endurance, try to do about 8-12 repetitions of each exercise; a few exercises, such as abdominal crunches and calf raises, may require more. Choose a weight heavy enough to fatigue your muscles but light enough for you to complete the repetitions with good form To avoid risk of injury, older (approximately 50-60 years of age and above) and more frail people should perform more repetitions (10-15) using a lighter weight.

In weight training, a set refers to a group of repetitions of an exercise followed by a rest period. For developing strength and endurance for general fitness, you can make gains doing a single set of each exercise, provided you use enough resistance to fatigue your muscles. (You should just barely be able to complete the 8-12 repetitions—using good form—for each exercise.) Doing more than 1 set of each exercise will increase strength development, and most serious weight trainers do at least 3 sets of each exercise see the section 'More Advanced Strength Training Programs' for guidelines on more advanced programs'

If you perform more than 1 set of an exercise, you need to rest long enough between sets to allow your muscles to work at a high enough intensity to increase fitness. Fiber length of the rest interval depends on the amount, resistance. In a program to develop a combination of strength and endurance for wellness, a rest period of 1-2 minutes between sets is appropriate; if you are lifting heavier loads to build maximum strength, rest 3-5 minutes between sets. You can save time in your workouts if you alternate sets of different exercises. Each muscle group can rest between sets while you work on other muscles.

Overtraining—doing more exercise than your body can recover from—can occur in response to heavy resistance training. Possible signs of overtraining include lack of progress or decreased performance, chronic fatigue, decreased coordination, and chronic muscle soreness. The best remedy for overtraining is rest:- Add more days of recovery between workouts. With extra rest, chances are you'll be refreshed and ready to train again. Adding variety to your program, discussed later in the chapter, can also help with overtraining from resistance exercise.

**Type or Mode of Exercise** For overall fitness, you need to include exercises for your neck, upper back, shoulders, arms, chest, abdomen, lower back, thighs, buttocks, and calves—about 8-10 exercises in all. If you are also training for a particular sport, include exercises to strengthen the muscles important for optimal performance and the muscles most likely to be injured. A weight-training program for general fitness is presented later in this chapter, on pp. 107-119.

It is important to balance exercises between **agonist** and **antagonist** muscle groups. (When a muscle contracts, it is known as the agonist; the opposing muscle, which must relax and stretch to allow contraction by the agonist, is known as the antagonist.) Whenever you do an exercise that moves a joint in one direction, also select exercise that works the joint in the opposite direction. For example, if you do knee extensions to develop the muscles on the front of your thighs, also do leg curls to develop the antagonistic muscles on the back of your thighs,

The order of exercises can also be important. Do exercise & for Large-muscle groups or for more than one joint before you do exercises that use small-muscle groups or single joints. This allows for more effective overload of the larger, more powerful muscle groups. Small-muscle group fatigue more easily than larger ones, and small-muscle fatigue limits your capacity to overload larger-muscle groups. For example, lateral raises, which work the shoulder muscles, should be performed after bench presses, which work the chest and arms in addition to the shoulders. If you fatigue your shoulder muscles by doing lateral raises first, you won't be able to lift as much weight and effectively fatigue all the key muscle groups used during the bench press. Also, order exercises so that you work agonist and antagonist muscle groups in sequence, one after the other. For example, follow biceps curls, which work the biceps, with triceps extensions, which exercise the triceps—the antagonist muscle to the biceps.

### **The Warm-Up and Cool-Down**

As with cardiorespiratory endurance exercise, you should warm up before every weight training session and cool down afterward. You should do both a general warm-up—several minutes of walking or easy jogging—and a warm-up for the weight training exercises you plan to perform. For example, if you plan to do 1 or more sets of 10 repetitions of bench presses with 125 pounds, you might do 1 set of 10 repetitions with 50 pounds as a warm-up. Do similar warm-up exercises for each exercise in your program.

To cool down after weight training, relax for 5-10 minutes after your workout. Although this is controversial, a few studies have suggested that including a period of post exercise stretching may help prevent muscle soreness;

warmed-up muscles and joints make this a particularly good time to work on flexibility.

**Making Progress** The first few sessions of weight training should be devoted to learning the exercises. You need to learn the movements, and your nervous system needs to **practice** communicating with your muscles so you can develop strength effectively. To start, choose a



weight that **you** can move easily through 8-12 repetitions, and do only 1 set of each exercise. Gradually add weight and (if you want) to sets to your program over the first few weeks until. You are doing 1-3 sets of 8-12 repetitions of each exercise.

As you progress, add weight when you can do more than 12 repetitions of an exercise. If adding weight means you can do only 7 or 8 repetitions, stay with that weight until you can again complete 12 repetitions per set. If you can do only 4-6 repetitions after adding weight, or if you can't maintain good form, you've added too much and should take some off. Knowing how much resistance to add and when to add it is as much an art as a science. You can add more resistance in large muscle exercises, such as squats and bench presses, than you can in smaller muscle exercises, such as curls. For example, when you can complete 12 repetitions of squats with good form, you may be able to add 10-20 pounds of additional resistance; for curls, on the other hand, you might add only 3-5 pounds. As a general guideline, try increases of approximately 5%, half a pound of additional weight for each 10 pounds you are currently lifting.

You can expect to improve rapidly during the first 6-10 weeks of training: a 10-30% increase in the amount of weight lifted. Gains will then come more slowly. Your rate of improvement will depend on how hard you work and how your body responds to resistance training. There will be individual differences in the rate of improvement. Factors such as age, motivation, and heredity will affect your progress.

Your ultimate goal depends on you. After you have achieved the level of strength and muscularity that you want, you can maintain your gains by training 2-3 days per week. You can monitor the progress of your program by recording the amount of resistance and the number of repetitions and sets you perform on a workout card like the one shown in Figure 4.4.

## **CHAPTER THREE**

### **3.1. Research Methodology**

The study is general survey method it's in essence, tries to assess and compare the Cardio respiratory Endurance and Muscular endurance abilities of Gym trainees and None-Gym trainees in Athletics of commercial Bank of Ethiopia

### **3.2. Data Collecting Instruments**

The researcher used the following instrument instruments in order to collect data to Cardio respiratory Endurance.

1. Electronic stopwatches
2. Standard weight measurement
3. Standard height measurement (tape measurement)
4. Whistle to give signal
5. A football filled court (track)

To accomplish the objective of the study, a combination of both primary and secondary data were used. The primary data collecting by Two major methods. These are, questionnaire and physical fitness test, the test is two type i.e. CRE test and muscular endurance test by using 1 mile walk and push up test respectively.

On the other hand, from secondary source of data, books which del with similar topic where the major ones.

### **3.3. Sample size and sampling technique**

A total number of 24 Gym trainees were selected for the study. From both Gym trainees and non-Gym trainees 12 Gym trainees would selected from the two groups of samples equally.

### **3.4. Sampling technique**

The sample is selected by using stratified sampling method, the Gym trainees group into two strata i.e. Gym trainees and non –Gym trainees where bay simple random sampling is used. Stratum one constitute Gymnasium trainees who are a total of 60 Gym trainees. Among these Gym trainees 12 were selected to be sample of the study stratum two constitutes non- Gym trainees . Here, there are a lot of students, from whom 12 students were selected for the sample of the study. Randomly from departments of **IT Human resource development transaction**

## **CHAPTER FOUR**

### **5. Data Analysis and Interpretation**

6.

The data which were gathered from the above mentioned sources of data were presented in a tabular form since this is the simple way. Then after, the data were analyzed and interpreted in light of the general objective of the study and its hypothesis.

**4.1. The participation of Gym trainees and non-Gym trainees in sport activities And their level of performance in physical exercise Table 1**

| no | Item                                                 | Gym trainees |       | Non-Gym trainees |      |
|----|------------------------------------------------------|--------------|-------|------------------|------|
|    |                                                      | NR           | P (%) | NR               | P(%) |
| 1  | Age                                                  |              |       |                  |      |
|    | 20-22                                                | 7            | 58.3  | 6                | 50   |
|    | 23                                                   | 2            | 16.6  | 4                | 33.3 |
|    | 24                                                   | 3            | 25    | 2                | 16.6 |
| 2  | Habit of doing sport                                 |              |       |                  | 58.3 |
|    | Yes                                                  | 11           | 93.6  | 7                | 41.6 |
|    | No                                                   | 1            | 8.3   | 5                |      |
| 3  | Involving in physical activity regularly             |              |       |                  |      |
|    | Yes                                                  | 10           | 3.3   | 4                | 33.3 |
|    | No                                                   | 2            | 16.6  | 8                | 66.6 |
| 4  | Current performance level                            |              |       |                  |      |
|    | V. Good                                              | 2            | 16.6  | 1                | 8.3  |
|    | Good                                                 | 9            | 75    | 3                | 25   |
|    | Average                                              | 1            | 8.3   | 6                | 50   |
|    | Poor                                                 |              |       | 2                | 16.6 |
| 5  | Exercise of program how to perform physical exercise |              |       |                  |      |
|    | Yes                                                  | 9            | 75    | 2                | 16.6 |
|    | no                                                   | 3            | 25    | 10               | 83.3 |

Clues: NR-Means number of respondents

#### P-means percentage

As indicated in the table, the response for item number 1 of table 1 shows that from 12 subjects of Gym Trainees 58.3% (7 of the respondents) are between the ages of 20-22 years old. 16.6% (2 of the respondents) are 23 years old. The rest 25% 13 of the respondents are 24 years old. Comparatively, from the 12 subjects of none-Gym Trainees 50% (6 of the respondents are between the range of 20-22 years old. 33.3% (4 of the respondents) are at the age of 23 years old. the rest of None-Gym Trainees 11.6% /2 of the respondents/ are 24 years old.

Response for item number 2 of table 1 show that 91.6% (11 of the respondents) of the male-Gym Trainees had the habit of doing sport the remaining 8.3% (one respondent) has no habit of doing sport from the 12 non-Gym Trainees 58.3% (7 of the respondents) of non-Gym Trainees have no the habit of doing sport.

The response for item number 3 of table 1 i.e. regularity of involving in physical exercise activity, 83.3% (10 of the respondents) of Gym-Trainees involved in regular physical exercise, while 16.6% (2 of the respondents) didn't involve in regular physical exercise. On the other hand, from the 12 non-Gym-Trainees, 33.3 (4 of the respondents) involve in regular physical exercise. The other, 66.6% (8 of the respondents) of the non-Gym Trainees didn't involve in regular physical exercise.

Responses for item number 4 of table 1 i.e. the current performance abilities of the Trainees show that 83.3% (9 of the respondents) of Gym-Trainees are in a good performance level, and 16.6 (2 respondents of these Trainees) are in a very good performance levels. Only 1 respondent (8.3%) is in a very good performance level. Lastly, unlike in Gym Trainees there is one respondent with poor performance level from the non- Gym Trainees.

Finally, the respondents for item number 5 of table 1 indicate that, 75% (9 respondents) of Gym-Trainees have set a program about their involvement in physical exercise, whereas, 25% (3 respondents) of Gym Trainees revealed that they have no program in performing physical exercise. On the reverse, from the non-Gym-Trainees 83.3% (10 respondents) revealed that they have no programme how to involve in physical exercise. Only, 16.6% ( 2 respondents) of the

non- Gym-Trainees. students revealed that they involved in physical exercise with programme. Therefore, it can be inferred from this data that Gym-Trainees have good performance level in physical exercise than that of None Gym Trainees. Similarly, most the Gym-Trainees have set a program. For involving In physical exercise than the none- Gym-Trainees.

The other information obtained from the open ended Questions include, data of beginning of doing sport, type of sport, the frequency of performing physical exercise, the health condition of the trainees and which is analysed as follow as.

For the 1<sup>st</sup> issue, i.e. data of beginning of doing physical exercise, 33.3% (4 respondents) of Gym-Trainees have begun doing physical exercise 2 years ago, 16.6% (2 respondents) of these respondents began 5 years ago. On the other hand, 25% (3 respondents) of non- Gym-Trainees have begun performing physical exercise 6 months ago, 16.6% (2 respondents! of these Gym-Trainees began 2 years ago.

when the type physical exercise is concerned, both Gym trainees and Non-Gym trainees involve in similar physical exercise i.e. aerobic exercise such as, running, jumping, rape skipping flexibility exercise like knee bent, side stretch, and physical muscular endurance exercise, like, push up, sit up and football and handball.

With regard the frequency of performing the physical exercise, 16.6% (2 Respondents) of the Gym-Trainees perform 3 days per week, and 41.6% (5 respondents) of these trainees perform 2 days per week, whereas 58.3% (7 respondents) of the non- Gym-Trainees involve physical exercise intermittently, and 33.3% (3 respondents) of these trainees perform physical exercise occasionally, on unplanned days.

Finally, with regard to the healthy condition the Gym trainees were found to be in a good health condition. Few respondents of non- Gym-Trainees 25% (3 respondents) have healthy problems like, Gastric, Depression and insomnia. This shows that the involvement of Gym-Trainees in regular physical exercise made them health their than that of non- Gym-Trainees who involve in physical exercise rarely.

## 4.2. Data Analysis from the Two Physical tests (CRE & ME)

**Table 2** Walk test CRE results of Gym trainees and non- Gym-Trainees

| Item         |        | Performance test results $Vo_2$ max milliliter<br>kilometer per minute |       |
|--------------|--------|------------------------------------------------------------------------|-------|
| Gym trainees | score  | None-Gym trainees                                                      |       |
| 1            | 62.275 | 1                                                                      | 56.53 |
| 2            | 68.4   | 2                                                                      | 59.3  |
| 3            | 64.4   | 3                                                                      | 52.32 |
| 4            | 65.75  | 4                                                                      | 52.3  |
| 5            | 56.9   | 5                                                                      | 58.45 |
| 6            | 55.75  | 6                                                                      | 52.35 |
| 7            | 62.5   | 7                                                                      | 55    |
| 8            | 65.525 | 8                                                                      | 56.35 |
| 9            | 63.651 | 9                                                                      | 52.9  |
| 10           | 66.362 | 10                                                                     | 58.8  |
| 11           | 66.32  | 11                                                                     | 56.6  |
| 12           | 66.635 | 12                                                                     | 52.75 |

From table 2, the mean and standard deviation of Gym-Trainees and non Gym-Trainees



from 1 mile walk test is calculated as follows:

The mean for Gym-Trainees

$$(X) \frac{x_1+x_2+\dots+x_n}{N} = \text{where } n \text{ is number of Trainees}$$

$$= \frac{62.275 + 68.4 + 64.4 + 65.75 + 59.9 + 55.75 + 62.5 + 65.525 + 63.651 + 66.362 + 66.32 + 66.635}{12}$$

$$= \frac{702.193}{12} = 58.51608333 = 58.5$$

Standard deviation of Gym-Trainees calculated as:

$$\frac{x_1-(x) + x_n-(x)^2}{n-1} = \text{where } X \text{ is the mean of the Gym-Trainees}$$

$$\text{Then} = \frac{(62.275 - 58.5)^2 + (68.4 - 58.5)^2 + (65.75 - 58.5)^2 + (59.9 - 58.5)^2 + (55.75 - 58.5)^2 + (62.5 - 58.5)^2 + (65.525 - 58.5)^2 + (63.651 - 58.5)^2 + (66.362 - 58.5)^2 + (66.32 - 58.5)^2 + (66.635 - 58.5)^2}{n-1}$$

$$= \frac{14.25 + 98.01 + 34.81 + 52.56 + 25.36 + 2.56 + 7.56 + 16 + 7.02 + 26.53 + 61.81 + 61.15 + 66.17}{11}$$

$$\frac{448.43}{11} = 40.76$$

$$69.35 = 53SD = \sqrt{6.3} = 2.50$$

11

The mean of non- Gym Trainees

$$X = \frac{65.53 + 59.3 + 52.32 + 52.34 + 58.45 + 52.35 + 55 + 56.35 + 52.9 + 58.5 + 56.6 + 52.75 + 58.5 + (66.635 - 58.5)^2}{12}$$

$$= \frac{663.95}{12} = 55.3295 \approx 55.33$$

12

Then, standard deviation =

$$\begin{aligned} & (56-55.33)^2 + (53-55.33)^2 + (52.32-55.33)^2 + (52.3-55.33)^2 + (58.45-55.33)^2 + (52.35-55.33)^2 + (55-55.33)^2 \\ & + (55.35-55.33)^2 + (52.9-55.33)^2 + (56.5-55.33)^2 + (52.75-55.33)^2 \\ & = 1.44 + 15.76 + 9.06 + 9.18 + 9.73 + 8.88 + 0.1 + 1.04 + 5.90 + 1.61 + 6.65 \end{aligned}$$

$$= \frac{69.35}{11} = 6.3045 \approx 6.30$$

11

From this data, it is indicated that the mean and standard deviation of Gym Trainees is greater than that of Non-Gym Trainees from the results of 1 mile walk test. When we compare the Arithmetic mean of Gym trainees and non-Gym Trainees they have scored 58.5 and 55.55 respectively. According to the 2002 revised physical fitness specialist manual of cooper institute for aerobic research, score of V02 max above 56.1 ml/kg/ min is superior and V02 max score between 51.1-56.1ml/kg/ min is excellent. Hence, Gym Trainees have superior score while that non-Gym Trainees is Excellent. Thus, it is possible to conclude that the cardio vascular fitness ability of Gym Trainees is better than the non-Gym Trainees

**Table 3:** ME abilities of Gym Trainees and non- Gym Trainees from the push up test

| Item         | Performance test results |                   |       |
|--------------|--------------------------|-------------------|-------|
| Gym Trainees | Score                    | Non- Gym Trainees |       |
| 1            | 52.5                     | 1                 | 40    |
| 2            | 50.5                     | 2                 | 50    |
| 3            | 59                       | 3                 | 41.5  |
| 4            | 59.5                     | 4                 | 40.52 |
| 5            | 61.5                     | 5                 | 32    |
| 6            | 61                       | 6                 | 42    |
| 7            | 59.5                     | 7                 | 36.5  |
| 8            | 55                       | 8                 | 39    |
| 9            | 61                       | 9                 | 36.5  |
| 10           | 57.5                     | 10                | 49    |
| 11           | 50                       | 11                | 43    |
| 12           | 51.5                     | 12                | 44.5  |

from the table 3, the mean and standard deviation of can be calculated as follows:

Gym-Trainees

$$(X) = \frac{52.5+50.5+59+59.5+61.5+63+59.5+55+61+59.5+50+57.5}{12}$$

12

680

— = 45.36

12

$$\text{Standard deviation} = \frac{(52.5-45.36)^2+(50.5-45.36)^2+(59-45.36)^2+(59.5-45.36)^2+(61.5-45.36)^2+(63-45.36)^2+(59.5-45.36)^2+(55-45.36)^2+(61-45.36)^2+(59.5-45.36)^2+(50-45.36)^2+(57.5-45.36)^2}{(12)-(1)}$$

(12)-(1)

$$\frac{1765.03}{11} = 160.45$$

11

$$SD = \sqrt{160.45} = 12.66$$

The mean of non-Gym Trainees

$$\begin{aligned} (\bar{X}) &= \frac{40.50+41.5+40.52+32+42+36.5+39+36.5+49+43+44.5}{12} \\ &= \frac{494.52}{12} = 41.12 \end{aligned}$$

Standard deviation =

$$\begin{aligned} & \frac{(40-41.25)^2+(50-41.21)^2+(40.52-41.21)^2+(32-41.25)^2+(42-41.25)^2+(36.5-41.21)^2+(39-41.25)^2+(36.5-41.21)^2+(49-41.25)^2+(43-41.21)^2+(44.5-41.21)^2}{12-1} \\ &= \frac{1.46+77.26+0.47+84.82+0.62+22.18+4.88+22.58+60.68+3.2+10.82}{11} \\ &= \frac{288.57}{11} = 26.23 \end{aligned}$$

$$SD = \sqrt{26.23} = 5.12$$

Similar to the 1 mile walk test, the push up test results Gym-Trainees is greater than non-Gym-Trainees Gym- Trainees according to their mean and standard deviation result as slow in the above calculation. Therefore, it can be concluded that ME ability of Gym-Trainees is better than non Gym-Trainees

## Chapter five

### Summary and conclusion

#### **Summary of major findings**

In general, when the major finding of the study is summarized, there is variation between Gym Trainees and non- Gym-Trainees in their physical exercise involvement. For instance, there is a great disparity between Gym trainees and non- Gym-Trainees with regard to the habit of involvement in sport activities. Furthermore, these Gym-Trainees had programmes in performing physical exercise, whereas the non- Gym-Trainees involve in physical exercise occasionally.

Similarly, most of the Gym trainees 83.3% (10 of the respondents) involve in regular physical exercise, whereas only 33.3 % (4 of the respondents) of non- Gym-Trainees in regular physical exercise.

Next, with regard to the number of Gym trainees who didn't involve in regular physical exercise, there are 16.6% (2 respondents) and 66.6% (8 respondents) in Gym trainees and non- Gym-Trainees respectively.

With regard to the current performance levels of the Trainees, most of Gym-Trainees are in a good performance level, whereas half of the non- Gym-Trainees are on average performance level. At the same time Gym-Trainees are in a very good performance level than non- Gym-Trainees i.e. 16.6% and 8.3% respectively. Besides, there is one respondent with poor performance level from the non- Gym-Trainees.

Finally, from 1 mile walk test and push up test, Gym-Trainees are found to have better abilities of CRE and ME than that of non- Gym-Trainees.

## **5. Conclusion and Recommendation**

This chapter deals about the summary of the main body of the research. The major objective of the research was to compare and contrast the cardiorespiratory and muscular endurance fitness of the male Gym-Trainees non-male Gym Trainees of commercial Bank Ethiopia, with particular reference in the Gym-Trainees. The research tries to explain the respiratory endurance and muscular endurance fitness and the factors to develop these endurance abilities. In general, the main outcome of the research is concluded in the following manner.

### **5.1. Conclusion**

Cardio respiratory and muscular endurance are the essential elements of physical fitness for an individual. They are important to lead a healthy life and to work once job Efficiently. In this research the muscular Endurance (ME) and cardio respiratory endurance(CRE) ability of Gym –Trainees Commercial Bank of Ethiopia was examined.

Cardio respiratory endurance is the ability of the body to perform prolonged, large-muscle, dynamic exercise at moderate high levels of intensity. It is a key health-related component of fitness. A healthy cardio respiratory system is essential to high levels of fitness and wellness.

CRE ability depends on such factors as the ability of the lungs to deliver oxygen from the environment, the heart's capacity to pump blood, the ability of the nervous system and blood vessels to regulate blood flow, and the capability of the body's chemical system to use oxygen and process fuels for exercise.

Muscular endurance is the ability to resist fatigue and sustain a given level of muscle tension, or it is the ability of a muscle or group of muscles

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## Appendix I

**Addis Ababa University**  
**Department of sport science**  
**Gym-Trainees and None-Trainees**

### Questionnaire to be filled by Trainees

Introduction: The main Purpose of this questionnaire is to gather information about the cardiovascular and muscular endurance abilities of Gym-trainees and None-Gym Trainees of commercial Bank of Ethiopia.

Direction:

- 1) Encircle the letter for the multiple choice question and write the statement for open ended question.
- 2) No need of writing your name on the questionnaire

Thank you in advance!

1. Sex                      A. Male                                      B. female
2. Age \_\_\_\_\_
3. currently working department  
    A) Gym-Trainees                                      B. None-Gym Trainees                                      C. specify your department
4. Do you have habit to do sport?  
    A) Yes                                      B) No
5. Do you know about the benefit of Sport?  
    A) Yes                                      B) No
6. Do You involve in regular Physical activity?  
    A) Yes                                      B) No

7. If your answer for question No. 6 is yes, for how long, have you been practicing in physical exercise? \_\_\_\_\_
8. How do you rate your current performance?
  - A. Very good
  - B. Good
  - C. Average
  - D. poor
  - E. Very poor
9. On what type of physical exercise do you involve?
10. If your answer for question No.6 is No, what is the reason that obstacles you from doing physical activity? \_\_\_\_\_
11. If you answer for question No.6 is Yes, is your practice programmed?
  - A. Yes
  - B. No
12. If Your answer fore question No. 11, is yes, write your program precisely \_\_\_\_\_
13. Do you have any of the following health problems? (hint, you can circle more than one)
  - A. Hypertension (Blood pressure)
  - B. Diabetes
  - C. Cancer
  - D. Cardiac (Heart problem)
14. For question No. 13, what corrective measures do you take to mitigate the pain those of any one or more of the healthy problems?
15. What Do you advise the people who have one or more of the healthy problems in question No 13?

## Appendix II.

Assessing your current level of cardio respiratory Endurance before talking any of the cardio respiratory endurance assessment testes, refer to the fitness prerequisites and cautions.

The 1-mile walk test

### Equipment

1. A rack of course that provides a measurement of 1 mile
2. A stop watch, clock, or watch with a second hand
- S. A weight scale

### Preparation

Measure your body weight (in pounds) before taking the test body weight.; \_\_\_\_\_  
\_\_\_\_\_ 1 b

### Instruction

- L Warm up before taking the test. Do same walking, easy jogging, or calisthenics and some stretching exercise.
2. Cover the 1-mile course as quickly as possible. Walk at a pace that is brisk but comfortable. You must raise your heart rate above 120 beats per minute (bpm).
3. As soon as you complete the distance, note your time and take your pulse for 10 seconds.

Walking time \_\_\_\_\_ min \_\_\_\_\_ sec.

10 second pulse count \_\_\_\_\_ beats.

4. Cool down after the test by walking slowly for several minutes.

### **Determining Maximal Oxygen Consumption**

1. Convert your 10 seconds pulse count into a value for exercise heart rate by multiplying it by 6.

Exercise heart rate: \_\_\_\_\_ x6 \_\_\_\_\_ 6pm  
10 sec pulse count

2. Convert your walking time from minutes and seconds to a decimal figure. For example, a time of 14 minutes and 45 seconds would be  $14 + (45/60)$ , or 14.75 minute.

Walking time \_\_\_\_\_ min ( \_\_\_\_\_ sec & 60 sec/min) = \_\_\_\_\_ min

3. Insert values for your age, gender, walking time, and exercise heart rate in the following equation, where

W= Your weight (in pounds)

G= Your gender (male= 1; Female =6)

A= Your age (In years)

T= your time to complete the 1 mile course (in minutes)

H= Your Exercise heart rate (in beats per minute)

### **Appendix 3**

Procedure ninety-Degree push-up (Dynamic) steps support the body in a push up position from the toes the hand should be just outside the shoulders, the back and legs straight, and the toes tucked under. Lower the body until the upper arm is parallel to the floor or the elbow is bent at 90 degrees. The rhythm should be approximately one push-up every 3 seconds. Repeat as many times as possible up to 35.

**Declaration**

This thesis my original work and has not been presented in any other university and that all source consulted for the thesis have been properly acknowledged.

Name ESAYAS YALEW

Signature \_\_\_\_\_

Date \_\_\_\_\_

This thesis has been submitted for examination with my consent and approval as a thesis advisor

Name \_\_\_\_\_

Signature\_\_\_\_\_

Date\_\_\_\_\_