

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
DEPARTMENT OF SPORT SCIENCE

**COMPARATIVE ANALYSIS BETWEEN PROJECT PARTICIPANTS
AND NON PARTICIPANTS IN SOME TRAINING QUALITIES OF
FOOTBALL WITH REFERENCE TO KIRKOS SUB-CITY**

BY
FELEKE BERHANU

JUNE, 2015
ADDIS ABABA

**COMPARATIVE ANALYSIS BETWEEN PROJECT PARTICIPANTS
AND NON PARTICIPANTS IN SOME TRAINING QUALITIES OF
FOOTBALL WITH REFERENCE TO KIRKOS SUB-CITY**

BY

FELEKE BERHANU

**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES
OF ADDIS ABABA UNIVERSITY IN THE PARTIAL FULFILMENT
OF THE REQUIREMENT FOR THE DEGREE OF MASTERS OF
SCIENCE IN SPORT SCIENCE**

JUNE, 2015

ADDIS ABABA

ADDIS ABABA UNIVERSITY SCHOOL OF GRADUAT STUDIES
DEPERTMENT OF SPORT SIENCE

**COMPARATIVE ANALYSIS BETWEEN PROJECT PARTICIPANTS AND
NON PARTICIPANTS IN SOME TRINING QUALITIES OF FOOTBALL
WITH REFERENCE TO KIRKOS SUB-CITY**

BY

FELEKE BERHANU

APPROVED BY BOARD OF EXAMINES

**CHAIRMAN, DEPARTMENT OF
GRADUATE COMMITTEE**

SIGNATURE

DATE

ADVISOR

SIGNATURE

DATE

INTERNAL EXAMINER

SIGNATURE

DATE

EXTERNAL EXAMINER

SIGNATURE

DATE

Declaration

I declared that this thesis is my own original work and has not been presented for any degree and that all sources of materials used for the study have been duly acknowledged.

Name Feleke Berhanu

Signature _____

Date: June 2015

This thesis has been submitted for examination with my approval as a university advisor.

Name Bezabih Wolde (Dr)

Signature _____

Date: June 2015

ACKNOWLEDGEMENTS

Thanks are due to a number of people for their assistance and support through this process. But I would like to thank the ALMIGHTY GOD AND HIS MOTHER ST. MERRY who never made me down is my doctor to eliminate my hard pains all of a sudden before I feel hurt.

I would like to thanks my advisor Bezabih Wolde (Dr) for his humble approach and unreserved support in commenting and providing advice on the whole study from the beginning to the end.

My heartfelt thanks also extended to Ato Mesfin Melese head coach of the project and all the project participants and non participants.

I would like thanks Federal sports commission for that they gave me a chance to be enrolled in post graduate study. Special thanks go to Addis Ababa University and sport department for the financial support.

My wife Tsige Asrat, you are so kind and patient. My friends Henok A/mariam,wondwosen abebe,Yohannes Bogale ,Awgichew Fekade and Matiws Tiumelisan; I realize the meaning of true friend by what you did to me. You all are my friends indeed in all my need.

Finally I would like to express my deepest gratitude to my precious mother Bekelech Zewde, whatever happened in my life to the extent of extremes, you have been beside me. I love you and wish you long life. My youngest sister Tesfanesh Berhanu, my big brother Seifu Berhanu I never forget your continuous support and understanding.

Table of Contents

Contents	page
Acknowledgments	i
Tables of contents	ii
List of table"s.....	v
List of figures	vi
List of appendices	vii
Acronyms	viii
Abstract	ix

CHAPTER ONE

1. Introduction	1
1.1. Background of the study	1
1.2. Statement of the Problem.....	2
1.3. Research questions.....	3
1.4. Hypothesis	3
1.5. Research objectives	4
1.5.1. General objectives	4
1.5.2. Specific objectives	4
1.4. Significance of the Study	4
1.5. Delimitation of the Study	5
1.6. Limitation of the Study.....	5
1.7. Definition of terms	6
1.8. Organization of the study	6

CHAPTER TWO

2. Review of Related Literature	8
---------------------------------------	---

2.1. Testing and Evaluation.....	8
2.2. Physical fitness testing.....	10
2.3. Definition of fitness testing.....	10
2.4. Benefits of fitness testing.....	11
2.5. Criteria of fitness testing.....	13
2.6. Speed.....	13
2.6.1. Definition of speed.....	13
2.6.2. Structure of speed.....	15
2.6.3. Acceleration Training.....	16
2.7. Strength.....	16
2.7.1. Definition and structure of strength.....	16
2.7.2. Benefits of strength in soccer.....	19
2.8. Endurance.....	20
2.8.1. Definition and structure of endurance.....	20
2.8.2. Heart rate.....	21
2.8.3. The Importance of Maximal Heart Rate.....	21
2.9. Agility.....	22
2.10. Factors in performance.....	24
2.10.1. Hot Environment.....	24
2.10.2. Cold Environment.....	25
2.10.3. Nutritional factors.....	26
2.10.4. Altitude.....	27
2.10.5. Sleep.....	29
2.11. Balance.....	30
2.12. Coordination.....	31
2.13. VO ₂ max.....	32

CHAPTER THREE

3.1. Methods.....	33
3.2. Research design	33
3.3. Subject.....	33
3.4. General Method	34
3.5. Tests.....	34
3.6. Instruments and Apparatus	44
3.7. Procedures	45
3.8. Testing.....	46

CHAPTER FOUR

4. Analysis and interpretation of data	47
4.1. Results	47
4.2. Discussion of experimental subjects	55
4.3. Discussion of control subjects	56

CHAPTER FIVE

5. Conclusion, Summary and Recommendation.....	57
5.1. Summary	57
5.2. Conclusion	58
5.3. Recommendation.....	59
Bibliography.....	60

List of Tables

	Page
Table 1: normative data for squats test	35
Table 2: normative data for 300 yard shuttle test	37
Table 3: Normative data for home step test	38
Table 4: normative data for zigzag test	40
Table 5: normative data for stand stork test	42
Table 6: normative data for foot-eye coordination test	44
Table 7: Selected variables and their criteria measures	47
Table 8: Mean and standard deviation of experimental group players	47
Table 9: Mean and standard deviation of control group players	48
Table 10: Comparative analysis of strength between Experimental and Control group players	48
Table 11: Comparative analysis of speed between Experimental and Control group players	49
Table 12: Comparative analysis of endurance between Experimental and Control group players	49
Table13: Comparative analysis of agility between Experimental and Control group players	50
Table 14: Comparative analysis of balance between Experimental and Control group players	50
Table15: Comparative analysis of coordination between Experimental and Control group players	51

List of figures

	Page
Figure 1: descriptions of stand stork test	69
Figure 2: descriptions of foot-eye coordination test.....	70
Figure 3: descriptions of squat test.....	71
Figure 4: descriptions of home-step test.....	72
Figure 5: descriptions of zigzag test.....	73
Figure 6: descriptions of 300 yard shuttle test.....	74

List of Appendices

Appendix-A description and figure of each test

Appendix-B personal best result of both sample group tests

Acronyms

ACSM - American College of Sports Medicine

AMS - Acute Mountain Sickness

ATP- adenosine tri phosphate

CSTF - Canadian Standardized Test of Fitness

F.I.T.T - frequency, intensity, type and time

HAI - High Altitude Illness

HR– Heart rate

HRR - Heart rate reserve

Pmax - Maximal power

PO₂ - Pressure of the oxygen

VO₂max - the maximum amount of oxygen in milliliters

Abstract

This study is conducted with ultimate objective of the comparative analysis between project participants and non participants in some training qualities of football: with reference to kirkos sub city

Professionals spend a great deal of time and effort trying to improve athletic performance. Even as coaches evaluate each athlete by using the results of vast battery of test, there has been considerable speculation and discussion about the strength and weakness of experimental and control group players in kirkos sub city. The purpose of this study was to determine the outcome of strength, speed, endurance, agility, balance and coordination scores have on both group participants status.

The research design appropriate for this analysis is both qualitative and quantitative research method to analysis between project participants and non participants in some training qualities of football found in Addis Ababa with reference to kirkos sub city

In kirkos sub-city, there are 11 U-17 youth football projects, each of which have 25 players or a total population were 275 players. Fifty individuals from kirkos sub city, between two months were used in this study. The subjects were grouped in to two groups. The two groups were project participants and non participants with the same sex and the same age.

Each subject participated in a serious of tests conducted by the researcher. Project participants and non participants were compared to each other on six different tests. The tests used in this study consisted of the squat test /strength/, 300 yards shuttle test /speed/, home step test /endurance/, zigzag test /agility/, stand stork test/balance/ and foot-eye coordination /coordination/. The tests were ranked in order of importance by using central tendency and excel 2007 procedure and according to the raw score norms.

The results of the central tendency procedure and the raw score norms showed that project participants were better than non participants in all six tests. But according to the raw score norm project participants score less in two variables i.e. balance and coordination.

Key words: *strength, speed, endurance, agility, balance and coordination*

CHAPTER ONE

INTRODUCTION

1.1. Background of the study

The aim of the present study was to determine the differences in selected basic and complex performance qualities between the project participants and non participants. Best suited activity, performance tests and new training methods achieve excellence.

Evaluating an athlete's performance tests is a very common occurrence for many strength and conditioning professionals. For a couple of decades researchers and coaches have taken test scores and used them to predict the potential of an athlete. In the sport of football everything is measured and evaluated. These evaluations may lead to some position changes in some of the athletes. Testing athletes in physical performance tests is extremely important to the evaluation process of experimental and control group players. Testing athletes may provide the coach with information about the physical attributes of the players.

This information may be used as a predictor of the athlete's playing status. This information may also give the coaches information about the physical conditioning of the players. The information can then be processed in a manner to help make accurate evaluations of the athletes.

The physical attributes of project participants and non participants are measured in a variety of ways by a battery of very different tests designed to assess an athlete's ability to perform a certain skill or function. For example, testing football players provides a way to assess their ability to play the sport of football. "One reason for testing is to assign positions and ranking". All coaches want to be sure they are putting their best athletes in the game (Graham 1994).

In 1994, Arce identified two main objectives for the evaluation of athletes. The first is to determine whether the athlete has strength, power, endurance, agility, balance and coordination to play the game. The second is to evaluate whether the athlete is making gains in his or her training and testing program.

Testing athletes can help a coach determine the potential of a player to play at a certain position. In addition, Professionals need some type of testing protocol to help in the evaluation process of their

athletes. This testing process needs to include all areas of training, such as strength, speed, endurance, agility, balance and coordination and, that might reflect strengths and weaknesses that the athlete may possess. The testing needs to be administered in a safe and effective manner to ensure an accurate evaluation (Ebben, 1998).

Evaluating performance tests of a football player may not only give a coach in-sight regarding an Athlete's playing status and position potential but it also may be used as a way for comparing the fitness status of the experimental and control groups. These findings may give the coaching staff insight to areas that may need more attention. For example, if an athlete tests poorly in speed tests then the coaches could alter the program to help the athlete improve in this area. In addition, comparing the project participants and non participants may yield some interesting data. These data may inform the coach which test or tests may be more accurate.

Thus, Professionals have conducted evaluations of various physical tests for many years. These professionals have obtained much needed information about the performance of their athletes. Now with the same information the strength and conditioning professional can draw conclusions regarding which tests are more accurate in predicting playing status. If these professionals can make these predictions and if they are able to rank these tests in order of importance then we can begin to see comparative result of these tests between project participants and non participants

1.2. Statement of the Problem

As showed in the background section Strength and conditioning professionals spend a lot of time and effort trying to improve athletic performance. Coaches evaluate each athlete by utilizing the results of a number of tests. These tests help the coach to determine the difference between the project participants and non participants. The evaluation of this test will help the coaches decide on which test is best suitable for a particular athlete, while it is not clear as to what extent this testing may influence the coach's decision regarding the comparative analysis between project participants and non participants, it is possible that these testing may become a useful tool to a coach in determining the playing status of an athlete.

There will be considerable speculation and discussion about the test result of the project participants and non participants. Many strength and conditioning coaches test their athletes and make evaluations based on their performance on the tests.

The researcher evaluates many football projects in the research area and had about six years of experience as a sport officer but the trainees all in Kirkos sub-city are not go through testing process.

The problem, therefore, lies in the basic and complex performance qualities between project participants and non participants to determine which tests are important indicators of strengths and weaknesses of the player. One important area of inquiry is to evaluate strength, speed, endurance, agility, balance and coordination tests between project participants and non participants testing in order to determine whether project participants score is significant difference on basic and complex performance tests compared to non participants.

1.3. Research Questions

1. Is project training effective in selected parameters?
2. Is there significant difference between project participants and non participants?

1.4. HYPOTHESES

- The project participants would be more efficient than non participants in strength test.
- The project participants would be more efficient than non participants in speed test.
- The project participants would be more efficient than non participants in endurance test.
- The project participants would be more efficient than non participants in agility test.
- The project participants would be more efficient than non participants in balance test.
- The project participants would be more efficient than non participants in coordination test.

1.5. Objectives of the study

1.5.1. General objectives

The general objectives of this study are to identify and compare the basic and complex performance qualities between project participants and non participants in some training qualities.

1.5.2. Specific objectives

- To identify the outcomes of the training and test results for compare the project participant's and non participant's performance.
- To measure the basic and complex performance qualities.

1.6. Significance of the Study

The purpose of this study will to compare the change in the results of six /basic and complex/performance tests between project participants and non participants and also it benefits the beginners who can improve their fitness and help the professionals to develop programs that may be more sport specific for certain positions or position groups. In addition to find out which of these two categories is more physically fit in response to tests administered so as one can improve the standard and level of physical fitness in project participants and non participants. This comparative analysis between project participants and non participants testing may yield valuable information for the strength and conditioning professionals. This study is designed to result of tests in order of importance that will compare project participants from non participants. The results of tests may produce interesting information that may lead to a re-structuring of program design among much strength and conditioning programs.

Designing suitable testing program and procedures is needed in recurring and producing potential youth project. Such kinds of testing may be useful for the success of the projects in pursuing training program and their success of their performance latter. Hence, it is essential to test the project participants and non participants.

In general, this will help the researcher to:

Evaluation of a performer's strengths and weaknesses, relative to the demands of their sport, Aiding the prescription of suitable training loads, Monitoring the effectiveness of training, Providing

short-term fitness goals and Initiate concerned and interested researchers in the area to expand findings and to come up with new ideas and suggestions that can be contribute to the betterment of the testing in particular and its contribution to compare both groups in general. In this regard the study can play an important role in the provision of data and differentiating the strong as well as the weak side of the project participants and non participants performance qualities.

1.7. Delimitation of the study

The present study was delimited on the following aspects such as:

1. The training program for testing was used in this study was limited to twice a weekly for eight weeks.
2. The subject in this study was consisting of project participants and non participants of 25 players each.
3. The physical fitness components basic performance qualities i.e. - strength, endurance and speed and complex performance qualities i.e. - balance, agility, and coordination was considered for the present study.
4. This study had been delimited only to the issue of the comparative analysis of project participants and non participants, but nutritional factors, sleep, altitude, hot and cold environment were not considered.

1.8. Limitation of the study

The availability of reliable data for any research is an important input for success and achievement of the final outcome of the research work. Any study undertaken for the first time depends to a large extent on previous knowledge, the availability of up-to-date and pertinent research materials, journal articles and other essential devises. The availability of information dealing with these things would help to facilitate and strengthen the study under consideration.

- Inadequacy of available relevant research materials is one of the limitations encountered in this study.
- The scarcity of sufficient books and literature in the area of study was the major short coming that the researcher encountered during the execution of the study.
- Absence of subjects during exercise and testing also one of the limitations

1.9. Operational Definition of Term

- **Strength** - the extent to which muscles can exert force by contracting against resistance (e.g. holding or restraining an object or person)
- **Agility** - the ability to perform a series of explosive power movements in rapid succession in opposing directions (e.g. Zigzag running or cutting movements)
- **Balance** - the ability to control the body's position, either stationary (e.g. a handstand) or while moving (e.g. a gymnastics stunt)
- **Muscle Endurance** - a single muscle's ability to perform sustained work (e.g. rowing or cycling)
- **Co-ordination**- the ability to integrate the above listed components so that effective movements are achieved.
- **Speed**- is the quickness of movement of a limb, whether this is the legs of a runner or the arm of the shot putter.
- **VO2 Max** – Maximal rate of oxygen consumption during exercise. Typically accepted as a measure of overall health and fitness.

1.10. Organization of the Study

This thesis has five chapters. The first chapter deals with background of the study, purpose of the study, statement of the problem, significance of the study, delimitation of the study, research objectives, research questions, limitation of the study, and definition of some key terms and concepts. Chapter two deals with review of related literature, Chapter three comprises methods and procedures of the study. While chapter four deals with data analysis and interpretation of findings and discussion. Eventually, chapter five provides summery conclusion and recommendation made on the bases of the data analyzed.

Ethical issue

In this study 25 of players or project participant, the coaches and 25 non participants in the same sex and age for comparison was consult by their own language without any subjective situation for the fitness tests.

CHAPTER TWO

REVIEW OF RELATED LITRATURE

This chapter discusses about, Testing and Evaluation, Physical fitness testing, Definition of fitness testing, Benefits of fitness testing, Criteria of fitness testing, Speed, Definition of speed, Structure of speed, Acceleration Training, Strength, Definition and structure of strength, Benefits of strength in soccer, Endurance, Definition and structure of endurance, heart rate, the importance of maximal heart rate, Agility, Balance, Types of balance, Balance and age, Coordination, Factors in performance, Hot Environment, Cold Environment, Nutritional factors, Altitude Sleep and VO₂ max.

2.1. Testing and Evaluation

When the first year athletes begin the program they are tested, on strength, power, and speed, so the strength and conditioning coaches can evaluate the athlete's fitness levels. The testing and evaluation process of athletes has two main objectives. The first objective is to identify the possibility of any pre-existing physical conditions that might hinder the athlete's performance. This might range from pre-existing injuries to lower than average scores on strength, power, and speed tests. Low strength, power, and speed test scores may show weaknesses in specific areas. The identification of inadequacies in some of these tests could give the strength and conditioning coach the ability to design a program to help the athlete in these specific areas (Arce, 1994).

The second objective is to measure the athlete's sport-specific skills. This measurement will produce information about the level of preparation the athlete has achieved. This information might also render information about the position or positions that might be most suited for the athlete. Once these two objectives are met then the strength and conditioning coach can begin the process of tailoring the program for the athletes (Ibid).

The athletes are evaluated at the beginning to determine their fitness level. The strength and conditioning coach has the responsibility of assessing the level of fitness for every athlete. Once this has been attained then the strength and conditioning coach must be able to coach athletes at different fitness levels. A university's strength and conditioning program can be evaluated on its ability to accommodate all levels of athletes at the same time. There could be athletes that have participated in structured strength programs and also some athletes that have never resistance trained a day in their lives. The goal is to be able to have a program that can accommodate both types of athletes. "It is

important to understand that in training football players, the „pre-training“ status of the players will affect the amount of development that can be expected with just short-term training. Thus mistakes in exercise prescription can lead to little or no changes. Individualized and periodized training is vital for development” (Kraemer & Gotshalk , 2000, p. 803).

Most strength and conditioning programs test their athletes for the purpose of monitoring the progress of their athletes. This testing enables the strength and conditioning coaches to evaluate their athletes and their program. The testing process needs to be an integral part of the strength and conditioning program. This process should be in direct concurrence with the design of the program. The evaluation of athletes should not be conducted in a manner in which, the process does not follow the design of the program. This should work together within the training program at the appropriate times to produce the most accurate results Gambetta, (1998).

The testing of athletes needs to be sport-specific. This will enable the coaches or the investigators to evaluate these tests under the assumption that they are valid quantifiers since they are sport-specific. The strength and conditioning coach needs to understand the athlete’s sport. The tests that are chosen by the strength and conditioning coach need to fit the parameter of the sport for optimal evaluation. “When selecting tests, the strength and conditioning professional should analyze the energy system demands of the sport the athlete is being measured for. For example, while a 1.5 mile run is an excellent field test for measuring cardio respiratory endurance in sports requiring a lot of energy from the oxidative energy system, it is not an appropriate test for football, which primarily on the ATP-PC energy system. A more appropriate running test for football would be a short-distance sprint such as a 40-yard dash” (Graham, 1994, p. 9). Sport-specific training is crucial to the success of every strength and conditioning program. Sport-specific programs create training that is designed to mimic movements that the athletes perform in competition. The idea, therefore, is to make these movements stronger, faster, and more powerful Foss & Keteyian, (1998). “According to the principle of specificity, conditioning programs must approximate the mechanical and movement speed requirements of the sport. Test items should assess the physical characteristics it takes to succeed in a specific sport and the adaptations that occur in response to the prescribed conditioning program” (Ebben , 1998, p. 42).

During testing, the strength and conditioning staff wants to ensure that the tests being used on the athlete reflect the sports physical demands on the athlete. This is a major concept when discussing the testing of athletes.

Many coaches will evaluate athletes on tests that do not reflect the sports energy system demands. The tests being administered have to be able to evaluate not only the athlete but also the sport in which the athlete participates in, in this case football. Tests that represent the sports energy system are a must.

2.2. Physical fitness testing

Physical fitness testing for field team sports players is a very important part of research and development within a particular sport. It allows investigators to establish norms and thus make objective comparisons between players in different ages, genders, and level of leagues from other countries. Such information about fitness demands can be obtained by using fitness tests that evaluate physical performance capacity. Performance is an assessment of how well a task is executed and the success of a training program is largely dependent upon satisfying the performance aims associated with it (Arce, 1994).

The researcher want to make the players familiar will certain fitness test to enable them to be one step ahead when playing at possibly a higher level of competition later on in their careers.

2.3. Definition of fitness testing

A physical fitness test is a test designed to measure physical speed, strength, agility and endurance. Reiman & Manske, (2009) have defined a testing as using a set of problems to assess abilities. Therefore, performance testing means using a set or tool of tests to determine performance abilities or functional limitations. A functional limitation is the inability to perform a particular activity at a normal level.

In addition, Coulson & Archer, (2009) have defined testing as a statement about the quality or value of what has been measured and thus involves the tester making a decision, so interpreting a score for each player. This mean, it is first necessary to define the intent of baseline testing and then develop a practical model for application

2.4. Benefits of fitness testing

It is important to optimize and develop player performance and this process to assess a player performance requires a determination of requirements and the continuous determination of physical performance using appropriate methods and procedures. The aim is to assess the performance achieved as quickly as the players.

Performance tests for sport players can be designed to cover the physical fitness components, technical and tactical of the game. Fitness testing is used throughout players to document, assess and predict sports performance Bangsbo, (2003).

It is important that the players and coaches obtain objective information about the player's physical fitness characteristics to clarify the objectives of training. A successful training program for these players is one that will maximize all of the required skill and fitness components of the game. An essential part to any training program is fitness performance testing, which can help identify weaknesses, monitor progress, provide feedback, educate coaches and players, and predict performance potential Bangsbo, 2003; Carling et al., (2009).

Fitness tests are the only effective and objective way to evaluate a training program. The use of post testing data permits accurate evaluation of many qualities. A coach will be able to see progress since the player's previous tests or compare data with a previous group of players of the same age, position, or experience (Bisanz & Gerisch, 2008a; Schmid & Alejo, 2002). The particular test mode and outcome measures chosen must therefore be selected carefully in order to meet the objective of monitoring the effectiveness of player's physical preparation Cronin & Hansen, (2005).

Physical fitness characteristics of player in top sports depends on the players technical, tactical and physiological characteristics. These components are closely linked to each other. In sports such as soccer and rugby union, players perform different types of exercise ranging from standing still to maximal running with varying intensity. Therefore, Competitive naturally provides the best test for players, but it is difficult to isolate the various components within the sport and get objective measures of sport performance without performance testing for all players. Fitness testing can provide relevant information about specific parts of a sport Bangsbo, Mohr, Poulsen, et al., (2006).

There are many reasons for performance testing and evaluating training processes. (Bangsbo, 2003; Carling, et al., 2009; Dick, 2007; Ebben, 1998; Gamble, 2010; Reiman & Manske, 2009; Reinhold, 2008; Sayers et al., 2008; Thiess & Schnabel, 1995) demonstrated the next reasons for performance tests, which all field team sports as soccer and rugby players and coaches need it to be successes in their sport:

to assess the current physical state of the players, to study the effect of a training program, to motivate players to train harder, to give players objective feedback, to make players more aware of the objectives of the training, to evaluate whether a players are ready to play a competitive matches, to plan short and long term training programs, to determining players positions placement and ranking them, to establish homogeneous groupings for training and place players in small sides training, to establish the physical characteristics demanded of a given sport, to identify a relationship between individual performance capacities and demands of competition, to monitor progress during rehabilitation or determine whether an athlete is ready to compete and monitor his health status, to examine the development of performance from year to year, to enable future performance to be predicted, and to provide data for scientific research on the limitations of performance.

Fitness tests results provide baseline scores on various measures of player's ability, so that realistic goals can be set and degree of improvement quantified. The following points should be considered when establishing aims for the player:

The coach must be aware of the basic physical abilities required for performance at the competitive level of the team and how can make training for this, the coach must have enough knowledge about exercise science to have a good idea of what a training program can achieve for each individual on the team and also designed for every time in season, the coach should encourage players to internalize the goals to promote the physical, mental, and emotional commitment necessary to work toward the goals, players should keep one or more copies of the goals in places where they will be seen daily, and players should make their goals known to their training partners so they can work together and motivate each other to achieve their goals Baechle & Earle, (2008).

Physical fitness tests will be useful if it is repeated at regular intervals and same procedures. In this way can progress be monitored or issues affecting performance be identified. Therefore, the

accurately physical fitness tests must be selected tests that are valid, reliable and objective. From this background, it is necessary to present and understand the scientific criteria of measurement methods.

Here the researcher idea that conducting tests on a regular basis provides feedback on the effectiveness of the relevant program and enables coaches to monitor an athlete's progress.

2.5. Criteria of fitness testing

There is a need for a review of quality criteria and the feasibility of physical fitness characteristics tests in field team sports. (Baechle & Earle, 2008; Dick, 2007) demonstrated that the fitness testing procedure must be *objective* (consistency of result), *reliable* (consistency of reproduction) and *valid* (testing what it purports to test). These three characteristics are the key factors in evaluating test quality and must be present for the test to be beneficial.

2.6. Speed

Speed and agility are necessary abilities, which can affect performance in a variety of sports. These abilities are related and depend on the player's muscular strength. Integrating speed and agility training into the training plan and changing specific training variables can optimize sport performance capacity. Therefore, understanding factors and variables, which affect speed and agility enables the coaches to develop sport specific training plans and programs that maximize sport performance (Bompa & Haff 2009).

From the researcher points of view to developing speed, participants employ the following methods: Method of repetition of movements with maximum reaction, Method of reaction to an unexpected impulse and Method of repetition of movements in simple situations.

2.6.1. Definition of speed

Speed is the rate of motion or the rate of change of position. It is expressed as distance moved (d) per unit of time (t). Thus $s=d/t$. This definition is not enough to describe the complex concept of speed.

In sport generally speed defined as an ability to move as fast as possible over a specific distance. Speed is the displacement per unit time and is typically quantified as the time taken to cover a fixed

distance (Baechle & Earle 2008). Bompa & Haff (2009); Dick (2007) have defined speed in training theory as the capacity of moving a part of body or the whole body to cover distance with the greatest possible velocity.

In context of competition, Bompa & Claro, (2009) defined speed as the capacity to move quickly as fast as possible in the field according to the game conditions and placement of the opposing players, and described that the term of speed includes three element components: reaction time, stride frequency per second and the speed to cover a given distance. Thus the ability to be quick and react is important elements of speed that are needed for every player in the game.

On the other hand Steinhöfer (2003) defined speed, as a conditional coordinate that determined performance requirement to respond stimulations or signals in the shortest possible time, and / or cyclic or acyclic movements at low resistance that performed at the highest possible speed.

There are many references that defined the concept of „speed” from different view/points. In many cases, the term of speed in references has been defined as the ability to sprint. In context of athletics Clark et al., (2010) defined speed as the “rate of performance” of an activity, which can refer to any movement or action and especially for sprinter. Acyclic and cyclic could be described as forms of speed, which are characteristic of a large number of field team sports such as soccer and rugby union, but this description isn’t enough as a clear definition of both speed forms.

Therefore, Schnabel et al., (2003) have described the difference between cyclic and acyclic movements. In their view, these term in relation to speed indicates that,

„Acyclic and cyclic movement activities to be obtained, requires high values of speed, as well as reaction processes that occur in the shortest time

(E.g. Sprinting, running with fast turning, quick jump or push off and respond to a technical-tactical task quickly and to solve them quickly)“.

Clark, et al., (2010) agrees to his definition in relation to speed, in sports and that is a conclusion of reactive ability, rapid force development, rapid force application and effective movement technique. Generally, when the force demands of an activity increase, the velocity output of the movement decreases. According to the review of references of Bompa & Haff, (2009); Clark, et al., (2010); Schnabel, et al., (2003) who defined the speed of different standard points in theoretical and practical

sport training. Structure of important speed activities during field team sports in current study will be discussed in the next section.

2.6.2. Structure of speed

Speed of movement is important to sports performance and in many sports such as soccer and rugby union, is the basis for player selection and successes in competitions. Thus, sports performance may depend more on the players to accelerate quickly and change their direction in game situations than to maintain speed over a longer distance. While sprint speed in a straight line (linear sprint) and agility (non linear) or change of direction sprint are related, they are clearly different skills and every each of them depends on many factors.

Little & Williams, (2005) have described the high speed actions during competition, they stated that high speed action can be categorized into actions requiring acceleration, maximal speed, or agility. Acceleration is the rate of change in velocity that allows a player to reach maximum velocity in a minimum amount of time. Maximum speed is the maximal velocity at which a player can sprint. Agility is often recognized as the ability to change direction and start and stop quickly.

Therefore, acceleration, deceleration and change of direction movements are important specific qualities in field games. Due to the variable nature of match play and high speed movements activities, may be initiated from a variety of starting positions. Multidirectional acceleration from both standing and moving starts must therefore be provided for in sport specific agility and speed training design. In this view, speed and agility in field team sports such as soccer and rugby union occurs in response to game situations (Young et al., 2001).

From this viewpoint, practice related strategies that are specific to the sport have application in speed and agility training. According to Little & Williams, (2005); Schnabel, et al., (2003); Young, et al., (2001) who explained the speed movements categories as running in linear and non-linear sprint. The understanding of multidirectional speed and agility movements are important and useful in field team sports in current study.

2.6.3. Acceleration Training

Murray (2005) looked at weighted sledge training and their effect on sprint acceleration and they concluded that training with a weighted sledge will help improve the athlete's acceleration phase. The session used in the research was 4 x 20m and 4 x 50m maximal effort runs.

Lockie et al. (2003) investigated the effects of various loadings and concluded that when using a sledge a light weight of approx. 10-15% of body weight should be used so that the dynamics of the acceleration technique are not negatively affected.

Starts over 10-20 meters performed on a slight incline of around five degrees have an important conditioning effect on the calf, thigh and hip muscles (they have to work harder because of the incline to produce movement) that will improve sprint acceleration.

2.7. Strength

The requirement for a particular strength quality for a team sports player will depend on the typical demands placed upon them during competition and also the nature of these sports (Gamble, 2010). Muscular strength is generally acknowledged as being an important factor in sports that are dominated by speed such as soccer and rugby union, which relates with a large endurance component. Given the importance of muscular strength in so many sports, the coach and player must understand how the development of strength can affect sport performance and need to understand the principles associated with resistance training to effectively use resistance training to enhance performance (Bompa & Haff, 2009).

2.7.1. Definition and structure of strength

The term strength will be employed to identify the maximal force or torque that can be developed by the muscles performing a particular joint movement (e.g. elbow flexion, knee extension). However, the muscles may perform at maximal effort as either isometric, concentric or eccentric actions and the two dynamic actions may be performed at a wide range of velocities (Komi, 2003).

Therefore, strength is not the result of a measurement performed under a single set of conditions because of the number of variables or conditions involved strength of a muscle or muscle group,

strength must be defined as the maximal force a muscle or muscle group that can generate at a specified or determined velocity. Also strength is the ability to develop force against an unyielding resistance in a single contraction of unlimited duration (Maud & Foster, 2006).

Strength is the maximal force produced by a muscle or muscles at a given speed. Power is the product of force (strength) and velocity (speed) (Hamill & Knutzen, 2009). The parameter that describes a force being applied over a given distance (work performed) in a given time is power. For the purpose of this, power will be defined as force x distance/time (also work/time) and maximal power (P_{max}) will be defined as the highest average power output during the concentric phase of a muscular contraction (Baker, 2001).

Some definitions of strength are as follows, (Baechle & Earle, 2008) has defined strength as “Strength is the maximal force that a muscle or muscle group can generate at a specified velocity” and (Bompa & Haff, 2009) as a maximal force or torque (rotational force) a muscle or muscle group that can be generated.

(Dick, 2007; Weineck, 2004) divided strength into four types:

- Maximal strength
- Speed strength
- Reactive strength
- Endurance strength

Maximal strength is the highest level of force that can possibly generated of a player. Its importance will vary between sports but this relates more to the length of the maximal strength training phase than whether it should be included or not. The greater a players maximal strength to begin with, the more of it can be converted into sport-specific strength endurance or explosive power (Bompa & Haff, 2009). As same as has (Dick, 2007) defined maximum strength as the greatest force that the neuromuscular system is capable of applying in a single maximum voluntary contraction.

Speed strength ability defined by (Weineck, 2004) as a component of the explosive power and results from the slope values of a force-time curve. From the three components maximum power, speed and explosive force, the speed strength ability will be formed in muscle contractions. (Martin,

1999) refers that speed strength, is the ability to quickly make optimal force. The rapid force is composed as a complex property of the component strength and speed.

Reactive strength concerns the coupling of eccentric and concentric muscle actions, and as such comprises both eccentric and concentric speed strength qualities, also in addition to stretch shortening cycle components (Gamble, 2010). Reactive strength defined by (Bompa & Haff, 2009) as the ability to change quickly from an eccentric to a concentric contraction.

Endurance strength is dependent on the components of strength and endurance and can be defined as the maximum force dependent on the fatigue resistance to extended repetitive stress under static or dynamic muscle work (Dick, 2007). The application of endurance strength is the ability to counter the fatigue produced by the strength load components of an activity over a prolonged period of time (Bompa & Haff, 2009).

Maximum strength is the principle component for field team sports such soccer and rugby union. Player's body weight and the performance activities in game are closely correlated together. (Dick, 2007) demonstrated the difference between absolute and relative strength and suggested that, heavy players can in absolute terms achieve greater strength expression than lighter players. The maximum force that player can express, regardless of body weight, is therefore referred to as absolute strength. On other hand, the maximum force that player can express in relation to body weight is known as relative strength.

Hoff (2005) stated that strength testing should take place for the upper and lower body and should be evaluated using a 1 RM test of half squat and bench press. This gives an indication of the greatest amount of weight an individual can lift for each exercise, and also provides information on the athletes training loads calculated as a percentage of the 1 RM.

Therefore, the understanding of strength importance for field team players such as soccer and rugby union could give coaches overview about strength training intensity. Thus, the next part demonstrates the benefits of strength as an important factor for soccer and rugby union.

2.7.2. Benefits of strength in soccer

Muscular strength takes many forms in soccer. Players need the muscular strength in various activities during soccer matches such as starts, stops, sprint, jumps, dribbling, kick the ball, head ball

and tackling. In particular, the muscles strength of the trunk is necessary because it is required during the tackling with the ball (Bisanz & Gerisch, 2008b).

Soccer is a strength related sport and therefore requires both absolute strength (e.g. for kicking and body contact with opponents) and relative strength (e.g. running and jumping). Thus it would appear that muscular strength is a very important component of physical performance in soccer, in terms of both high-level performance and injury occurrence (Stolen, et al., 2005). Moreover, power is heavily dependent on maximal strength, with an increase in the latter being connected with an improvement in power capabilities (Wisloff, et al., 2004).

Reilly & Williams, (2003) stated that the benefits of strength training in soccer players were three aspects:

To increase muscle power output during explosive activities such as tackling, jumping, kicking and accelerating, to prevent injuries, and to regain strength post injury.

Reilly, (1996) stated that upper body strength is employed during throwing and it is proved that upper body strength helped in preventing being knocked off the ball. In addition, lower body muscular strength important fitness elements for speed, jump, kick, tackle and turning.

Bangsbo, (2003) suggested that the explosive strength of the leg muscles is related to speed in soccer game, when player needs to be able to quickly change direction. This may be explained why soccer players seem to have comparative advantages when they came to contact on the field.

Thus, high levels of maximal strength in upper and lower body are important for soccer players. This is in accordance with previous studies and emphasizes that muscular force and power and thus vertical jumping ability is a crucial part of game play and thus vital to a player's successful performance especially for defensive players Reilly & Williams, (2003); Stolen, et al., (2005).

In developing the strength of soccer players, the following methods are suggested by the researcher: Methods of maximum exertion for short period and Exhaustion method of specialized sport performance.

2.8. Endurance

Endurance as a high level of aerobic fitness characteristics in field team sports helps to maintain the work rates related with team play, supporting team matches, running off the ball and chasing opponent players from other team to get back possession (Carling, et al., 2009).

Physical fitness characteristics in field team sports as strength and power, which related strongly to game activities that involves acceleration, sprinting and jumping share importance with endurance in explaining differences in physical fitness characteristics within soccer and rugby players performance. Therefore, the understanding of aerobic endurance as an important factor in field team sport matches will be demonstrates in this study. In this section in thesis, it will be presented the important aerobic endurance factors study as $\dot{V}O_{2max}$ and match covered distance in soccer and rugby players.

2.8.1. Definition and structure of endurance

In general, aerobic endurance is the amount of oxygen intake during exercise. This definition isn't enough to define aerobic endurance exactly. (Bompa & Haff, 2009) suggested that endurance could be classified as several ways such as aerobic endurance, low intensity exercise endurance or define as the ability that allow a player to perform activities continually for a long duration.

Endurance is directly or indirectly of high importance in all sports. It is however not easy to define endurance, but there is agreement regarding the following aspects endurance: it related to doing work for a long time of period, it relates to working under fatigue conditions, it involves a large number of muscles and it involves work efficiency. (Heyward, 2006) defines endurance as “the ability of the heart, lungs, and circulatory system to supply oxygen and nutrients to working muscles efficiently”.

Schnabel, et al., (2003); Thiess & Schnabel, (1995) also defines endurance as the resistance ability to fatigue, (Shephard & Astrand, 2000) have also used to the concept of ability to resist fatigue for defining endurance as “the ability to do sports movements, with the desired quality and speed, under conditions of fatigue”. In context of field sports has (Mahler, 1995) defined endurance as the ability to perform dynamic exercises that involving large muscle groups at moderate to high intensity for extended periods.

In addition the researcher defines endurance is the ability to carry out lengthy mobile activity of moderate intensity which mobilizes the functional capacity the organs, particularly of the heart and circulatory system and the respiratory system. It demands participation of large muscle groups and has a positive influence on the level of the participants.

2.8.2. Heart rate

In response to physical activity, HR increases in a predictable manner (Boulay et al., 1997). In fact, the relationship between exercise intensity and HR is an extremely linear one-the greater the intensity, the higher the HR, with the relationship becoming more curvilinear (HR begins to plateau) at very high intensities (Wenger & Bell, 1986). Because of its predictability, one can use HR to prescribe running intensities.

It has been reported that the HR observed at slightly below the ventilatory threshold is a better indicator of the exercise intensity that can be sustained for prolonged periods than other physiological measures such as blood lactate concentration, work output, ventilation (liters of air breathed in or out per minute), and volume of expired carbon dioxide (Boulay, et al., 1997). This is good news for the coach since determining athletes' heart rates is obviously much easier than determining their blood lactate concentrations or VO₂ max.

2.8.3. The Importance of Maximal Heart Rate

Measurement of heart rate is routinely used to assess the response of the heart to exercise, or the recovery from exercise, as well as to prescribe exercise intensities. Given that the increase in heart rate during incremental exercise mirrors the increase in cardiac output, maximal heart rate is often interpreted as the upper ceiling for an increase in central cardiovascular function. Indeed, research for the last 100 years has demonstrated that heart rate does in fact have a maximal value; one that cannot be surpassed despite continued increases in exercise intensity or training adaptations (Karvonen et al., 1957).

HR is considered the standard for estimating exercise training intensity in the field based on its linear relationship to VO₂ max. The recommendations of the American College of Sports Medicine (ACSM) for moderate to hard relative exercise training intensities for cardio respiratory fitness based on HR are 55%-90% of maximum heart rate (HR_{max}) or 40%-85% of heart rate reserve

(HRR) (American College of Sports Medicine, 1998). Although the use of heart rate to monitor exercise intensity is common practice, several drawbacks of this method has been noted. To be effective, an accurate determination of HR must be obtained, often requiring individuals to stop their activity temporarily to palpate their pulse rate (Dunbar et al., 1994). In addition, many individuals experience difficulty palpating a pulse or accurately timing their pulse count which can result in subjective error. It has been suggested that individuals who use HR to monitor their exercise intensity may become overly preoccupied with the monitoring of their HR in order to avoid deviating from their targeted training range. This preoccupation and frequent pauses in activity to obtain an accurate HR are believed to have a negative effect on activity enjoyment and long-term compliance (White, 1977).

Use of a HR monitor would eliminate many of the problems associated with palpating a pulse and would provide an alternative means by which an individual could use HR as a guide to estimating exercise intensity. However, some individuals may perceive the need to wear a device during exercise as bothersome or the additional expense of a HR monitor a barrier to initiating an exercise regimen (Joseph et al., 2001).

Some input about heart rate from the researcher: it is important to monitor exercise intensity for a number of reasons. Firstly, the specific physiological adaptations to training change depending on what relative work load is employed. It is fundamental that the athlete or coach understands which type of endurance training (as a reflection of intensity) is best for their sport or event.

2.9. Agility

The vast majority of agility tests in soccer are designed to evaluate the physical qualities of the players, without cognitive (i.e. choice reaction) challenges. Zig zag runs, 90-180° turns, shuttle runs, sideways, and backwards running with maximal intensity are commonly used drills. Agility patterns may vary as a function of playing role, and Sporis et al. (2010) suggested different tests for different positions. Published agility tests do not reflect the nature of deceleration and turning performed during elite soccer matches. In fact, the vast majority of turning movements are initiated from a stationary or jogging condition while change-in-direction within sprinting movements rarely occur (Bloomfield et al., 2008).

Several studies have reported that professionals or elite players have better agility skills compared to players of lower standard (Reilly et al., 2000B; Vaeyens et al., 2006; Kaplan et al., 2009; Rebelo et al., 2013). However, Rösch et al. (2000) observed no differences across a broad range of playing standard. The literature is equivocal regarding agility performance across playing positions (Taskin, 2008; Sporis et al., 2010; Boone et al., 2012). Interestingly, midfielders perform relatively better in agility tests compared to linear sprint tests. The literature also suggests that when change-of-direction is preceded by braking from a nearly full sprint, the agility difference across position categories shrinks. Midfielders in general have lower body mass and lower peak sprinting speed (Sporis et al., 2009), it is reasonable to expect that this group also demonstrates smaller performance differences in certain agility tests compared to linear sprint tests.

Timing of ground reaction forces, body configuration and center of gravity placement are crucial biomechanical elements when changing direction while sprinting. By lowering the center of gravity while changing direction, the involved lower extremity muscles can work under more optimal conditions. By leaning the upper body towards the intended direction during turns, combined with foot placement in the opposite intended running direction away from the vertical center of gravity-line during ground contact, more kinetic energy can be counteracted. Correct technique during change-in-direction movements is also important from an injury prevention perspective.

Here the researcher suggests some important points that the performances of athletes in sports today have dramatically elevated the level of agility necessary for performance success. Agility training provides the athlete with performance benefits: neuromuscular adaptation, improved athleticism, injury prevention and decreased rehabilitation time. A comprehensive agility program will address components of agility such as strength, power, acceleration, deceleration, coordination, balance and dynamic flexibility. When instructing athletes on the execution of agility exercises it is critical to instruct athletes on technique as a priority and speed of movement only after technique has been mastered.

2.10. Factors in performance

2.10.1. Hot Environment

As an athlete exerts energy when exercising in hot environments, his or her core temperature will rise greater than if the individual was exercising at a moderate temperature. This effect may be a possible explanation for decreased athletic performance when environmental temperatures continue to rise, due primarily to excessive fluid loss and impaired thermoregulation in extreme environments (Siegel & Laursen, 2012). In warm environments, exercising induces a rise in core temperature, sweating rate, and progressive dehydration. The ability of an athlete to thermo regulate adequately depends on his or her body type. Athletes with a smaller body size will produce and store less heat than their heavier counterparts (Marino et al., 2000). When a player exercised in an environment that created a core temperature greater than his or her accepted body temperature, the player's body innately anticipated an undesirable rise in core temperature. To counteract that response, the player slowed down before a critical temperature was reached in an attempt to forego a possible crisis should the critical temperature be exceeded. In this way, the effect of hot temperatures caused an athlete to show a decrease in performance by about 2-3% in order to account for a possibly dangerous rise in core temperature (Dugas, 2010). Performance reduction was confirmed in another study in which soccer players covered 15% less distance when the combination of air temperature and water vapor pressure created a perceived environment of 49°C.

In an attempt to combat this phenomenon, researchers have investigated the effect of pre-cooling an athlete before performance. The idea of pre-cooling is to lower an athlete's body temperature purposely in order to increase the time it will take for the athlete to reach his or her critical temperature, allowing improved performance and less stress on the body from heat (Wegmann et al., 2012). Common methods of pre-cooling include ice baths, ice jackets, and ingestion of cold water. A review of pre-cooling methods showed that the effects of pre-cooling have consistently shown an enhancement in performance under hot weather conditions (Siegel & Laursen, 2012). However, playing in dry, hot weather does not present the added problem of humidity. In hot and humid conditions, the ability of the body to extract heat through sweating is impaired because sweat cannot evaporate off the body. Hot and humid environments are characterized by temperatures greater than 18°C and when the amount of water vapor in the air exceeds the ability of water to be evaporated

from land surfaces back into the atmosphere (Hue, 2011). This may hinder the body's ability to thermo regulate, especially in endurance events. Humid environments also affect an athlete when swimming, even though he or she is submerged in water. The silicone cap that is typically worn during competition places stress on the hypothalamus, which is in charge of sudation, by not allowing body heat to escape because the head is covered. When the process of removing heat from the body is interrupted, overall performance is decreased as core temperature rises (Hue & Galy, 2012).

The researcher described the effects of temperature on playing performance. Both the coach and player must take the necessary measures to prevent problems arising when playing soccer in adverse weather conditions. Correct clothing, fluid intake, hydration levels, adaptation, planning and rest periods all play a part in maintaining playing performance.

2.10.2. Cold Environment

Just as the hot environment can negatively impact performance, exercising in the cold environment has been found to influence performance as well. One major concern of exercising in the cold is the effect cold air has on the pulmonary system. Exercised induced bronchospasm can lead to a higher ventilation rate due to the constriction of the airways as a result of the dry and cold air being breathed in. This leads to a higher exertion and a decrease in performance (Lindberg, Malm , Hammarström, Oksa, & Tonkonogi, 2012). Unlike in warm environments, heart rate decreases in cold weather, due to the body's attempt to retain heat through vasoconstriction (Lindberg et al., 2012). The nerve conduction decreases which in turn decreases the electrical impulses at the sino atrial node, the heart's pacemaker (Wilmore, Costill, & Kenney, 2008). This can create inaccurate intensity level reading if athletes are trying to reach a certain heart rate, in which case studies suggest that they would be exercising at a greater intensity in the cold compared to normal temperatures when trying to reach the same heart rate. This extra exertion leads to decreased performance (Nimmo, 2005).

Cold wind also plays a role in the decrease in body temperature through the process of convection (displacement of heat by motion of gas or liquid). Additionally if the wind is high, heat from the body will be displaced. The clothing an athlete wears can increase body temperature through conduction (transfer of heat from one solid to another). If the athlete's clothes are not appropriate for

cold, heat may actually be removed from the body via that method as well (Wilmore et al., 2008). Prolonged exposure to cold temperatures reduces core body temperature. This is pronounced in athletes with small body size, as heat is able to escape more readily due to less body surface area (Nimmo, 2004). Other factors that are reduced in cold weather are muscle power, force production, muscle shortening velocity, and an increase in fatigue rate (Wilmore et al., 2008).

High intensity exercise is especially affected as many studies have shown a reduction in dynamic performance of about 10% when the temperature of working muscles drops (Sargeant, 1987). $\text{VO}_{2\text{sub}}$ and VO_2 peak tests in cold environments have also revealed reduced performance in athletes due to multiple factors such as fast-twitch fiber recruitment, thermogenesis, and higher contribution of anaerobic glycolysis (Lindberg et al., 2012). Interestingly, performance was actually increased in soccer player when the match was performed at a temperature of approximately 14°C. The slightly colder temperatures provided an environment that kept players from getting too hot, but did not create a detrimental response from the body trying to stay warm (Peiser, Reilly, Atkinson, Drust, & Waterhouse, 2006).

The researcher recommends that to reduce the effects of cold weather, players should be correctly hydrated, undertake a good warm-up session and wear warm appropriate clothing. The coach must play a major part by making sure that players are correctly prepared and checking if the climatic conditions are suitable.

2.10.3 Nutritional factors

Another factor for better result is nutrition (Dr. Bezabeh Wolde 1997:49) defined nutrition as it is a science of nourishing the body. The athlete who is striving for excellence should train hard and to train hard should eat balanced diet and enough calories to cover the load and to maintain the body. Nutrients are chemical substances in food that function, to furnish the body with fuel, to build and repair body tissue.... Nutrients are divided in to proteins, carbohydrates, fats, water, vitamins and minerals. Carbohydrates are the major energy source for the body especially during intense training (Dr. Bezebih W. 1997. 49) Food is the fuel of athletic performance. Thought you cannot control the food your athletes eat, you can guide them toward healthy eating. To do so, you must be acquainted with the basics of proper nutrition.

The researcher suggests that to provide your body with enough energy (kilojoules) to meet the demands of training and enable proper recovery between exercise sessions. Training or competition increased generally daily energy requirements depending on duration, type and intensity of the activity, the three main nutrients from food that supply the body with energy are carbohydrate, fat and protein . These can be obtained by eating foods from five food groups, carbohydrate, fat, protein, iron and calcium.

2.10.4. Altitude

High altitude can significantly influence the performance of an aerobic athlete. Although the amount of oxygen available does not change as altitude increases, the partial pressure of the oxygen (PO₂) decreases. Normal PO₂ at sea level is 159 mmHg, climbing up to 2,000m the PO₂ drops to 125 mmHg, and at 4,000m it drops even farther to 97 mmHg. This drop in the partial pressure of oxygen creates a hypobaric hypoxic environment. A hypobaric environment has a reduced barometric pressure, while a hypoxic environment shows a compromised delivery of oxygen to the tissues. Physiologically, a hypoxic environment causes a decrease in the pressure gradient across cell membranes, making it harder for the tissues of the body to take up and utilize oxygen (Wilmore et al., 2008). A lack of oxygen throughout the body leads to physiological changes that have been shown to decrease prolonged athletic performance.

The response of the body to a change in altitude over a two to three week time frame is collaboratively called acclimatization. The athlete will immediately experience an increase in ventilation, heart rate and cardiac output in order to make up for the decrease in utilized oxygen (Derby & deWeber, 2010). This results in the athlete fatiguing earlier because the athlete has to work harder to get enough oxygen to the working muscles to achieve non-altitude results. This is most notable in maximal aerobic activities such as endurance running or in multiple maximal anaerobic activities such as repetitive sprints. While one maximal sprint may actually show an increase in performance due to its usage of the glycolytic energy system, multiple repetitions without an adequate recovery period (such as in soccer) will show a decrease in ability and performance. However, without proper acclimatization the athlete may face health risks that would impair performance before they even step on to the field (Levine, Stray-Gundersen, & Mehta, 2008).

The cumulative manifestation of symptoms associated with the body's reaction to a hypoxic environment is known as High Altitude Illness (HAI). Acute Mountain Sickness (AMS) is the most common form of HAI and involves the onset of headache and one of the following other symptoms: insomnia, dizziness or light-headedness, nausea or vomiting, fatigue or weakness, and anorexia (DaRosa, Jotwani, & Valentine, 2012). These symptoms usually disappear within three days (Derby & deWeber, 2010), but if a team arrives to a high altitude destination without allowing the proper time for athletes to acclimate, altitude sickness may debilitate performance or prevent athletes from playing altogether. Two to three weeks is the accepted amount of time for athletes to acclimate at one mile above sea level; an extra week is required for every additional 2,000 feet of elevation. The physiological changes during this adaptation include increased oxygen carrying capacity, increased hemoglobin, and increased red blood cells. Decreases in body weight and muscle mass have also been shown (Wilmore et al., 2008).

While most athletes are well versed in how altitude may impact personal physiological performance, most may not be aware of altitude's effect on techniques such as throwing, kicking, or even reacting to an approaching ball. The reduction in air density that accompanies increasing altitudes translates into a decrease in the drag and lift forces in the air acting on a ball. On the sports field, this would allow a ball to travel farther, but any curve put on the ball would be diminished (Levine et al., 2008). The difference in air density may affect teams who ascend to a higher altitude as well as teams who descend to a lower altitude. For athletic teams traveling to a higher altitude, the ball will deviate, or curve, about .4m less at 1000m and about .8m less at 2000m, making for a significant difference when a soccer player calculates how much curve to give the ball when aiming for a corner (Levine, et al., 2008). The distance a ball will travel is also greatly affected by the altitude. According to (Levine et al. 2008), "a ball that carries about 30m through the air at sea level will carry about 2.95m further at 1000 m, 5.9 m further at 2000 m." Since sports depend on a player's ability to accurately hit the target, these changes in ball travel could be the difference between a caught pass and a dropped ball. Thus, while altitude can affect a player's performance based on physiological changes, it may also affect the player's physical performance concerning the player's ability to adapt to the aerodynamic differences in ball movement.

The researcher contributes the idea that the benefits of altitude: exposure to high altitude could theoretically improve an athlete's capacity to exercise. Exposing the body to high altitude causes it

to acclimatize to the lower level of oxygen available in the atmosphere; many of the changes that occurs acclimatization improves the delivery of oxygen to the muscle, the theory being that more oxygen will lead to better performance

2.10.5. Sleep

It is no secret that the body needs sleep in order to function at its highest level. Athletes tend to be especially limited on sleep time due to competition schedules, prolonged training days, and work demands (Fischer, Nagai, & Teixeira, 2008). It is during the period of sleep that the body discards unnecessary information from the brain, heals, and gains energy for the next day's activities. A good night's sleep is imperative to enhancing performance (Willis, 2009).

The central nervous system controls every aspect of athletic performance, from firing the correct sequence of muscle contraction to reflexes and reaction, exact biomechanical movements to function of skills (Underwood, 2010). When athletes do not receive a full night of sleep, athletic performance decreases due to sleepiness. Researchers that studied ballet dancers found that health also deteriorated when sleep deprivation patterns were continuous (Fietze et al., 2009). In another study, after thirty hours of sleep deprivation, running performance during a five-mile run on a treadmill was reduced. An interesting finding during this same study was that the perceived effort remained the same; athletes ran a shorter distance because the perceived effort was the same as that for five miles. The deleterious effect of thirty hours of sleep deprivation impaired performance as much as nine percent. Thus, loss of sleep may result in a significant reduction in aerobic performance (Oliver, Costa, Laing, Bilzon, & Walsh, 2009).

Athletes in particular require more sleep than the average relatively sedentary individual (Davenne, 2009). Researchers who performed a study in 2005 found that when athletes were allowed to sleep as much as they could, players experienced enhanced performances, better moods, and a decrease in fatigue compared to when customary sleeping habits were instilled (Dement, 2005). This data is consistent with Dement's later study that found that the first factors to decline in performance are mood, cognitive function, and the ability of the brain to perform motor skills (Davenne, 2009). According to Underwood (2010), the muscles need an appropriate amount of sleep in order to meet the demands of reflex and reaction impulses. Evaluative tasks, visual tracking, and focus also depend on adequate rest. Lack of sleep also reduces blood flow to the brain resulting in confusion and

physical inabilities seen in individuals who are sleep deprived (Underwood, 2010). Additionally, these symptoms peak during the mid-afternoon, pre-disposing athletes to poor performance in games performed at this time or later that evening (Fietze et al., 2009).

It is not only the amount of time spent sleeping that affects performance. The quality of sleep received is also paramount to an athlete's ability to perform well. Deep sleep is essential for the release of growth hormones, which allow for the growth and repair of muscles, fat burning, and bone strengthening. The release and consequential effects of this hormone allow for an athlete to recuperate after an intense workout or competition and continue working toward better results. Sleep and physical activity have direct influences on each other (Davenne, 2009).

Here additional points by the researcher, the quality and amount of sleep athletes gets is often the key to winning. Sleep in particular provides energy to both the brain and body. If sleep is cut short, the body doesn't have time to repair memory, consolidate memory, and release hormones. The role of sleep in performance with result that shoe declines in split second decision making following poor sleep.

2.11. Balance

Balance is an important element from maintaining posture to completing complex sport skills and may be defined as the ability to maintain the center of body mass within limits of stability determined largely by the base of support (Alexander, 1994; Davelin, 2004; Horak, 2006; Pollok et al., 2000; Tyson & Connel, 2009; Woollacott & Shumwaycook, 1996). During simplistic tasks such as sitting or standing, the body continuously sways and to regulate this, the sensory system continuously process information about the body's position in space. It is a complex process involving coordination of multiple sensory, motor and biomechanical components (Guskiewicz & Perrin, 1996).

Functional goals of the balance system include 1) maintenance of a specified posture, such as sitting or standing; 2) voluntary movement, such as the movement between postures; and 3) the reaction to an external disturbance, such as a trip, slip or push (Pollock et al., 2000). Three different postural responses that young and older adults can use when regaining stability are ankle strategy, hip strategy, and a stepping strategy (Alexander, 1994; Horak, 2006; woollacot & shumwaycook, 1996).

2.12 Coordination

Sports Vision as such includes specific visual determinants which precisely coordinates a player's activity during the game. It has been seen that successful athletes generally have better skill, accuracy and spatio-temporal constraints on visual information acquisition. As such if two similar athletes meet in competition and one has a better trained visual system, the athlete with enhanced visual system will perform better (Loran & Griffiths, 2001). Sport activities often have a close relationship between perception and action therefore temporally constrained sport tasks require that players extract the most valuable source of visual information and use this information to quickly anticipate the opponent's movement outcome (Shim et al., 2006).

There are evidences which support the claims of vision playing an important role in the perceptual ability of an athlete relating proportionately to his/her motor response. Revien & Gabor (1981) stated that visual abilities affect sports performance and the acquisition of motor skills, which can be improved with training. Supporting the same (Quevedo et al. 1999); stated that sports vision training is conceived as a group of techniques directed to preserve and improve the visual function, with the goal of incrementing sports performance through a process that involves teaching the visual behavior required in the practice of different sporting activities.

Coordination is a skill that recruits the senses such as sight and hearing in conjunction with body parts to perform tasks accurately and with efficiency of movement. The researcher contends that coordination integrates the various skill-related components of fitness into accurate and effective movements. Juggling, hitting a baseball with a bat and dribbling a basketball are all coordination skills. Hand-eye coordination tests or foot-eye coordination tests are often used to assess coordination.

2.13. VO₂ max

Fitness can be measured by the volume of oxygen you can consume while exercising at your maximum capacity. VO₂ max is the maximum amount of oxygen in milliliters, one can use in one minute per kilogram of body weight. Those who are fit have higher VO₂ max values and can exercise more intensely than those who are not as well conditioned. Numerous studies show that you can increase your VO₂ max by working out at an intensity that raises your heart rate to between 65

and 85% of its maximum for at least *20 minutes three to five times a week* (referenced in French & Long (2012)). A mean value of VO_2 max for male athletes is about 3.5 liters/minute and for female athletes it is about 2.7 liters/minute.

The physical limitations that restrict the rate at which energy can be released aerobically are dependent upon:

The chemical ability of the muscular cellular tissue system to use oxygen in breaking down fuels, the combined ability of cardiovascular and pulmonary systems to transport the oxygen to the muscular tissue system

There are various physiological factors that combine to determine VO_2 max for which there are two theories: Utilization Theory and Presentation Theory.

Utilization theory maintains that VO_2 max is determined by the body's ability to utilize the available oxygen whereas Presentation Theory maintains it is the ability of the body's cardiovascular system to deliver oxygen to active tissues.

A study by (Saltin & Rowell ,1980)-concluded that it is the delivery of oxygen to active tissues that is the major limiting factor to VO_2 max. A study by (Gollnick et al., 1972) showed a weak relationship between the body's ability to utilize the available oxygen and VO_2 max.

Here additional information about vo2 max by the researcher: the vo2 max test is an incremental test to voluntary exhaustion. The amount of oxygen you breathe in and out is measured and gives as an indication of your aerobic fitness. Then give you a comparison to general and athletic populations, and to the requirements of different sports.

CHAPTER THREE

3.1. METHODS

In this chapter the methods, procedures, and the subjects are described. The design and the analysis of this study are also explained. Furthermore, a description of the subjects is presented and is followed by a general methodology. Following this, the test section is explained. The procedure section has been explained thereafter. Finally, this section includes information concerning the step-by-step procedures used in this study. The testing the design of this study is explained in this chapter.

3.2. Research design

The research design appropriate for this analysis is both qualitative and quantitative research method to analyze between project participants and non participants in some training qualities of football found in Addis Ababa with reference to kirkos sub-city.

3.3. Subject

The sample size of each target population can be determined by what Kothari (2004) suggest, “The ideal sample size of a target population is large to serve as an adequate representative and small enough to be selected economically in terms of both time and complexity of analysis.” In kirkos sub-city, there are 11 U-17 youth football projects, each of which have 25 players or a total of 275 players. In this study 25 players / 1 youth project which can serve as project participants and 25 voluntary non project participants in the same sex and age generally 50 players for comparison are included. The selection of 1 youth project is conducted using simple random sampling techniques this sampling technique is selected because it gives equal and independent chance for all projects in the defined population of being selected as a sample. And 25 voluntary players they are non structured/formal sport persons selected purposively.

3.4. General Method

Each subject participated in a series of tests conducted by the tester and the assistant. Experimental and control group were compared to each other on 6 different tests. The tests were ranked in order of importance, by using a central tendency and excel 2007 statistical procedure. There were one strength test, which were the squats test, one speed test, which were the 300 yard shuttle test, there were one endurance test, which were the home step test, there were one agility test, which were zigzag test, there were one balance test, which were standing stork test and there were one coordination test, which were hand eye/foot eye coordination test. The groups were formed in a way that they train together during the training and testing time.

3.5. Tests

Each test represents a parameter in evaluating athletic performance.

Squats Test/strength test/

Objective

The objective of this test is to monitor the development of the athlete's leg strength

Required Resources

To undertake this test you will require:

- A chair or box that makes the athlete's knees bend at right angles when they are sitting
- Assistant

How to conduct the test

This test requires the athlete to complete as many squats as possible with no rest.

- The athlete warms up for 10 minutes
- The athlete stands in front of a chair, facing away from it, with their feet shoulder width apart
- The athlete squats down lightly touching the chair with their backside before standing back up and repeats this sequence of movements until they

are unable to continue

- The assistant counts and records the number of successfully completed squats

Table 1 normative data for squats test

Raw score norms for Squats test	
Age 16-25	
male	Level
Scores	Performance category
Excellent	>49
Good	44-49
Above average	39-43
Average	35-38
Below Average	31-34
Poor	25-30
Very Poor	<25

Table source (Arnot and Gaines 1984) is the national norms for 16 to 25 year olds.

Analysis

Analysis of the test result is by comparing it with the athlete's previous results for this test. It is expected that, with appropriate training between each test, the analysis would indicate an improvement in the athlete's leg strength.

Advantages

- Minimal equipment required
- Simple to set up and conduct
- Can be conducted almost anywhere

Disadvantages

- Specific facilities required
- Assistant required to administer the test

300 yard Shuttle Test/speed/

Objective

The objective of the 300 yard Shuttle Test (Jones 1991) is to monitor the athlete's intermediate anaerobic power (lactate system).

Required Resources

To undertake this test you will require:

- Flat non-slip surface
- Cones
- Stopwatch
- Assistant

How to conduct the test

This test requires the athlete to complete 10 shuttle runs between two cones 30 yards apart as fast as possible.

- The athlete warms up for 10 minutes
- The assistant marks out a 30 yards (27.4 meters) straight section with two cones
- The athlete starts at one cone
- The assistant gives the command 'GO' and starts the stopwatch
- The athlete performs 10 shuttle runs between the two cones at maximum effort and at each turn touches the cone with a foot
- The assistant stops the stopwatch and records the time when the athlete completes the 10 shuttle runs

Table 2 normative data for 300 yard shuttle test

Raw score norms for 300 yard shuttle test	
Age 16-25	
male	Level
Scores	Performance category
Excellent	55-60
Good	61-65
Above average	66-70
Average	71-75
Below Average	76-80

Table source (Jones 1991) is to monitor the athlete's intermediate anaerobic power.

Analysis

Analysis of the test result is by comparing it with the athlete's previous results for this test. It is expected that, with appropriate training between each test, the analysis would indicate an improvement in the athlete's anaerobic energy system. I have not found any normative tables for this test but a good time for men is 55 to 60 seconds and 65 to 70 seconds for women.

Advantages

- Minimal equipment required
- Simple to set up and conduct
- Can be conducted indoors or outdoors

Disadvantages

- Assistant required to administer the test

Home Step Test/Endurance/

Objective

The objective of this test is to monitor the development of the athlete's cardiovascular system.

Required Resources

To undertake this test you will require:

- A 12 inch high bench or step
- A stopwatch
- Heart rate monitor (optional)
- Assistant

How to conduct the test

This test requires the athlete to step up and down, one foot at a time, onto the step or bench for 3 minutes and to maintain a steady 24 steps/minute

- The athlete warms up for 10 minutes
- The assistant sets the metronome to a 24 steps/minute pace
- The assistant gives the command “GO” and starts the stopwatch
- The athlete steps up and down, one foot at a time, onto the step or bench at a steady 24 steps/minute for 3 minutes
- The assistant ensures the athlete maintains the required 24 steps/minute pace
- The assistant stops the test after 3 minutes and immediately records the athlete’s heart rate (bpm)

Table 3: Normative data for home step test

Raw score norms for home step test	
Age 16-25	
Male	Level
Scores	Performance category
Excellent	>90.0
Above average	80.0-90.0
Average	65.0-79.9
Below Average	55.0-64.9
Poor	<55

Table Source: Canadian Public Health Association

Analysis

Analysis of the test result is by comparing it with the athlete's previous results for this test. It is expected that, with appropriate training between each test, the analysis would indicate an improvement in the athlete's level of fitness.

Advantages

- Minimal equipment required
- Simple to set up and conduct
- Can be conducted almost anywhere

Disadvantages

- Specific facilities required - gym bench
- Assistant required to administer the test

Zigzag Test/agility/

Objective

The objective of this test is to monitor the development of the athlete's speed and agility.

Required Resources

To undertake this test you will require:

- 5 cones
- Flat non-slip surface
- Stopwatch
- Assistant

How to conduct the test

This test requires the athlete to run around a series of cones as fast as possible.

This test requires the athlete to run around a series of cones as fast as possible.

- The athlete warms up for 10 minutes

- The assistant marks out a rectangle 10 by 16 feet with four cones and places a cone in the centre
- The assistant gives the command "GO" and starts the stopwatch
- The athlete commences the test at the Start & Finish cone and follows the grey route indicated in the diagram
- The assistant stops the stopwatch and records the time when the athlete's torso crosses the Start & Finish cone

Table 4 normative data for zigzag test

Raw score norms for zigzag test	
Age 16-25	
Male	Level
Scores	Performance category
Excellent	5-8
Good	9-10
Above average	11-13
Average	14-15
Below Average	>15

Table source Mackenzie, B. (2005) Zigzag Test [WWW] Available from:
<http://www.brianmac.co.uk/zigzag.htm> [Accessed 28/11/2014]

Analysis

Analysis of the test result is by comparing it with the athlete's results of previous these tests. It is expected that, with appropriate training between each test, the analysis would indicate an improvement in the athlete's agility and speed.

Advantages

- Minimal equipment required
- Simple to set up and conduct
- The test can be administered by the athlete
- Can be conducted almost anywhere

Disadvantages

- Assistant required to administer the test

Standing Stork Test/balance/

Objective

To monitor the development of the athlete's ability to maintain a state of equilibrium (balance) in a static position.

Required Resources

To undertake this test you will require:

- Warm dry location - gym
- Stopwatch
- Assistant

How to conduct the test

- The athlete warms up for 10 minutes
- The athlete stands comfortably on both feet with their hands on their hips
- The athlete lifts the right leg and places the sole of the right foot against the side of the left kneecap
- The assistant gives the command “GO”, starts the stopwatch and the athlete raises the heel of the left foot to stand on their toes
- The athlete is to hold this position for as long as possible
- The assistant stops the stopwatch when the athlete’s left heel touches the ground or the right foot moves away from the left knee
- The assistance records the time
- The athlete rests for 3 minutes
- The athlete stands comfortably on both feet with their hands on their hips
- The athlete lifts the left leg and places the sole of the left foot against the side of the right kneecap

- The assistant gives the command “GO”, starts the stopwatch and the athlete raises the heel of the right foot to stand on their toe
- The athlete is to hold this position for as long as possible
- The assistant stops the stopwatch when the athlete’s right heel touches the ground or the left foot moves away from the right kneecap
- The assistance records the time

Table 5 normative data for stand stork test

Raw score norms for stand stork test	
Age 16-19	
Male	Level
Scores	Performance category
Excellent	>50
Above Average	41-50
Average	31-40
Below Average	20-30
Poor	<20

Table source (Johnson & Nelson 1979) - are national norms for 16 to 19 year olds.

Analysis

Analysis of the test result is by comparing it with the athlete's previous results for this test. It is expected that, with appropriate training between each test, the analysis would indicate an improvement in the athlete's static balance.

Advantages

- No equipment required
- Simple to set up and conduct
- Can be conducted almost anywhere

Disadvantages

- Assistant required to administer the test

Foot Eye Coordination Test/ Coordination/

Objective

The objective of the test is to monitor the ability of the athlete's vision system to coordinate the information received through the eyes to control, guide, and direct the legs in the accomplishment of juggling a ball (foot-eye coordination).

Required Resources

To undertake this test you will require:

- Football
- Stopwatch
- Flat non-slip surface
- Assistant

How to conduct the test

This test requires the athlete to juggling a ball alternatively.

- The athlete warms up for 10 minutes
- The athlete stands one stride back from the ball
- The assistant gives the command "GO" and starts the stopwatch
- The athlete juggling a ball alternatively on the right and left leg this cycle of juggling is repeated for 30 seconds.
- The assistant counts the number of juggling a ball and stops the test after 30 seconds
- The assistant records the number of juggling

Table 6 normative data for foot-eye coordination test

Raw score norms for foot-eye coordination test	
Age 16-25	
male	Level
Scores	Performance category
Excellent	>35
Above Average	30-35
Average	25-29
Below Average	20-24
Low score	<20

Table source (Beashel and Taylor (1997) scores for 16 to 25 year olds

Analysis

Analysis of the result is by comparing it with the results of previous tests. It is expected that, with appropriate training between each test, the analysis would indicate an improvement in the athlete's hand eye coordination skill.

Advantages

- Minimal equipment required
- Simple to set up and conduct
- Can be conducted almost anywhere

Disadvantages

- Assistant required to administer the test

3.6. Instruments and Apparatus

To undertake the squats test the equipment used in performing the squats test is discussed in this quote. “A chair or box that makes the athlete's knees bend at right angles when they are sitting and assistant” (Fry, A.C.et al.2014, P.630-635)

To undertake 300 yard Shuttle Test the equipment used in performing the 300 yard Shuttle test is discussed in this quote.”Flat non-slip surface, Cones, Stopwatch and Assistant” (Gilliam, G.etal.1983, P.46)

To undertake Home Step Test the equipment used in performing the Home Step Test is discussed in this quote.”A 12 inch high bench or step, A stopwatch, Heart rate monitor (optional) and Assistant” (Draper, N and Whyte, G.1997, p.3-5)

To undertake Zigzag Test the equipment used in performing the Zigzag Test is discussed in this quote.” 5 cones, Flat non-slip surface, Stopwatch and Assistant” (Little, T., & Williams, A.G, 2005, P .76-78)

To undertake Standing Stork test the equipment used in performing the Standing Stork test is discussed in this quote. “Warm dry location – gym, Stopwatch and Assistant” (Hungerford, B.A.etal.2007, P.879-887)

To undertake Hand Eye Coordination test the equipment used in performing the Hand Eye Coordination test is discussed in this quote.”Tennis Ball /football/, Stop watch, Smooth Wall and Assistant” (Loran et al. 2001, P.32-34)

3.7. Procedures

There are two major testing periods (the first testing period and second testing period). The first testing period is at the end of the forth week around mid-time this session is usually in the mid February. Athletes are tested immediately. An athlete’s scores in the squats, home step, 300 yard shuttle, zigzag test, standing stork test and hand eye/hand foot /coordination are also recorded during this testing period for both groups.

The second testing session begins right before the end of eighth week. This session is usually in the mid march. Test scores are gathered in the squats, home step, 300 yard shuttle, zigzag test, standing stork test and hand eye/hand foot /coordination are also recorded during this testing period.

This is a very important testing session because it is the last testing session of the study. The investigator of this study want to look at the athlete’s last testing session so all of the athletes test

scores over eight week period can be taken into account. After all of the test scores have been gathered in the respective athletes, here at Kirkos sub-city, the investigator then picked their personnel best in each test. Even though the last testing period scores are gathered, a test score from one of the previous maxing sessions might be recorded if it is a higher score than the last test score. The athlete's personnel best test scores over eight weeks of participation are recorded and used in this study.

3.8. Testing

The basic design of the study consisted of the testing of the athletes and ranking the tests in order of importance or significance. The athletes have been tested in their relative years of participation. Their test scores from all six tests have been recorded. While the athletes have been placed into groups according to their positions, they have also been given a playing status of either project participants or non participants.

This procedure was carried out for each of the two groups (project participants and non participants). By central tendency statistical analysis has been performed on each group. This analysis produces the order of importance for each test, for each group. This information can and will be used by the strength and conditioning professional. This information is a way to evaluate the tests being administered to the athletes and this information is a way to evaluate the strength and conditioning program.

The collection of data has been performed in the same process between the given eight weeks and the data has been collected in a reliable and consistent manner.

CHAPTER FOUR

ANALYSIS AND INTERPRETATION OF DATA

4.1. RESULTS

The purpose of this study was to examine the change in the results of 6 physical performance tests between project participants and non participants after implementing relevant training program.

The squats test were recorded in number of counts, 300 yard shuttle test were recorded in seconds , home step test were recorded in heart beat , zigzag test were recorded in seconds , stand stork test were recorded in seconds and foot eye coordination were recorded in number of counts.

Table 7: Selected variables and their criteria measures

No	Variable	Criteria measures
1	Strength	squats
2	Speed	300 yard shuttle
3	Endurance	Home step
4	Agility	Zigzag run
5	Balance	Stand stork
6	Coordination	Foot-eye coordination

Mean and standard deviation of the selected dimensions of project participants and non participants were computed. Its results have been depicted in table 8 and 9.

Table 8: Mean and standard deviation of project participants

No	Variable	Units	Mean		S.D	
1	Strength	No of counts	114.56		41.77	
2	Speed	Seconds	10.75		48.83	
3	Endurance	Pulse Rate	104.64	103.28	10.35	11.78
4	Agility	Seconds	7.16		0.78	
5	Balance	Seconds	15	15.88	6.87	7.64
6	Coordination	No of counts	31.64		13.1	

Table 8 reveals that the mean and standard deviation values of dimensions of physical fitness of project participants. These values were recorded as Strength 114.56 and 41.77, Speed 10.75

and 48.83, Endurance 104.64/103.28 and 10.35/11.75, Agility 7.16 and 0.78, balance 15/15.88 and 6.87/7.64, coordination 31.64 and 13.1 respectively.

Table 9: Mean and standard deviation of non participants

No	Variable	Units	Mean		S.D	
1	Strength	No of counts	59		9.35	
2	Speed	Seconds	72:202		12.32	
3	Endurance	Pulse Rate	150.24	155.68	14.28	14.46
4	Agility	Seconds	10.76		0.522	
5	Balance	Seconds	6.44	6	1.47	1.32
6	Coordination	No of counts	6.52		1.26	

Table 9 reveals that the mean and standard deviation values of dimensions of physical fitness of non participants. These values were recorded as Strength 59 and 9.35, Speed 72.202 and 12.32, Endurance 150.24/155.68 and 14.28/14.46, Agility 10.76 and 0.522, balance 6.44/6 and 1.47/1.32, coordination 6.52 and 1.26 respectively.

Table 10: Comparative analysis of strength between project participants and non participants

Group	Sample	Mean	Median	S.D
project participants	25	114.56	101	41.77
non participants	25	59	56	9.35

The analysis of table 10 indicates that the mean, median and standard deviation values for strength variable for project participants and non participants were recorded as 114.56, 101, 41.77 and 59, 56, 9.35 respectively. It shows that project participants have performed better as compared to their non participants in strength variable.

From table 10 it has been observed that the mean score of project participants is higher than non participants. Mean score of squats test is lower for non participants as compared to project

participants. We come to the conclusion that project participants have better strength than non participants

Table 11: Comparative analysis of speed between project participants and non participants

Group	Sample	Mean	Median	S.D
project participants	25	10.75	59.46	48.83
non participants	25	72.202	60.13.44	12.32

The analysis of table 11 shows that the mean, median and standard deviation value on the speed variable of the project participants and non participants were recorded as 10.75, 59.46,48.83and 72.202, 60.13.44,12.32 respectively. It shows that project participants have performed better as compared to their non participants in speed variable.

From table 11 it has been observed that the mean score of project participants is higher than non participants. Mean score of 300 yard shuttle test is lower for non participants as compared to project participants. We come to the conclusion that project participants have better speed than non participants.

Table 12: Comparative analysis of endurance between project participants and non participants

Group	Sample	Mean		Median		S.D	
		L	R	L	R	L	R
project participants	25	104.64	103.28	104	106	10.35	11.78
non participants	25	150.24	155.68	156	156	14.28	14.46

L = left **R**= right

The analysis of table 12 shows that the mean, median and standard deviation value on the endurance variable of the project participants and non participants in left and right leg were recorded as 104.64/103.28, 104/106, 10.35/11.78 and 150.24/155.68, 156/156, 14.28/14.46 respectively. It shows that the project participants have performed better as compared to non participants in endurance variable.

From table 12 it has been observed that the mean score of project participants is higher than non participants. Mean score of home step test is lower for non participants as compared to project participants. We come to the conclusion that project participants have better endurance than non participants in both left and right leg.

Table13: Comparative analysis of agility between project participants and non participants

Group	Sample	Mean	Median	S.D
project participants	25	7.16	7	0.782
non participants	25	10.76	11	0.522

The analysis of table 13 shows that the mean, median and standard deviation value on the agility variable of the project participants and non participants were recorded as 7.16, 7, 0.782 and 10.76, 11, 0.522 respectively. It shows that the project participants have performed better as compared to non participants in agility variable.

From table 13 it has been observed that the mean score of project participants is higher than non participants. Mean score of zigzag test is lower for non participants as compared to project participants. We come to the conclusion that project participants have better agility than non participants.

Table 14: Comparative analysis of balance between project participants and non participants

Group	Sample	Mean		Median		S.D	
		L	R	L	R	L	R
project participants	25	15	15.88	12	16	6.87	7.637
non participants	25	6.44	6	6	6	1.47	1.32

L = left **R**= right

The analysis of table 14 shows that the mean, median and standard deviation value on the balance variable of the project participants and non participants in left and right leg were recorded as 15/15.88, 12/16, 6.87/7.637 and 6.44/6, 6/6, 1.47/1.32 respectively. It shows that the project participants have performed better as compared to non participants in balance variable.

From table 14 it has been observed that the mean score of project participants is higher than non participants. Mean score of stand stork test is lower for non participants as compared to project participants. We come to the conclusion that project participants have better balance than non participants in both left and right leg.

Table15: Comparative analysis of coordination between project participants and non participants

Group	Sample	Mean	Median	S.D
project participants	25	31.64	32	13.1
non participants	25	6.52	7	1.26

The analysis of table 15 shows that the mean, median and standard deviation value on the coordination variable of the project participants and non participants were recorded as 31.64, 32, 13.1 and 6.52, 7, 1.26 respectively. It shows that the project participants have performed better as compared to non participants in coordination variable.

From table 15it has been observed that the mean score of project participants is higher than non participants. Mean score of foot-eye coordination test is lower for non participants as compared to project participants. So the conclusion is that project participants have better foot eye coordination than non participants.

Score of project participants and non participants according to raw score norms in six /basic and complex/performance tests variables were analyzed as follows:

Raw score norms for Squats test

Age 16-25 male

Scores	Performance category
Excellent	>49
Good	44-49
Above average	39-43
Average	35-38
Below Average	31-34
Poor	25-30
Very Poor	<25

According to Raw Score Norms the project participants personal best score from two squat test average is (115) this is due to the given exercise before each tests and non participants personal best score from two squat test average is (59) this is also due to the given exercise before each test. So both groups found to be above excellent performance category. Thus overall we can say that strength of project participants result were much stronger than the non participants. Project participants performed better in reference to strength as compared to the non participants.

Raw score norms for 300 yard shuttle test

Age 16-25 male

Scores	Performance category
Excellent	55-60
Good	61-65
Above average	66-70
Average	71-75
Below Average	76-80

According to „Raw Score Norms „the project participants personal best score from two 300 yard shuttle test average is (58 sec) this is due to the given exercise before each tests and it is found to be in excellent performance category and the non participants personal best score from two 300 yard shuttle test is (72 sec) it is found to be in average performance category. So the conclusion is that

300 yard shuttle test of project participants result was superior to the non participants. Project participants performed better in speed as compared to the non participants.

Raw score norms for home step test
Age 16-25 male

Scores	Performance category
Excellent	<79
Good	79-89
Above average	90-99
Average	100-105
Below Average	106-116
Poor	117-128
Very Poor	>128

According to „Raw Score Norms „the project participants personal best score from two home step test average is (104) for left leg and (103) for right leg it is found to be in average performance category and the non participants personal best score from two home step test is (155) for left leg and (150) for right leg it is found to be in very poor performance category. So the result shows that long term training program should set to become capable for home step test even project participants.

Raw score norms for zigzag test
Age 16-25 male

Scores	Performance category
Excellent	5-8
Good	9-10
Above average	11-13
Average	14-15
Below Average	>15

According to „Raw Score Norms „the project participants personal best score from two zigzag test average is (7 sec) it is found to be in excellent performance category and the control subjects personal best score from two zigzag test is (11 sec) it is found to be in above average performance category. So the conclusion is that zigzag test of Experimental subjects result was more than the non participants. Project participants performed better in agility as compared to the non participants.

Raw score norms for stand stork test

Age 16-19 male

Scores	Performance category
Excellent	>50
Above Average	41-50
Average	31-40
Below Average	20-30
Poor	<20

According to „Raw Score Norms „the project participants personal best score from two stand stork test average is (16) for left leg and (15) for right leg it is found to be in poor performance category and the non participants personal best score from two stand stork test average is (6) for left leg and (6) for right leg it is found to be in poor performance category. So the result shows that long term training program should set to become capable for stand stork test even project participants.

Raw score norms for foot-eye coordination test

Age 16-25 male

Scores	Performance category
Excellent	>35
Above Average	30-35
Average	25-29
Below Average	20-24
Low score	<20

According to „Raw Score Norms „project participants personal best score from two foot eye coordination test average is (32 sec) it is found to be in above average performance category and the non participants personal best score from two foot eye coordination test average is (7 sec) it is found to be in low score performance category. So the conclusion is that foot eye coordination of project participants result was more than the controls. Project participants performed better in foot eye coordination as compared to the non participants.

4.2. Discussion of experimental subjects

The present findings of the study showed that strength, speed, endurance, agility, balance and coordination differs significantly between project participants and non participants. Squats test was administered to measure lower body strength of project participants and non participants, the ranking show that strength of project participants personal best score from two squat tests is above excellent performance category. Thus overall we can say that project participants result were much stronger in reference to strength as compared to non participants.

Although project participants are more agile than non participants that agility is a crucial factor of the players in taking a fast, precise and accurate decision. The ranking show that agility of project participants best score from two zigzag test averages is in excellent performance category. Thus overall we can say that project participants result were much superior in reference to agility as compared to the non participants.

The present study assessed the speed of the project participants using the 300 yard shuttle test, which measures maximum speed that can be applied to any movement and depends on the development of agility, The ranking show that speed of project participants personal best score from two 300 yard shuttle test averages is in excellent performance category. Thus overall we can say that project participant's result was much superior in reference to speed as compared to the non participants.

Home step test which measures the development of the athlete's cardiovascular system. In the current study, the ranking show that endurance of project participants personal best score from two home step tests is in average performance category. Thus overall we can say that project participants result were better in reference to endurance as compared to the non participants.

In the stand stork test, this measures the development of the athlete's ability to maintain a state of equilibrium (balance) in a static position but footballer in a dynamic balance. The ranking show that balances of project participants personal best score from two stand stork tests is in poor performance category. Yet their improvements were not statistically significant

Foot-eye coordination which measures the ability of the athlete's vision system to coordinate the information received through the eyes to control, guide, and direct the legs in the accomplishment of juggling a ball. The ranking show that coordination of project participants personal best score from two foot-eye coordination tests is in above average performance category. Thus overall we can say that project participants result were better in reference to foot-eye coordination as compared to the non participants. Specific training that set for each variable except stand stork test has significant improvement on project participants.

4.3.Discussion of control subjects

The administration of tests was exactly the same for both groups. In this study the results of non participants on each six tests was less in comparison to project participants, thus a combined training program before each test demonstrated a medium percentage of improvement for non participants. The ranking show that strength of non participants personal best score from two squat test averages is above excellent performance category, the ranking show that agility of non participants personal best score from two zigzag test averages is in above average performance category, The ranking show that speed of non participants personal best score from two 300 yard shuttle test averages is in average performance category, the ranking show that endurance of non participants personal best score from two home step tests is in very poor performance category, The ranking show that balances of non participants personal best score from two stand stork tests is in poor performance category and The ranking show that coordination of non participants personal best score from two foot-eye coordination tests is in low score performance category.

CHAPTER FIVE

SUMMARY, CONCLUSSION AND RECOMANDATION

Introduction

Today's athletes are becoming bigger, stronger, and faster (Costill et al., 1968; Kraemer & Gotshalk 2000). This is a function of most strength and conditioning programs that evaluate their athletes on various tests used to measure their performance in categories, such as strength, endurance, speed, agility, balance and coordination. In this sense, the strength and conditioning professional uses these tests to evaluate the athlete by comparing scores to another population's scores.

The tests that are being evaluated, are designed to study the effects of training (controlled) on certain qualities, these include: the squats, 300 yard shuttle, home step, zigzag, stand stork, and coordination. These tests are used to make comparisons between project participants and non participants. In connection to this, the comparison made in this study, focused primarily on the project participants and non participants of kirkos sub city U-17 football project players. Comparison is the issue of outmost importance. Also, with the review of literature that has established the importance of evaluating tests (Arthur & Bailey 1998). The collecting of data that represents test scores between project participants and non participants may help the project coaches and professionals in proper and sport-specific program design.

The purpose of this study was to determine what influence the strength, speed, endurance, agility, balance and coordination tests scores have on an individual's playing status. These findings may be used to help the project coaches and professional to develop programs that may be more sport-specific for certain positions or position groups.

5.1. Summary

The innermost intention of this study was to identify and compare the basic and complex performance qualities between project participants and non participants in some training qualities.

The study was mainly designed to answer the following basic questions.

1. Is project training effective in selected parameters?
2. Is there significant difference between project participants and non participants?

In order to answer these questions, the data relevant to the study were gathered by comparing the results of both groups according to the raw score norms of each test.

Finally, on the basis of the analyzed data the following main findings were obtained from the study.

The study showed that:

- ✓ Effective training was given that is relevant to selected parameters.
- ✓ Project participants are better than non participants in all six tests.
- ✓ Project participants score list result according to raw score norms in some parameters i.e. balance and coordination.
- ✓ Non participants score better in second test than first test.

5.2. Conclusion

It is concluded that all the six tests adopted for the study are capable of increasing the performance for each test at the end of 8th week training program and the given relevant exercise through the eight weeks had significant change even in non participants in some parameters i.e. –strength and agility. In conclusion the results of the present study confirm the fact that project participants are comparatively better than non participants in basic and complex performance qualities except stand stork test, this shows and help the project coaches and professionals that testing the project athlete“s is vital to differentiate their specified position and understand their strength and weakness before they begin their training program, There were no athletes testing programs before the players join the project training. The information derived from this study will not only serve professionals and coaches in their testing of young athletes, but provide guidelines for training programs for team games athletes and yield valuable information for future researchers.

5.3. Recommendation

The following points are recommendation to excellent solution for comparative analysis between project participants and non participants.

- ✚ The sub-city should work with trained testers.
- ✚ Every football project trainees should go through performance testing process.
- ✚ The project coaches should give emphasis for balance and coordination training.
- ✚ The present study was delimited only to male players; the same type of study may be made with female students.

BIBLIOGRAPHY

- Arnot, R. and Gaines, C. (1984) *Sports Talent*. Harmondsworth: Penguin
- Arthur, M. R., & Bailey, B. (1998). Complete Conditioning for football. Champaign, IL: Human Kinetics.
- Baechle, T. R., & Earle, R. W. (2008). Essentials of strength training and conditioning (3rd ed. ed.). Leeds: Human Kinetics.
- Baker, D. G. (2001). Comparison of upper-body strength and power between professional and college-aged rugby league players. *J Strength Cond Res*, 15(1), 30-35.
- Bangsbo, J. (2003). Fitness training in soccer: a scientific approach (English ed.). Spring City, PA: Reedswain Inc.
- Bangsbo, J., Mohr, M., & Krstrup, P. (2006). Physical and metabolic demands of training and match-play in the elite football player. *J Sports Sci*, 24(7), 665-674.
- Beashel, P and Taylor, J (1997) Fitness for Health and performance. In: Beashel, P and Taylor, J, *the World of Sport Examined*. Croatia: Thomas Nelson and Sons, p. 66
- Bezabih W.(1997) *Complied Sport Medicine* K.C.T.E.
- Bisanz, G., & Gerisch, G. (2008a). Fussball: Kondition - Technik - Taktik und Coaching. Aachen: Meyer & Meyer.
- Bisanz, G., & Gerisch, G. (2008b). Fussball: Kondition – Technik – Taktik und Coaching. Aachen: Meyer & Meyer.
- Bloomfield J, Polman R, O'Donoghue P. Deceleration and turning movements performed during FA Premier League soccer matches. In: Reilly T, Korkusuz F (eds). Science and football VI; the proceedings of the sixth world congress on science and football. Taylor & Francis, London 2008:174-181.
- Bompa, T. O., & Claro, F. (2009). Periodization in rugby. Maidenhead: Meyer & Meyer.
- Bompa, T. O., & Haff, G. (2009). Periodization : theory and methodology of training (5th ed. ed.). Leeds: Human Kinetics.
- Boulay MR, Simoneau IA, Lortie G, Bouchard C. (1997) Monitoring high-intensity endurance exercise with heart rate and thresholds. *Med Sci Sports Exerc* 29 (1):125-132

- Carling, C., Reilly, T., & Williams, A. M. (2009). Performance assessment for field sports. London ; New York: Routledge.
- Chia (2007) fit to play: enabling play and physical activity in children's cognitive, social and emotional and physical development through movement. Nonisk and daswanis (eds) pearson education asia.singapore.pp:112-128.
- Clark, J. R., Lucett, S., & Kirkendall, D. (2010). NASM's essentials of sports performance training. Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins.
- Costill, D.L. (2005) *Physiology of Sport and Exercise*. 3rd ed. Champaign, IL: Human Kinetics
- Coulson, M., & Archer, D. (2009). Practical fitness testing. London: A. & C. Black.
- Cronin, J. B., & Hansen, K. T. (2005). Strength and power predictors of sports speed. J Strength Cond Res, 19(2), 349-357.
- Davelin,C.D(2004). Dynamic balance in high level athlete's perceptual and motor skills,98,1171-1176.doi:10.2466/Pms.98.3c 1171-1176.
- Davenne, D. (2009). Sleep of athletes - problems and possible solutions. Biological Rhythm Research, 40(1), 45-52.
- Dement, W. (2005). Sleep extension: Getting as much extra sleep as possible. Clinics in Sports Medicine, 24(2), 251-268.
- Derby, R., & deWeber, K. (2010). The athlete and high altitude. Current Sports Medicine Reports (American College of Sports Medicine), 9(2), 79-85.
- Dick, F. W. (2007). Sports training principles (5 ed.). London: A & C Black.
- Dunbar CC, Goris C, Michielli DW, Kalinski MI. (1994) Accuracy and reproducibility of an exercise prescription based on ratings of perceived exertion for treadmill and cycle ergo meter exercise. Percept Mot Skills 78: 1335-1344
- Fitness Canada (1986) Canadian Standardized Test of Fitness (CSTF) Operations Manual. 3rd Ed. Ottawa: Fitness and Amateur Sport, Canada
- Foss, M. L., & Keteyian, S. J. (1998). Physiological Basis for Exercise and Sport. Boston, MA: McGraw-Hill.

- French, J. and Long, M. (2012) How to improve your VO₂max. *Athletics Weekly*, November 8 2012, p.53
- Gambetta, Vern. (1998). the Gambetta Method. Sarasota, Florida, Gambetta Sports Training System, Inc.
- Gollnick, P.D. et al. (1972) Enzyme activity and fiber composition in skeletal muscle of untrained and trained men. *J Appl Physiol.*, 33 (3), p. 312-319
- Graham, J. (1994). Guidelines for Providing Valid Testing of Athletes Fitness Levels. *Strength and Conditioning*, 7-13.
- Hamill, J., & Knutzen, K. (2009). *Biomechanical basis of human movement* (3rd ed. ed.). Philadelphia, Pa. ; London: Lippincott Williams & Wilkins.
- Heyward, V. H. (2006). *Advanced fitness assessment and exercise prescription* (5th ed.). Champaign, IL: Human Kinetics.
- Hoff, J. (2005). Training and testing physical capacities for elite soccer players. *J Sports Sci*, 23(6), 573-582.
- Hopkins and walker (1988) the meanings of physical fitness. *Preventive med.* 17. 764-773
- Horak,F.B.(2006). Postural orientation and equilibrium: what do we need to know about neural control of balance to prevent falls? *Age and Aging*, 35(supp12),ii7-ii11.
- Jackson, A.S. et al. (1995) Changes in aerobic power of men, ages 25-70 yr. *Med Sci Sports Exerc.*, 27 (1), p. 113-120
- Joseph FN, Joann K, Darrick P, Angie R. (2001) Comparison of the Counting Talk Test and Heart Rate Reserve Methods for Estimating Exercise Intensity in Healthy Young Adults. *JEP online*. 4 (4):15-2
- Johnson, B.L. and Nelson, J.K. (1979) *Practical measurements for evaluation in physical education*. 4th Edit. Minneapolis: Burgess
- Kaplan T, Erkmén N, Taskin H. The evaluation of the running speed and agility performance in professional and amateur soccer players. *J Strength Cond Res*. 2009;23(3): 774-778.
- Karvonen MJ, Kentala E, Mustala O. (1957) the effects of training on heart rate: a longitudinal study. *Ann Med Exper Fenn* 35(3):307-315

- Komi, P. V. (2003). *Strength and power in sport* (2nd ed. ed.). Osney Mead, Oxford: Blackwell Science.
- Kothari C .R(2004)research methodology methods and techniques. New age international publishers. New delhi.p 1-10
- Kraemer, W. B., & Gotshalk, L. A. (2000). *Physiology of American Football*. Exercise and Sport Science, 795-813.
- Little, T., & Williams, A. G. (2005). Specificity of acceleration, maximum speed, and agility in professional soccer players. *J Strength Cond Res*, 19(1), 76-78.
- Lockie, R.G. et al. (2003) Effects of resisted sled towing on sprint kinematics in field-sport athletes. *Strength Cond Res.*, 17 (4), p. 760-767
- Loran, D.; Griffiths, G. Visual performance and soccer skills in young players. *Optometry Today*, v. 41, p. 32-34. 2001.
- Mahler, D. A. (1995). *ASCM's guidelines for exercise testing and prescription* (5th ed.). Malvern, PA, USA ; London: Williams & Wilkins.
- Maud, P. J., & Foster, C. (2006). *Physiological assessment of human fitness* (2nd ed. ed.). Leeds: Human Kinetics.
- Murray, A. (2005) the effects of resisted sled-pulling sprint training on acceleration and maximum speed performance. *J Sports Med Phys Fitness*, 45 (3), p. 284-90
- Pollock,A.S.,Durward,B.R.,Rowe,P.J.,&paul,J.P.(2000).what is balance? *Clinical rehabilitation*,14,402-406.
- Quevedo, L.; Sole, J.; Palmi, J.; Planas, A.; Saona, C. Experimental study of visual training effects in shooting initiation. *Clinical and Experimental Opto metry*, v. 82, p. 23-28, 1999.
- Reilly T, Williams AM, Nevill A, Franks A. A multidisciplinary approach to talent identifications in soccer. *J Sports Sci*. 2000;18(9):695-702.
- Reilly, T. (1996). Fitness assessment. In T. Reilly (Ed.), *Science and soccer* (pp. 25-50). London: E&FN Spon.
- Reilly, T., & Williams, A. M. (2003). *Sc ience and soccer* (2nd ed.). London ; New York: Routledge.

- Reiman, M. P., & Manske, R. C. (2009). Functional testing in human performance. Champaign, IL: Human Kinetics.
- Reinhold, T. (2008). Leistungsdiagnostik im Fußball: Anforderungsprofil, Konditionstests, Diagnostik im Spitzenfußball. Saarbrücken Vdm Verlag.
- Revien, L.; Gabor, M. Sports Vision: Dr . Revien's Eye Exercises for Athletes. New York: Workman Publishing; 1981.
- Saltin, B. and Rowell, L.B. (1980) Functional adaptations to physical activity and inactivity. *Federation Proceeding*. 39 (5), p. 1506-1513
- Schell, J. and Leelarthaepin, B (1994) *Physical Fitness Assessment in Exercise and Sports Science*. 2nd Ed, Leelar Biomedisience Services, Matraville, NSW. p. 327
- Schmid, S., & Alejo, B. (2002). Complete conditioning for soccer. Champaign, Ill. ; Leeds: Human Kinetics.
- Schnabel, G., Harre, D., Krug, J., & Borde, A. (2003). Trainingswissenschaft: Leistung - Training - Wettkampf. München: Sportverlag.
- Scott (2009) functionally integrated training for soccer, soccer fit academy.
- Shephard, R. J., & Astrand, P. O. (2000). Endurance in sport (2nd ed. ed.). Oxford: Blackwell Science.
- Shim, J.; Carlton, L. G. ; Kwon, Y. H. Perception of kinematic characteristics of tennis strokes for anticipating stroke type and direction. *Research Quarterly for Exercise and Sport*, v. 77, p. 326-339, 2006.
- Siegel, R., & Laursen, P. (2012). Keeping your cool: Possible mechanisms for enhanced exercise performance in the heat with internal cooling methods. *Sports Medicine (Auckland, N.Z.)*, 42(2), 89-98. doi:10.2165/11596870-000000000-00000
- Singh (1986) normative study of physical fitness of Punjab university men students. Unpublished doctoral thesis, Punjab University, Chandigarh.
- Sodhi and sidhu (1984) physique and selection of sportsmen-a kin anthropometric study.patialapubl.house,Patiala.

- Sporis G, Jukic I, Milanovic L, Vucetic V. Reliability and factorial validity of agility tests for soccer players. *J Strength Cond Res.* 2010;24(3):679-686.
- Steinhöfer, D. (2003). *Grundlagen des Athletiktrainings*. Münster: Philippka.
- Stolen, T., Chamari, K., Castagna, C., & Wisloff, U. (2005). Physiology of soccer: an update. *Sports Med*, 35(6), 501-536.
- Tanaka (2004) role of exercise science in maintaining overall quality of life in humans. *Japan j. phys. educ. hlth. sport sci.*49,209-229.
- Taskin H. Evaluating sprinting ability, density of acceleration, and speed dribbling ability of professional soccer players with respect to their positions. *J Strength Cond Res.* 2008;22(5):1481-1486.
- Thiess, G., & Schnabel, G. (1995). *Leistungsfaktoren in Training und Wettkampf*. Berlin: Sportverlag.
- Tyson, S.F., & Connel, L.A. (2009) How to measure balance in clinical practice. A systematic review of the psychometrics and clinical utility of measures of balance activity for neurological conditions. *clinical rehabilitation*, 23, 824-840.
- Uppal ak (1980) effect of 10 week participation in physical education program on selected strength variables in women. *Snipes*.3(3), 31-34.
- Wegmann, M., Faude, O., Poppendieck, W., Hecksteden, A., Fröhlich, M., & Meyer, T. (2012). Pre-cooling and sports performance: A meta-analytical review. *Sports Medicine*, 42(7), 545-564.
- Weineck, J. (2004). *Optimales Training: Leistungsphysiologische Trainingslehre unter besonderer Berücksichtigung des Kinder- und Jugendtrainings* (15 ed.): Spitta.
- Wenger HA, Bell GI. (1986) The interactions of intensity, frequency, and duration of exercise training in altering cardiorespiratory fitness. *Sports Medicine* 3:346-356
- White JR. (1977) EKG changes using carotid artery for heart rate monitoring. *Med Sci Sports* 9:88-94
- Willis, J. (2009). How students' sleepy brains fail them. *Kappa Delta Pi Record*, 45(4), 158-162.
- Wilmore, J. H., Costill, D. L., & Kenney, W. L. (2008). *Physiology of Sport and Exercise*. Champaign, IL: Human Kinetics.

Wisloff, U., Castagna, C., Helgerud, J., Jones, R., & Hoff, J. (2004). Strong correlation of maximal squat strength with sprint performance and vertical jump height in elite soccer players. *Br J Sports Med*, 38(3), 285-288.

Young, W. B., McDowell, M. H., & Scarlett, B. J. (2001). Specificity of sprint and agility training methods. *J Strength Cond Res*, 15(3), 315-319.

JOURNALS

Alexander, N. B. (1994). Postural control in older adults. *Journal of the American Geriatrics Society*, 42, 93-108.

Arce, J. H. (1994). Purdue University's Power Building Strength and Conditioning Program. *Strength and Conditioning Journal*, 7-19

Costill, D. L., Hoffman, W. M., Kehoe, F., Miller, S. J., & Myers, W. C. (1968). Maximum anaerobic power among college football players. *Journal of Sports Medicine and Physical Fitness*, 8, 103-106.

DaRosa, M. J., Jotwani, V., & Valentine, V. (2012). Traveling to high altitude with athletes. *International Journal of Athletic Therapy & Training*, 17(5), 11-17.

Dugas, J. P. (2010). How hot is too hot?: Some considerations regarding temperature and performance. *International Journal of Sports Physiology & Performance*, 5(4), 559-564.

Ebben, W. P. (1998). A Review of Football Fitness Testing & Evaluation. *Strength and Conditioning Journal*, 42-47.

Fietze, I., Strauch, J., Holzhausen, M., Glos, M., Theobald, C., Lehnkering, H., & Penzel, T. (2009). Sleep quality in professional ballet dancers. *Chronobiology International: The Journal of Biological & Medical Rhythm Research*, 26(6), 1249-1262.

Fischer, F., Nagai, R., & Teixeira, L. (2008). Explaining sleep duration in adolescents: The impact of socio-demographic and lifestyle factors and working status. *Chronobiology International: The Journal of Biological & Medical Rhythm Research*, 25(2/3), 359-372.

Fry, A. C. et al. (2014) Kansas Squat Test: A Reliable Indicator of Short-term Anaerobic Power. *The Journal of Strength & Conditioning Research*, 28 (3), p. 630-635

Guskiewicz, K. M., & Perrin, D. H. (1996). Research and clinical applications of assessing balance. *Journal of Sport Rehabilitation*, 5, 45-63.

- Harmon, K. G., Drenth, J. A., Gammons, M., Guskiewicz, K. M., Halstead, M., Herring, S. A., ... Roberts, W. (2013). American medical society for sports medicine position statement: concussion in sport. *British Journal of Sport Medicine*, 47, 15-26. doi:10.1136/bjsports-2012-091941.
- Hue, O. (2011). The challenge of performing aerobic exercise in tropical environments: Applied knowledge and perspectives. *International Journal of Sports Physiology & Performance*, 6(4), 443-454.
- Hue, O., & Galy, O. (2012). The effect of a silicone swim cap on swimming performance in tropical conditions in pre-adolescents. *Journal of Sports Science & Medicine*, 11(1), 156-161.
- Jones, A. (1991). Test and measurement: 300-yard shuttle run. *Strength & Conditioning Journal*, 13(2), p. 56-60.
- Levine, B. D., Stray-Gundersen, J. J., & Mehta, R. D. (2008). Effect of altitude on football performance. *Scandinavian Journal of Medicine & Science In Sports*, 18, 76-84.
- Lindberg, A., Malm, C., Hammarström, D., Oksa, J., & Tonkonogi, M. (2012). Maximal work capacity and performance depends on warm-up procedure and environmental but not inspired air temperatures. *Journal of Exercise Physiology Online*, 15(1), 26-39.
- Mancini, M., & Horak, F. B. (2010). The relevance of clinical balance assessment tools to differentiate balance deficits. *European journal of physical and rehabilitation medicine*, 46, 239-248.
- Marino, F., Mbambo, Z., Kortekaas, E., Wilson, G., Lambert, M., Noakes, T., & Dennis, S. (2000). Advantages of smaller body mass during distance running in warm, humid environments. *Pflügers Archiv: European Journal of Physiology*, 441(2-3), 359-367.
- Nimmo, M. (2004). Exercise in the cold. *Journal of Sports Sciences*, 22(10), 898-916.
- Nimmo, M. A. (2005). The application of research to athletic performance in the cold. *International Sportmed Journal*, 6(4), 224-235.
- Oliver, S., Costa, R., Laing, S., Bilzon, J., & Walsh, N. (2009). One night of sleep deprivation decreases treadmill endurance performance. *European Journal of Applied Physiology*, 107(2), 155-161. doi:10.1007/s00421-009-1103-9
- Peiser, B., Reilly, T., Atkinson, G., Drust, B., & Waterhouse, J. (2006). Seasonal changes and physiological responses: Their impact on activity, health, exercise and athletic performance. *International Sportmed Journal*, 7(1), 16-32.

- Sargeant, A. J. (1987). Effect of muscle temperature on leg extension force and short term power output in humans. *European Journal of Applied Physiology*, 56, 693-698.
- Underwood, J. (2010). Sleep. *Coaches Plan*, 17(1), 31-34. Vargas, T. M., & Short, S. E. (2011). Athletes' perceptions of the psychological, emotional, and performance effects of coaches' pre-game speeches. *International Journal of Coaching Science*, 5(1), 27-43.
- Wolfson, I., Whipple, R., Derby, C. A., Amerman, P., & Nashner, L. (1994). Gender differences in the balance of healthy elderly as demonstrated by dynamic posturography. *Journal of Gerontology*, 49, M160-M167.
- Woollacott, M. H., & Shumwaycook, A. (1996). Concepts and methods for assessing postural instability. *Journal of and physical activity*, 4, 214-233.

WEB SITES

- Mackenzie, B. (2005) Zigzag Test [WWW] Available from: <http://www.brianmac.co.uk/zigzag.htm> [Accessed 28/11/2014]

Appendix A



Figure 1 descriptions of stand stork test

- The athlete stands comfortably on both feet with their hands on their hips
- The athlete lifts the right leg and places the sole of the right foot against the side of the left kneecap
- The assistant gives the command “GO”, starts the stopwatch and the athlete raises the heel of the left foot to stand on their toes
- The athlete is to hold this position for as long as possible
- The assistant stops the stopwatch when the athlete’s left heel touches the ground or the right foot moves away from the left knee
- The assistance records the time



Figure 2 descriptions of foot-eye coordination test

- The athlete stands one stride back from the ball
- The assistant gives the command "GO" and starts the stopwatch
- The athlete juggling a ball alternatively on the right and left leg this cycle of juggling is repeated for 30 seconds.
- The assistant counts the number of juggling a ball and stops the test after 30 seconds
- The assistant records the number of juggling



Figure 3 descriptions of squat test

- The athlete stands in front of a chair, facing away from it, with their feet shoulder width apart
- The athlete squats down lightly touching the chair with their backside before standing back up and repeats this sequence of movements until they are unable to continue
- The assistant counts and records the number of successfully completed squats



Figure 4 descriptions of home-step test

- The assistant gives the command “GO” and starts the stopwatch
- The athlete steps up and down, one foot at a time, onto the step or bench at a steady 24 steps/minute for 3 minutes
- The assistant ensures the athlete maintains the required 24 steps/minute pace
- The assistant stops the test after 3 minutes and immediately records the athlete’s heart rate (bpm)



Figure 5 descriptions of zigzag test

- The assistant marks out a rectangle 10 by 16 feet with four cones and places a cone in the centre
- The assistant gives the command "GO" and starts the stopwatch
- The athlete commences the test at the Start & Finish cone and follows the grey route indicated in the diagram
- The assistant stops the stopwatch and records the time when the athlete's torso crosses the Start & Finish cone



Figure 6 descriptions of 300 yard shuttle test

- The assistant marks out a 30 yards (27.4 meters) straight section with two cones
- The athlete starts at one cone
- The assistant gives the command 'GO' and starts the stopwatch
- The athlete performs 10 shuttle runs between the two cones at maximum effort and at each turn touches the cone with a foot
- The assistant stops the stopwatch and records the time when the athlete completes the 10 shuttle runs

Declaration

I declared that this thesis is my own original work and has not been presented for any degree and that all sources of materials used for the study have been duly acknowledged.

Name Feleke Berhanu

Signature _____

Date: June 2015

This thesis has been submitted for examination with my approval as a university advisor.

Name Bezabih Wolde (Dr)

Signature _____

Date: June 2015

APPENDIX B

	Personal best score of experimental group			Types of tests							
				Strength No_of counts	Speed In seconds	Endurance H/R/M		Agility In seconds	Balance In seconds		Coordination No_of counts For 30 sec
						L	R		L	R	
	Name of the athlete	sex	age								
1	Getamesay	M	17	92	56:70	132	116	6	8	9	21
2	Abdurezak			78	58:06	100	84	8	24	30	37
3	Teshome			118	57:02	100	84	8	9	7	48
4	Solomon			96	55	88	80	7	5	6	9
5	Eyob			250	56:20	96	84	7	21	24	51
6	Natinael			162	55:11	116	110	7	22	25	28
7	Fikadu			176	60:75	104	108	8	7	7	53
8	Ibrahim			151	58:52	118	118	7	10	12	44
9	Petros			75	60:65	102	96	8	12	9	58
10	Fraol			158	60	88	110	6	26	27	18
11	Eyobel			101	60:19	108	92	6	18	27	19
12	Hamid			90	58:57	112	120	6	12	21	38
13	Semir			168	59:01	116	120	7	12	17	8
14	Fekede			102	59:48	104	112	7	15	17	38
15	Daniel			100	60	116	106	8	18	22	32
16	Asrat			117	01:02	100	108	7	8	11	36
17	Natinael mulugeta			74	59:46	108	108	7	7	8	31
18	Biniyam			101	58:72	96	96	7	13	16	23
19	Zekarias			82	58:10	100	106	8	24	24	36
20	Mujib			122	59:70	96	104	7	11	12	36
21	Aschalew			89	60:59	104	112	8	27	21	27
22	Mesfin			92	58:50	104	104	6	12	6	21
23	Henok			102	58:59	116	112	7	16	11	21
24	Hailemelak			70	57	92	96	8	27	19	37
25	Biruk			98	58:11	100	96	8	11	9	21
	mean			114.56	10.745	104.64	103.28	7.16	15	15.88	31.64
	Standard deviation			41.77	48.83	10.35	11.78	0.782	6.87	7.637	13.1
	median			101	59:46:00	104	106	7	12	16	32

	Personal best score of control group			Types of tests							
				Strength No_of counts	Speed In seconds	Endurance H/R/M		Agility In seconds	Balance In seconds		Coordination No_of counts For 30 sec
		Name of the athlete	sex			age	L		R	L	
1	Yohannes	M	17	84	60:12	140	148	11	6	5	5
2	Semed			77	60:12	156	152	11	5	4	8
3	Yonas			69	60:12	140	148	11	5	6	9
4	Zerihun			52	60:14	156	160	11	7	5	6
5	Eyuel			50	60:10	156	160	12	7	5	6
6	Elias			55	60:20	160	168	11	9	7	6
7	Jafar			61	60:13	144	152	10	7	4	5
8	Gezahegn			54	60:09	160	168	11	5	5	4
9	Tariku			50	60:12	152	152	11	3	5	8
10	Bisrat			56	60:14	144	148	11	5	4	7
11	Shamil			61	60:13	140	144	11	4	4	7
12	Sitotaw			58	60:12	160	164	10	7	7	6
13	Tibebe			54	60:13	160	168	10	8	6	6
14	Naod			60	60:14	168	172	11	6	6	5
15	Kirubel			54	60:13	136	140	10	6	6	7
16	Kalkidan			50	60:12	152	156	11	8	7	8
17	Yared			56	60:13	124	132	10	6	7	6
18	Tewodros			42	60:13	136	144	11	6	6	5
19	Tomas			58	60:12	168	176	10	8	7	7
20	Yonas tekle			61	60:13	164	172	11	6	7	7
21	Seife			68	60:13	168	176	11	7	7	5
22	Samson			70	60:14	116	120	10	8	9	7
23	Mikaele			52	60:13	132	140	11	7	8	8
24	Bereket			68	60:12	160	160	11	9	6	8
25	Kedir			55	60:13	164	172	11	6	7	7
	mean			59	72:202	150.24	155.68	10.76	6.44	6	6.52
	Standard deviation			9.35	12.32	14.28	14.46	0.522	1.47	1.32	1.26
	median			56	60:13:44	156	156	11	6	6	7

