

## **Effects of Physical Fitness Exercises on Muscular Strength and Endurance Performance of Male Football Players of Tabor Secondary School**

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**Abstract :** The main objective of this study was to explore the effects of physical fitness exercises in maximizing muscular strength and Endurance abilities of selected male football players. From Tabor Preparatory School thirty male football players were selected purposively as study subjects, with age ranges of 18 -19 years. All Selected subjects participated on proposed exercises training program for 12 consistent weeks, 3 days per a week, 90 minute duration per a day. Pre and post training tests were conducted on physical fitness variables such as, muscular endurance and muscular strength. The data collected from selected subject were analyzed using SPSS version 20 software. The data pertaining with components of physical fitness measurement were analyzed by paired simple T-test to determine the difference between initial and final mean of participants. According to the analyzed data in step test 29.6 (beats per minute) mean differences, and squat test 8.06 (squats per minute) mean differences were recorded. The mean differences value of sit ups and pushups performances of mean differences 10.74 and 9.24 (number per minute) were respectively recorded. In twelve minutes run 260.37 meters increments were observed. The results obtained in the study indicate that, there were significant improvements in squat, sit-ups, pushups, 12 minutes run and in the case of steps test, heart beat was reduced because of improvement in the performance. It is noted that the final findings of this study were significantly improved on all physical fitness variables due to the twelve weeks of physical fitness training program.

**Keywords:** - physical fitness, football, strength, endurance.

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### **I. INTRODUCTION**

Football as we know it in the UK, there are 265 million male and female football Players. The game is played by men, women and children of all ages and levels of abilities. Success as a player requires an appropriate mixture of mental, physical, technical and tactical abilities (FIFA, 2007. Football is the most popular worldwide sport which is characterized by high intensity, short term actions and pauses of varying length (Stroyer et al., 2004). Football is being played in every nation without exception. Sport has become a popular past time among the people. Above all, interest in football has been growing in the worlds over the years.

Football under the rapid increasing popularity has also need a demand of excellent performance. The football practitioners require many attributes to become successful Players. These include cardiovascular fitness, muscle strength, muscular Endurance, flexibility, agility, Coordination, skill and tactical knowledge (Teshome, 2012). To succeed in a team sport, football players need the optimal combination of technical, tactical, physical characteristics and mental motivation (Bangsbo & Michalsik, 2002).

Football is characterized as an intermittent sport, making physiological demands more complex than continuous sports such as running (Drust et al., 2000). It requires a number of physiological qualities to be performed at the highest intensity and skill execution with an exceptionally high standard of technical ability, as well as a tactical understanding of the game. Physical qualities of football players include aerobic and anaerobic endurance, strength, agility, and sprinting ability, jumping and kicking power. Like elite sprinters or distance runners, football payers generally have extraordinary capacities in one single physical quality (Hoff and Helgerud 2004).

For young players, the most important attributes are high levels of skill in passing, shooting, dribbling, and heading. The players must be able to execute these skills on a variety of field surfaces and when the ball is delivered either in the air or on the ground. Once these technical skills have been achieved, it is much easier for the player to develop the necessary decision-making ability, field positioning, speed, endurance, and

psychological characteristics. It is important to first assess the ability levels of the players and then to challenge them at those levels, which will make the game more enjoyable (Sport science exchange Roundtable, 2000).

Maximum strength is the maximum capability of a muscle or muscle group to generate tension. It is often measured by the one repetition maximum test (1RM), which is operationally defined as the heaviest load that can be moved over a specific range of motion, one time and with correct performance (Marta and Paulo, 2003). Strength and conditioning programs have helped many athletes become stronger, faster, and, in some cases, larger. These programs have also succeeded in providing athletes with the ability to enhance their performance. It is a commonly accepted fact that many football skills can be enhanced through proper strength training and conditioning (Jack, 2001).

Excellent endurance performance capacity has long been recognized as important prerequisite for on-field performance of football players (Bangsbo et al., 2006; Ekblom, 1986; Reilly, 1997). For instance, a player's aerobic endurance capacity facilitates performance retention, which is limited by endurance, throughout a 90-120 minutes game. In addition, it influences the regeneration capabilities following high-intensity games and training units and the recovery following brief high-intensity exercise spurts during games or training unit (Broich et al., 2012). Muscular endurance tests are those in which a number of repetitions are performed with sub maximal loads (Marta and Paulo, 2003).

Further, well-established anaerobic endurance capacity is important for explosive and maximum execution of such high-intensity game situations (Ekblom, 1986; Reilly, 1997; Reilly et al., 2008). Because of the importance of players' aerobic and anaerobic endurance capacity, maximizing this capacity is the central element of conditioning training in football players. Performance control and the design of player-specific training regimen aimed at performance optimization rely on diagnostic methods for the assessment of individual player's potentials and capacities.

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

The fitness formula for a well-conditioned football player is a simple one. There are no shortcuts, no magic pills. A long-term commitment is necessary to reach and maintain a player full physical potential. The two primary objectives of the strength program are to prevent injury and enhance the abilities to play the game. Those abilities include strength, speed, power and the ability to sustain these qualities for an entire game. Also the strength program of a football player must be intense, brief, and generate the type of muscular gains that are most functional in playing the game (Hoff and Helgerud, 2002).

Hence, the present study was employed with a view to improve with regard to the relationship of selected physical fitness variables to maximize the ability of football players of Tabor secondary school. Hawassa city is the investigator's working area where the researcher served and has more work experiences in teaching physical education and sport. Within this long period of time the researcher has been observed a lot of problem in muscular strength and endurance performance of football players in Tabor secondary school, SNNPR.

## **II. Methods**

### **2.1. Study design**

The study was focused on quasi-experimental study within 12 weeks designed training program to examine the effects of physical fitness exercises in maximizing muscular strength and Endurance abilities of selected male football players.

### **2.2. Participants Sample Size and Sampling Techniques**

The researcher was used purposive sampling technique. Its elements and purpose of the study may be members of subjects are easily identified from its larger population (Babbie, 2007). The selection of subjects based on their age, health status and on their interest to participate in physical fitness exercises program of muscular strength and endurance. The sample size of this study was 30 purposively selected male players between the ages of 18 and 19 years from Tabor secondary school male football players in Hawassa, SNNPR.

### **2.3. Data collection Instrument and procedure**

The data were collected using the following measurements;

#### **Steps Test**

Before starting this test the investigator collected essential instruments for this test, such as 12 inches or 30.61cm bench, stopwatch, and heart rate monitor (optional). By the help of assistant data recorder the investigator took subjects' resting heart rate before performing warm-up exercise. Purpose of this steps test was to measure cardio respiratory fitness.

The Subjects stood in front of a step bench. Assistant data recorder was order commands to "Go", and then the stop watch was starting counting. Subjects were start steps up and down on the flat form at a rate of steps in one

minute. The complete of up and down steps were counted as one step of up and down. The subjects stopped up and down immediately on completion of the test, and the heart beats were counted for 15 seconds. Finally we multiplied these 15 seconds by 4 in order to get the beats per minute (McArdle *et al.*, 1972).

**Squat Test** Before starting this test the investigator collected essential equipment for this test, such as Stop watch, mats and Score record sheets. This test was used to measure lower body or leg strength also raising heart rate during training sessions. Before test, the subjects performed warming –up exercise properly. Subjects stood upright in front of a mat with their feet shoulder wide apart. Assistant score recorder ordered to ‘Go’ then stop watch started counting. Subject’s squats down lightly pushes down and Jump up, repeats this sequence of movements until they are unable to continue with no rest in one minute. The assistant data recorder counted and recorded the number of successfully completed squats (Fry *et al.*, 2014).

**Sit-up Test** Before starting this test the investigator collected the equipment for this test such as mat, stop watch, pen and score record sheets. The participants performed enough warming up and stretching exercises. The Subjects lie on back, hands on back of neck with fingers clasped, knees bent less than 90 degrees, feet on floor and heels no more than 12 inches from buttocks. Up torso until elbow is in contact with knees and return to starting position. Subjects were encouraged to perform one or two trial repetitions before test. The complete of one sit ups (up and down) of repetitions were counted as one half sit up. The assistant score recorder recorded number of repetitions of sit-ups performed in 60 seconds (YMCA, 2000).

**Push-Ups Test** The muscles of the upper body and shoulders are another frequently measured muscle group. Push-up is used to measure the strength and endurance of upper body muscle groups. Less muscular strength and endurance of the upper body and shoulder group may increase the chances that a person may have shoulder pain. In this test, only the upper body is load. Before starting this push up tests the participants performed warming up and stretching exercises.

**Twelve (12) Minutes Run/ Walk Test (Cooper test)** The subjects of quasi experimental group started running on athletics track. The subjects did their best to run many laps around running track for 12minutes. When 12 minutes over the subjects stopped running and they stood on their spot. Then, the amount of distance covered by subjects within twelve minutes and the exercise heart rate (EHR) of each subject were measured in meter and beat per minute. In addition, after getting plenty of resting time, resting heart rate (RHR) of the subjects was measured in best minute.

#### 2.4. Data analysis

The data was collected through physical fitness assessment tests and analyzed by using computerized statistical package software of version twenty (SPSS V20). Mean  $\pm$  SE; Mean  $\pm$ SD were used to report the physical fitness status of the players. The paired sample t-test was used to compare the data among pre- test and post -tests. Level of significance was  $< 0.05\%$ .

### III. RESULTS

#### 3.1. Players fitness status of Step Test Performance (min)

As it is indicated on table 1 and figure 1, there was significant change in pre-post test results. The improvement was seen on step test mean differences values due to the twelve weeks physical fitness training, in which the subjects were engaged in. The mean value for step test before training was  $149.46 \pm 4.38$  beats per minute, and post training results mean value of step test was  $119.86 \pm 8.05$  beats per minutes after twelve weeks training program. The mean differences value was decreased by 29.6 beats per minutes. This finding showed that there was a significant improvement on cardiovascular fitness performance of the study subjects after 12 weeks training. The step test result was compared with an international step test norms among similar age groups that range from 18 and 19 years ([www.topendsport.com](http://www.topendsport.com)). The international step test norms is 148- 121 for this age groups while the step test mean value result of this study was 119.86. Hence, the study result has fallen in above average standard

**Table 1.** Mean and Standard deviation of step test (Pre-test and Post-Tests)

Variable	Experimental Group		
	N	PT	PoT
ST	30	<b>149.46<math>\pm</math>4.38</b>	<b>119.86<math>\pm</math>8.05</b>

*Values are in the form of mean  $\pm$  SD = standard deviation, PT, = pre training test, PoT= post training test, ST = step test.*

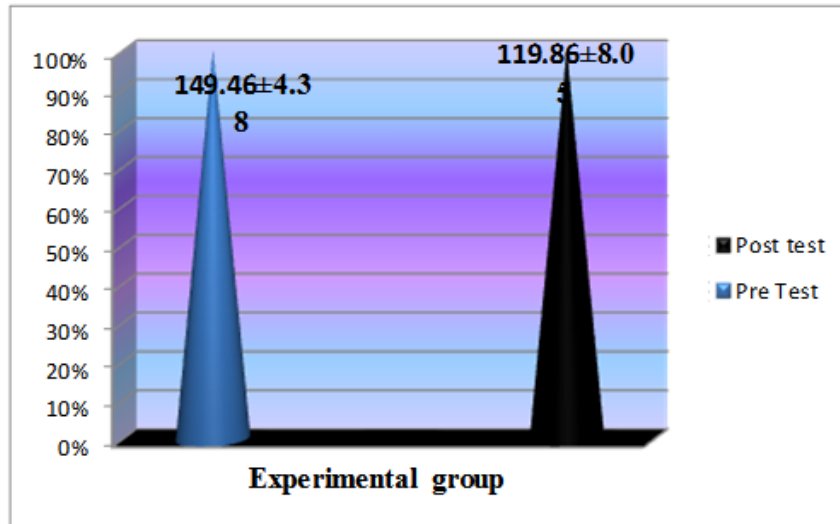


Figure 1. Mean comparison among pre and post step test results of the players

On the other hand, respondents training age in the club table 2 shows that, 18(52%) were below two years, 16(32 percent) 3 to 6 years in the club and the least 8(16 percent) were above six years in their respective clubs. This indicates that majority of the respondents were having enough training age in their clubs. In addition, marital status of players in each clubs majority of the respondents 40(80 percent) were unmarried whereas, the remaining 10(20 percent were married).

### 3.2. Players fitness status of Squat Test (number/min) Performance

As depicted in table 2 and figure 2 the squat test mean value and standard deviation of pre training test results was  $32.3 \pm 5.57$ , and post training test result was  $40.36 \pm 5.67$ . When we compare performance of pre - training test result with post training test result of the squat mean difference was 8.06 squat per minutes. The finding of this result showed an improvement in the squat performance of the participants after three months exercise of this study. It also showed the 3 months physical fitness training program had positive effects on the performance of participants' muscular strength and muscular endurance performance. In this study, comparison was made between the international squat norms and squat test result of this finding. Based on international squat test norms the age group range from 18 to 25 years is from 39- 43 squats per minute(Boot Camp,2013) while this study result depicted 40.36 squats, per minutes for the same age group. Thus, the result found in this study is above the average standard.

Table 2. Mean and Standard deviation of Squat Test (Pre and Post- test)  
Experimental group

Variable	N	PT	PoT
Sq	30	$32.3 \pm 5.57$	$40.36 \pm 5.67$

Values are in the form of mean  $\pm$  SD = standard deviation, PT, = pre training test, PoT= post training test, SqT = squat test.

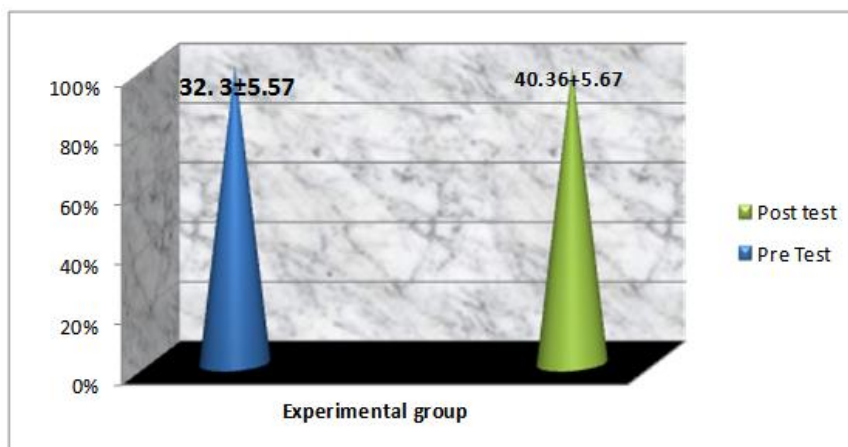


Figure 2. Mean comparison among pre and post squat test results of players

### 3.3. Players fitness status of Sit Ups (number/minute) Performance

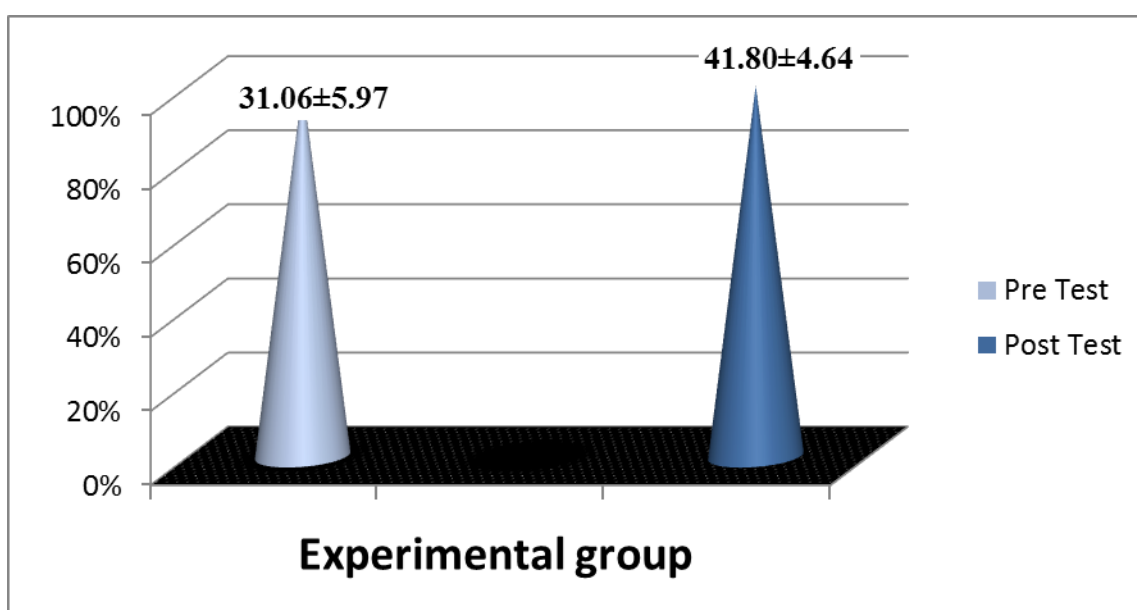
As it is revealed on table 3 and figure 3 below showed that there was a significant difference in before the exercises and post training after 12 weeks of individuals' sit-ups performance. The mean values of pre- test results of sit up was  $31.06 \pm 5.97$  mean values and SD, and post training test result of sit up was  $41.80 \pm 4.64$ . To finding this study results the researcher was compared the mean value of pre training test results with the post training test results. There was the significant increment was observed in the sit ups within 10.74 mean differences after twelve weeks fitness exercises.

**Table 3.** Mean value and standard deviation of sit ups data of players (pre and post- test)

Experimental group			
Variable	N	PT	PoT
SU	30	$31.06 \pm 5.97$	$41.80 \pm 4.64$

Values are in the form of mean  $\pm$  SD, SD = Standard deviation, PT, = pre training test, PoT= post training test, SU =Sit ups.

The study has comparative examined the sit-ups for age group ranged from 18 to 25 years. The sit-ups (number per minute) at international standard norms range from 42 to 40 sit-ups (Golding, *et al.*, 1986) whereas the finding for this study was 40.10 sit-ups per minute. Therefore, this study result is above the average standard.



### 3.4. Players fitness status of Pushups Performance number/minutes

The results which is stated on table 4 and figure 4 revealed the mean values of pushups test results. The mean values of pushups of pre training test results was  $22.46 + 2.92$ , and post training test results after twelve weeks exercises was  $31.7$ . When we compare the mean value of pushups performances of pre training test results with post test results of the participants after twelve weeks of exercises were improved by  $9.24 + 5.10$  mean differences and standard deviation.

**Table 4.** Mean value and standard deviation of Pushups data of players (pre and post- test)

Experimental group			
Variable	N	PT	PoT
PU	30	$22.46 \pm 2.92$	$31.7 \pm 5.10$

Values are in the form of mean  $\pm$  SD, SD = Standard deviation, PT, = pre training test, PoT= post training test, PU = pushups.

The result of pushups for the study subjects was compared with that of an international standard test norm for age group ranges from 15 to 19 years. The international standard test norms ranged from 29 to 38 pushups, number per minutes (Golding, *et al.*, 1986) while this study has demonstrated the finding to 31.7 pushups (number per minutes) for the same age groups. Therefore, the result of this study in good standard

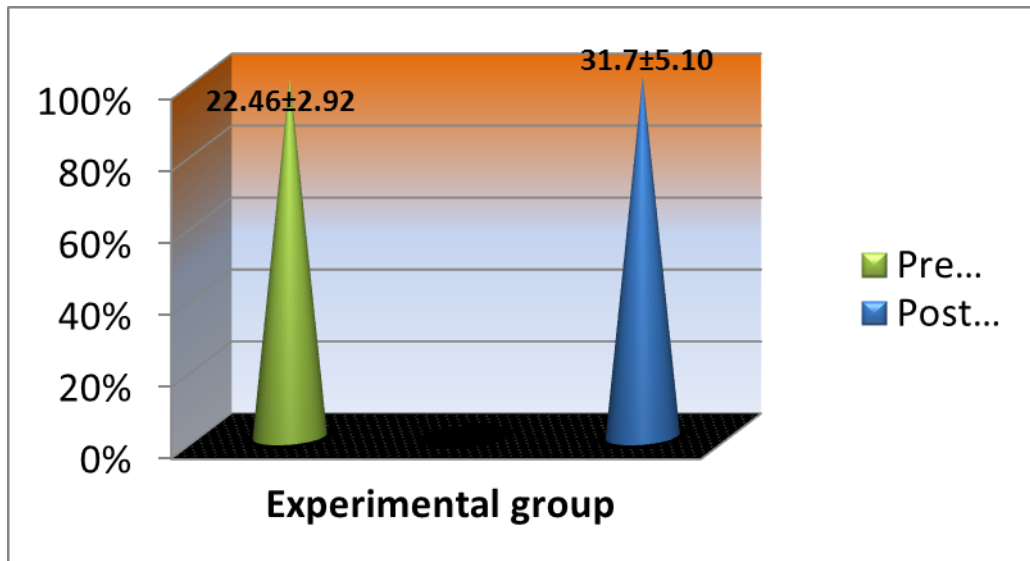


Figure 4. Mean comparison among Pre and post Pushups test results of players

### 3.5. Players fitness status of Twelve Minutes run Performance (m)

As depicted on table 5 and Figure 5 that there was a significant improvement observed in twelve minutes run (in meter) pre-post training tests mean values score of 12 weeks exercise. The mean value of pre training tests results of twelve minutes run was  $2563.5 \pm 169.4$ , and post training test mean value result of twelve minutes run were  $2823.87 \pm 66.8$ . From these results the researcher were observed the significant improvements in their performance of the subjects due to physical fitness exercises. When we compare 12 minutes run of pre and post test result of the participants after 12 weeks of exercises program. It showed a significant increment on the performance of the subjects within 260.37 meters mean differences. This result showed there was significant improvement in the performance of the participants' cardiovascular abilities.

Table 5. Mean value  $\pm$  SD of Twelve minutes Run (meter) of players (pre and post-tests)

		Experimental group	
Variable	N	PT	PoT
TMR	30	$2563.5 \pm 169.4$	$2823.87 \pm 66.8$

Values are in the form of mean  $\pm$  SD, SD = are standard deviation, PT, = pre training test, PoT= post training test, min = minute and TMR = twelve minutes run.

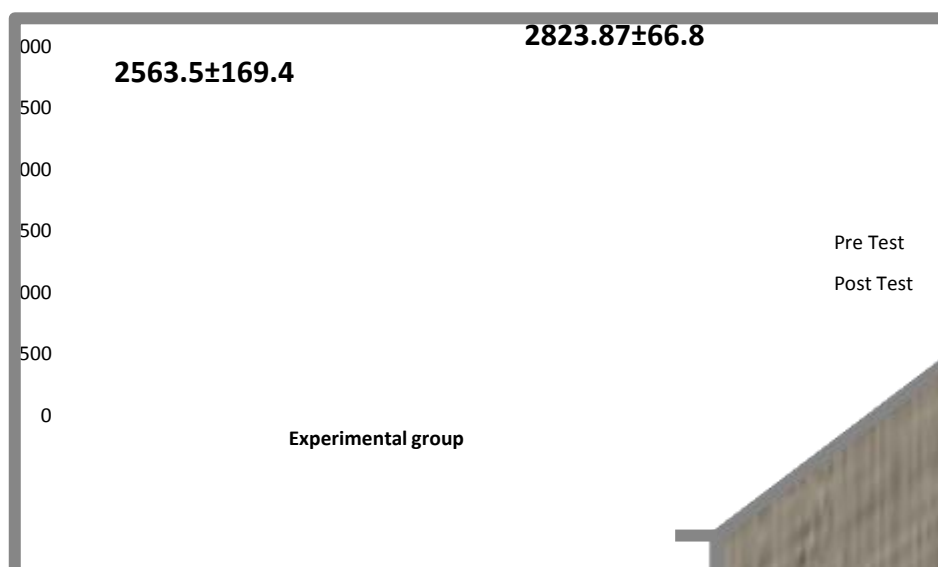


Figure 5. Mean comparison among Pre and post test results of Twelve Minutes Run

The standard norms for 12 minutes run test for male athletes whose age ranges from 17 to 19 was compared with the study result. Standard norms for this test ranges from 2700 – 3000 meters (Cooper, 1968) while the study result was found to be 2823.87 meters in 12 minutes run. Hence, the result of this finding is above average standard

**3.6. The Mean Difference Value and Significance Level of Each Physical Fitness Parameters**

The results of Table 6 showed that step test, squat test, sit up, pushups and twelve minutes run. The mean difference value of step test from pre-test and post test result was 29.6 beats per minute. These indicate the mean differences value varies from one test to another. Similarly, squat performance was increased with 8.06 and a significant improvement was recorded after three months of fitness exercises. However sit up performance was increased with 10.74 due to twelve weeks of physical fitness exercises for football players’ performances. According to push up tests there was a significant increment observed on mean differences between pre and post- test after three months of fitness exercises within 9.24 mean differences. When we compare pre-post results of the 12 minutes run after the exercise program of twelve weeks, there was an increased mean difference within 260.37 meter distances.

**Table 6.** The Mean Differences Value and Significance Level of Each Test Results of the Parameters

Variables	Para (I)	Para (II)	MD (I-II)	Sig
Step test	PoT	PT	<b>29.6</b>	0.000
Squat test	PoT	PT	<b>8.06</b>	0.000
Sit up	PoT	PT	<b>10.74</b>	0.000
Push up	PoT	PT	<b>9.24</b>	0.000
TMR	PoT	PT	<b>260.37</b>	0.000

*Para = parameter I and II, PT = pre training test, PoT= post training test, MD= mean differences, Sig= significances, TMR = Twelve minutes run.*

The findings of this study results showed there were significant improvements on three months physical fitness exercises parameters in football players. As supported by Hopkins et al., (1999) significant improvements in all functional physical fitness on their participants including cardio vascular endurance, body agility, balance flexibility and body fat was reported.

The results of these findings were compared with that of international standard norms. According to standard norms the test result of Step test, Squat test, Sit-ups and 12 minutes run were in the above average standard and pushups test result in Good standard level with the norms.

**IV. DISCUSSION**

There was significant change in pre-post test results. The mean value of the players after 12 weeks of training was significantly improved .The mean value for step test before training was  $149.46 \pm 4.38$  beats per minute, and post training results mean value of step test was  $119.86 \pm 8.05$  beats per minutes after twelve weeks training program. The mean differences value was decreased by 29.6 beats per minutes. The international step test norms is 148- 121 for this age groups while the step test mean value result of this study was 119.86. Hence, the study result has fallen in above average standard .This finding showed that there was a significant improvement on cardiovascular fitness performance of the study subjects after 12 weeks training. Eric, 2009 revealed by supporting this result, for healthy individuals, higher cardiovascular endurance also indicates an elevated level of physical fitness. The result of this study revealed that there was improvement of the squat test. The mean value and standard deviation of pre training test results was  $32.3 \pm 5.57$ , and post training test result was  $40.36 \pm 5.67$ . When we compare performance of pre -training test result with post training test result of the squat mean difference was 8.06 squat per minutes. When compared with international squat test norms the age group range from 18 to 25 years is from 39- 43 squats per minute(Boot Camp,2013) while this study result depicted 40.36 squats, per minutes for the same age group. Thus, the result found in this study is above the average standard. This result is also supported by Harms 2000M it indicated that muscular endurance, which represents multiple muscle contractions or a sustained muscle contraction over a period of time, for example during running, climbing, step up, swimming, jogging, running on tread mill at the gym there will be muscle contraction those muscle contraction can assists the improvements of muscular strength and endurance. During aerobic exercise, minute ventilation increases and an increased load is placed on the respiratory muscles .It is known that in a relative short period, varying from 5 to 12 weeks, football players are able to improve their running speed, by high-quality and high quantity practice, including besides football specific, strength and speed training (Sporiset *et al.*, 2008; Kotzamanidis *et al.*, 2005; Ronnestad *et al.* , 2008. Performance improvements as a result of training programs are influenced by the pre-training level of the individual players (Bouchard and

Rankinen, 2001). The step test result was compared with an international step test norms among similar age groups that range from 18 and 19 years (www.topendsport.com). This study also compared the international standard with the subject result. The result of this study revealed that an improvement on Endurance ability of players Standard norms for this test ranges from 2700 – 3000 meters (Cooper, 1968) while the study result was found to be 2823.87 meters in 12 minutes run. Hence, the result of this finding is above average standard the standard norms for 12 minutes run test for male athletes whose age ranges from 17 to 19 was compared with the study result.

## V. CONCLUSION

The present study was to explore the effects of physical fitness exercises in maximizing muscular strength and Endurance abilities of selected male football players. In line with this the study showed improvement in squat performance. It also showed that, the 3 month physical fitness training program had effects on the muscular strength and endurance performance of the participants. In addition, the study also showed increments in sit-ups and pushups test results with 10.74 sit ups (number per minute) mean differences and 9.24 pushups (number per minute) mean differences. Moreover, the 3 months physical fitness training program had effects on the performance of subjects' muscular strength and endurance performance and in step test results a heart beats was reduced, because it shows improvement on the performance of the study subjects.

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