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Effect of resistance training on speed, agility and power of Mekane Selam football club in Amhara Regional State, Ethiopia

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Abstract

The aim of this study is to examine the effect of resistance training on speed, agility and power of football players. All off thirty two (32) soccer players who was the only football players at Mekane Selam football club were conveniently selected and participated voluntarily in the research. Among those half of them were randomly selected as EG which specially prepared resistance training was applied and the rest were CG. Weight and height averages of EG and CG were similar which is 59.45 Kg and 59.96 Kg in weight and 1.75m and 1.76m in height respectively. Before training, PT of two groups of sixteen (16) players (30MAT and 60MST for speed test, Zig-Zag Test and IAT for agility test and PMT and SJT for power test) were recorded. The resistance training were implemented on the EG three time a week, 45 to 60 min a day. After two months, posttest measurement on the same parameters was taken. The difference between the tests were analyzed statistically, with paired sample “t” test at $p < 0.05$. Consequently it was observed that resistance training implemented on Mekane Selam football players brought about significant improvements between pre and post test results of speed, in which duration to complete 30MAT and 60MST was decreased by a mean difference of 0.7875 seconds at $P = .000$ and 1.5500seconds at $P = .000$. Agility in which zig-zag test and IAT result was decreased by a mean difference of 1.6875 seconds at $P = .000$ and 2.1250 seconds at $P = .000$ respectively. And power, in which PMT and SJT test result were increased by a mean difference of -.09563 second at $P = .000$ and -15.25000 cm at $P = .000$ respectively. As result the investigator recommended that adding resistance training on their soccer training program helps to improve players speed, agility and power.

Keywords: Resistance training, speed, agility, power

Introduction

Back ground of the study

Football is the greatest sport on earth and it is played in every country and at many different levels. Football is the most popular sport worldwide and it is also called “soccer” in some countries. It is an outdoor game that requires absolute athleticism as players have to hustle and run across the field with the ball throughout the game ^[1]. Football is one of the world's most popular games. It is played in nearly every country, by everyone from kids in vacant lots and back streets to professional players in giant stadiums. Professional football is watched by billions of people all over the world, and is probably the world's most popular spectator sport. Like other countries, football is a popular sport in Ethiopia and is played by many children, young and adult people. In Ethiopian, the governing body of Football is Ethiopia Football Federation (EFF) which was founded in 1943 ^[2]. The EFF was responsible for all regulatory processes of all professional football leagues in Ethiopia including the Ethiopian Premier League, the Ethiopian Higher League (second tier) and the Ethiopian First League (third tier). Eight clubs will enter the Ethiopian First League (third tier) after completing their regional competitions and participating in the national regional championship. Mekane Selam Football Club has been a part of Amhara regional participant club since 2018 and its goal is to enter the Ethiopian First league.

Successful performance in football comes about as a result of a multitude of factors, including technical, tactical, physical and psychological components as discussed by Rydings ^[3]. Within this endurance context, numerous explosive bursts of activity are required, including jumping, kicking, tackling, turning, sprinting, changing pace and sustaining forceful contractions to maintain balance and control of the ball against defensive pressure as discussed by Stølen ^[4].

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The terms strength training, weight training, and resistance training have all been used to describe a type of exercise that requires the body's musculature to move (or attempt to move) against an opposing force, usually presented by some type of equipment. Resistance training, also known as strength or weight training has become one of the most popular forms of exercise for enhancing physical fitness as well as for conditioning athletes as discussed by Fleck [5]. Resistance training is a form of exercise for the development of strength and size of skeletal muscles. Resistances training for young people to enhance muscular strength, prevent sport injuries, improve performance in sports and recreational activities and affect health and lifestyle in a positive way as discussed by Christou [6]. Resistance exercise induces potent changes in the muscle metabolism, cross sectional area (CSA) and neuro- muscular adaptations necessary for improved sports performance as discussed elsewhere [7, 8].

This would suggest that the physical training completed by football players would benefit from focusing on improving the ability to produce and maintain the performance of high intensity actions included related activities such as accelerating, decelerating, rapid change of direction, jumping and cutting, activities that would support the avoidance of non-contact injuries should be another important priority when planning team and individual training in football. The high intensity movements by which football performance is characterized are thought to be critical to the outcome of a game as these movements often relate to match winning moments as discussed by Faude [9]. To be successful in football, players need to develop a variety of motor skills of these speed, agility and power are the most important motor fitness components. The purpose of this study was to investigate the effect of Resistance Training on Speed, Agility and Power of Football Players.

Lots of research and sport science professionals agreed that results resistance training improves speed, agility and explosive power in soccer players by affecting the leg extensor and flexion muscles. Football needs several shot, jumping and tackling, sprinting and frequent changes of location shooting, so the ability to speed, agility and power performance are vital to the game of football. Improvement is also another major objective of the training program and can be footballers as the ability to use speed, agility and power to be effective as discussed by Köklü [10]. Coaches and athletes are keen to improve the ability to enhance athletic performance.

Although Mekane Selam Football club coaches conduct variety of training to improve their players' skill, they do not focus on developing speed, agility and power. Successful implementation of resistance training has positive impact to improve aforementioned skill related fitness. From this standing point of views, the researcher implemented some resistance training to examine the effects of resistance training on speed, agility and power of football players.

Based on the above reason the researcher tried to test the following hypothesis:

- HO:** Resistance training has no effect on speed of football players.
HA: Resistance training has an effect on speed of football players.

- HO:** Resistance training has no effect on agility of football players.
HA: Resistance training has an effect on agility of football players.
- HO:** Resistance training has no effect on Power of football players.
HA: Resistance training has an effect on Power of football players.

Materials and Methods

Treatment and study Design

In this research pretest and posttest patterned experimental method on randomly selected (N=16) control group (CG) and (N=16) experimental group (EG) was implemented. There are a total of 32 male football players, who are also members of Mekane Selam football club and trained by the investigator himself and one assistant coach, were voluntarily participated in the research. This study was conducted between the September and October of 2021, the training took place at the end of the season and during the players' break. The subject for this study was engaged in the selected resistance exercise program as experimental groups the training program was consisted of a selected resistance exercise variables for 8 weeks of study. Frequency and duration of the exercise were 3 days per week and up to 45-60 minutes per session the weekly exercise was conducted on Monday, Wednesday and Friday from the binning up to the end of the program.

Subjects and Sampling Methods

To achieve the present study all 32 mekane selam football club players were selected using purposive random sampling technique and amongst them the researcher randomly selected N=16, CG and N=16, EG which a special treatment was applied.

Method of Data Collection

The data were collected through a pre and post treatment fitness tests of speed, agility and power; therefore, quantitative data collection method was used for this study. 30 meter acceleration test and 60 meter speed test for speed, Zig-Zag test and Illinois agility run test for agility and 30 meter sprint fatigue-Power Maintenance test and Sargent jump test for power were used to examine the effect of resistance training on the above physical fitness components. The data were collected and recorded by the investigator with one assistances coach.

Measurement Tools and Applications

Medical Examination

All the participants was organized and selected based on their interest and their family consensus. Both the trainee and their parents were informed about the scope and the objectives of the study as well as the risks associated with resistance training and the researcher prepared questionnaire and medical check-up early for the identification of their current health status. And the researcher used following serious of skill related fitness tests and testified the hypothesis.

30 Meter Acceleration Test

The objective of this test is to monitor the development of the athlete's ability to effectively and efficiently accelerate

from a standing start or from starting blocks to maximum speed.

Procedures and Analysis



Fig 1: 30m acceleration

The test involves a 30m acceleration area to enable the runner to get up to their maximum speed, then maximal sprinting over 30 meters. To analyses 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.

60 Meter Speed Test

The purpose of this test is to monitor the development of the athlete's acceleration and pick up to full flight. The test comprises of 3 x 60m runs from a standing start and with a full recovery between each run. 60m.

Procedure and Analysis

Marks out a 60-meter straight section on the track with cones, the coach gives the command "GO" and starts the stopwatch, the players' sprints as fast as possible over the 60 meters and assistant stops the stopwatch as the athlete's torso crosses the finishing line and records the time. The test is conducted 3 times and the investigator uses the fastest recorded time to assess the player's performance. To analysis 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.

Zig-Zag Test

The purpose of the zig-zag test is to monitor the athlete's agility.

Procedure and Analysis

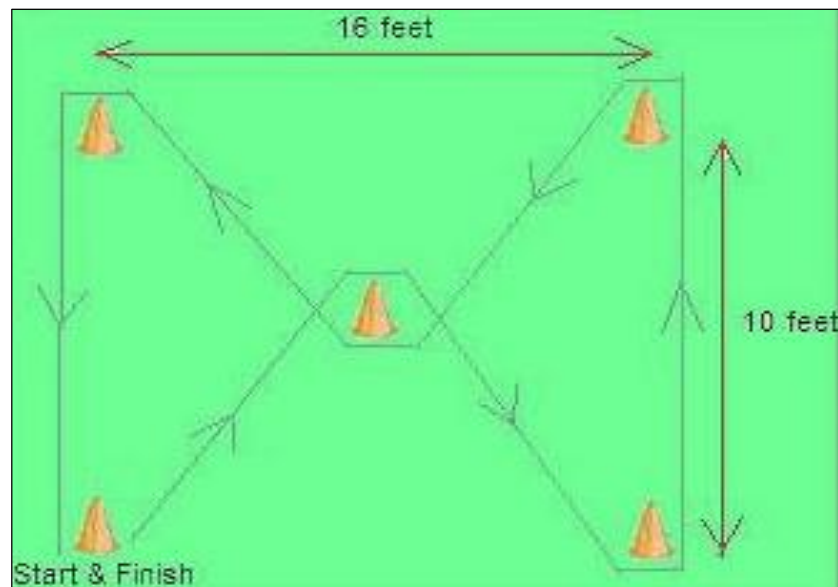


Fig 2: Zig-Zag Test

Mark out the course with four cones placed on the corners of a rectangle 10 feet (3M) by 16 feet (5M), with one more cone placed in the center, the athlete follows the grey route identified on the diagram and the athlete completes one circuit of the course starting and finishing at the Start/Finish cone. The assistance records the best time from the three rounds that the players complete the course. To 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 agility.

Illinois Agility Test

The objective of the Illinois Agility Test is to monitor the development of the athlete's agility.

Procedure and analysis

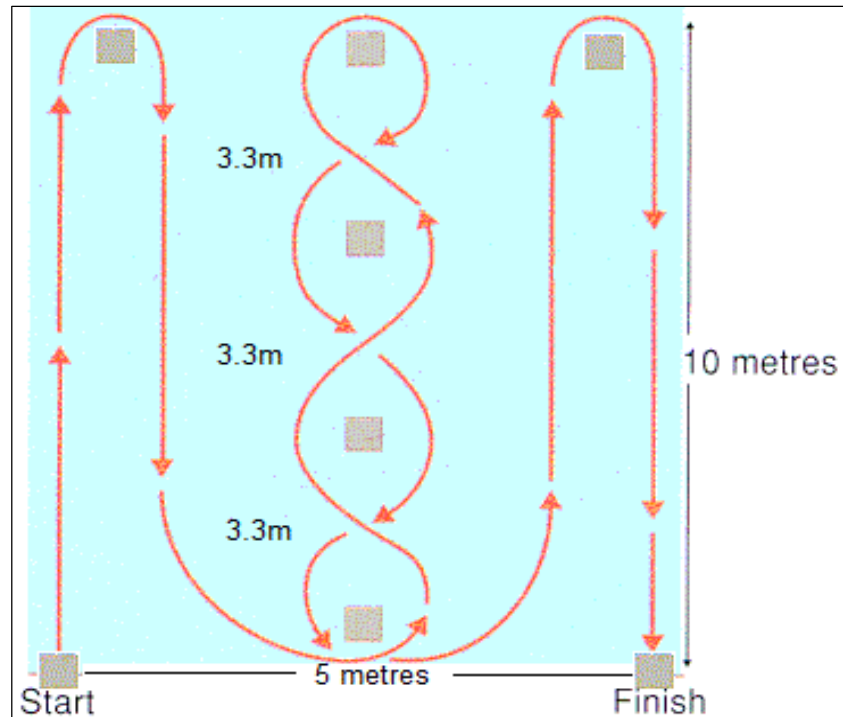


Fig 3: Illinois Agility Test

The length of the course is 10 meters and the width (distance between the start and finish points) is 5 meters. On the track you could use 5 lanes. 4 cones can be used to mark the start, finish and the two turning points. Each cone in the center is spaced 3.3 meters apart.

The athlete lies face down on the floor at the start point, on the assistant's command the athlete jumps to his feet and negotiates the course around the cones to the finish and also the assistant records the total time taken from their command to the athlete completing the course. To 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.

30 Meter Sprint Fatigue-Power Maintenance Test

In sports such as basketball, hockey, rugby and soccer, players often have to reproduce sprints in quick succession. The ability to recover between sprints and produce the same level of power over and over again is a measure of your sprint fatigue as discussed by Mackenzie ^[11].

Procedure and analysis

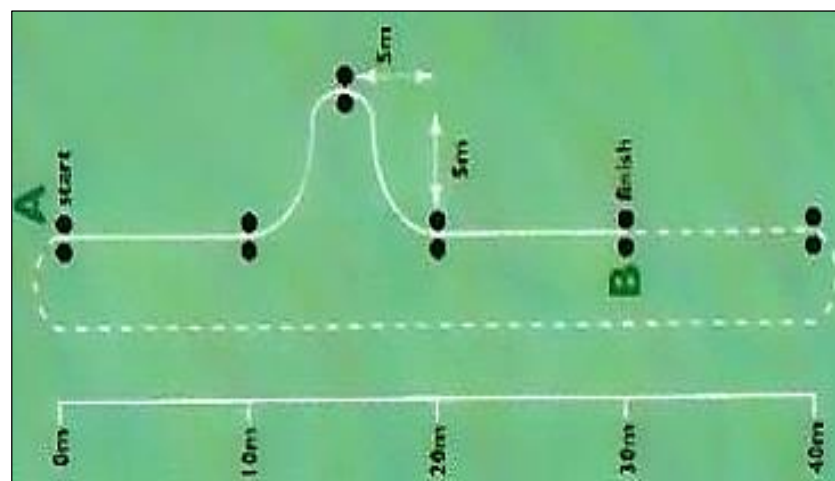


Fig 4: Power Maintenance Test

The athlete sprints from A to B between the cones deviating 5m sideways in the middle of the sprint. The assistant records the time for the athlete to complete the sprint from A to B. The athlete jogs slowly back to point A (taking no longer than 30 seconds to do so) following the route on the diagram, When the athlete reaches point A repeat the sprint to point B and the athlete is to complete a total of 10 sprints.

To analysis of the result is subtract the fastest time from the slowest time, this is your sprint fatigue. It is expected that, with appropriate training between each test, the analysis would indicate an improvement.

Sargent Jump Test

The purpose of this test was to measure the leg muscle power of subjects and to measure the development of the athlete's elastic leg power as discussed by Amaral ^[12].

Procedure and analysis



Fig 5: Sargent Jump Test

Chalks the end of his fingertips stands side onto the wall, keeping both feet remaining on the ground, reaches up as high as possible with one hand and marks the wall with the tips of the fingers (M1) from a static position jumps as high as possible and marks the wall with the chalk on his fingertips (M2). The assistant measures and records the distance between M1 and M2 and three trials would be given and the highest distance would be record as a score in meter.

Methods of Data Analysis

The data collected through physical fitness test was analyzed, interpreted and tabulated in to computerized statistical package software for social sciences (SPSS version 20) was present as a group mean value and standard deviations. The paired sample t-test was used to compare the data between pre- test and post-test. The level of significance error was also at $p < 0.05$. But based on the data analyzed level of significance in all parameters were less than ($p < 0.05$). Therefore, the investigator rejected the entire null hypothesis.

Results and Discussion

This section discussed about analysis of the data collected from the subjects of the study and its result. The purpose of this study was to investigate the effect of resistance training

on speed, agility and power of football Players. The subjects were grouped randomly in to EG (N= 16) and CG (N = 16). Both groups underwent measurements of 30 meter acceleration test, 60 meter speed test, Zig-Zag test, Illinois agility test, 30 meter sprint fatigue-Power Maintenance test and Sargent jump test two times Pre and Posttest. Then finding obtained after two months resistance training program are presented below in tables and analyzed graphically.

Table 1: Body weight and height averages of the groups (Kg)

Groups	N	Weight (Kg)	Height (m)
EG	16	59.45	1.75
CG	16	59.94	1.76
Total	32		

The abbreviations used in the research were as follows: Experimental Group (EG), Control Group (CG), 30 Meter Acceleration Test (30MAT), 60 Meter Speed Test (60MST), Zig-Zag Test, Illinois Agility Test (IAT), Power Maintenance Test (PMT) and Sargent Jump Test (SJT). Body weight averages of the groups in the research are as follows; EG=59.45 Kg; CG=59.94 Kg and height averages of the groups in the study are as follows; EG=1.75 m; CG=1.76m.

Table 2: PT & POT results of 30MAT and 60MST of the Groups

Groups	N	PT(X,±SD)	PoT (X, ±SD)	ΔX(PoT and PT)	P
30MAT result of EG	16	4.881±0.2228	4.094±0.3696	.7875	.000
30MAT result of CG	16	4.975±.2049	4.988±.1928	-.0125	.164
60MST result of EG	16	10.631±0.2822	9.081±0.6390	1.5500	.000
60MST result of CG	16	10.681±.2257	10.700±.2160	-.0188	.083

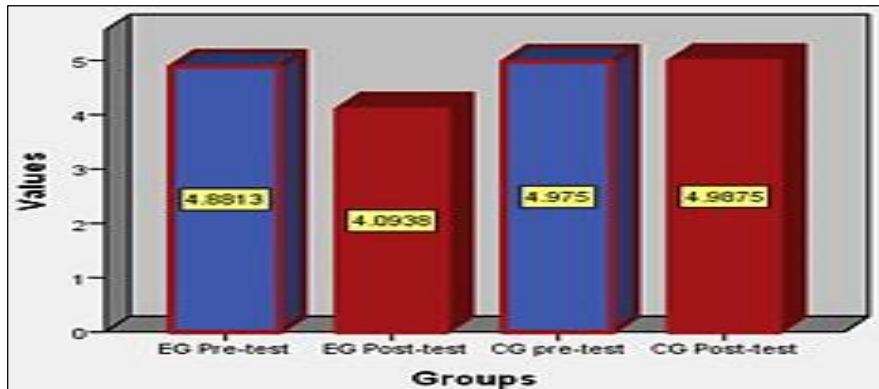
EG= Experimental groups, CG= Control Group, N= Participant in each group, 30MAT=30 Meter Acceleration Test, 60MST= 60 Meter Speed Test, PT=pretest of each test result, PoT= post test results, X=Mean Value, SD= Standard Deviation, ΔX =Mean difference of PT and PoT, P=significance level

As Table 2: shows that Pre and post 30MAT test mean of EG was 4.881 and post 30MAT test mean was 4.094 respectively. And of the CGPT and PoT result of 30MAT mean was 4.975 and 4.988 respectively. And also Pre and Post 60MST test mean of the EG was 10.631 and 9.081 respectively. And also the CG was 10.681 and 10.700

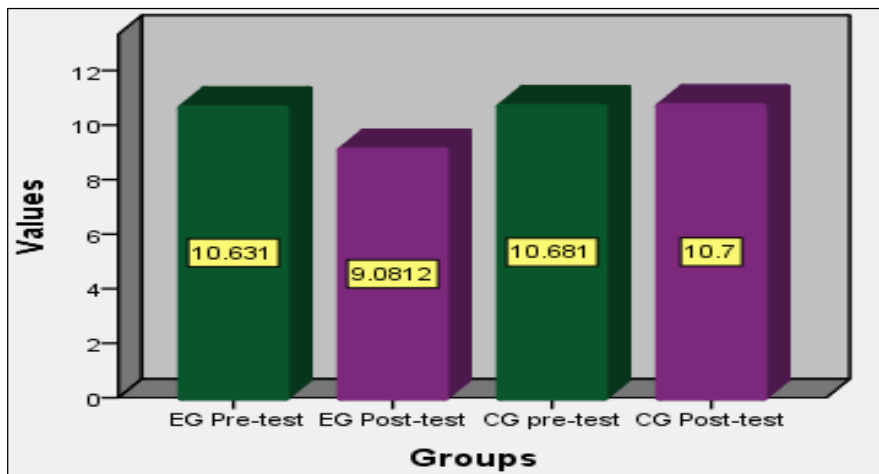
respectively. Therefore these data indicated that there is a statistically significant difference between pretest and posttest results of both the EG and CG. In which incase of the EG, duration of 30 meter acceleration test was significantly less by a mean difference of 0.7875 at $P=0.000$ and duration of 60 meter speed test was significantly less by

a PT and PoT mean difference of 1.5500 at P=0.000 after two months of resistance training. And also in case of the CG, in which duration of 30 meter acceleration test was significantly less by a mean difference of -.0125 at P=.164 and duration of 60 meter speed test was significantly

decreased by a mean difference of -.0188 at P=.083. As a result the investigator accepted alternative hypothesis 1 and rejected the null hypothesis because the treatment administered was effective and the results were consistent with Eskandar *et al.* [13].



Graph 1: PT & POT results of 30 MAT of the Groups



Graph 2: PT & POT results of 60 MAT of the Groups

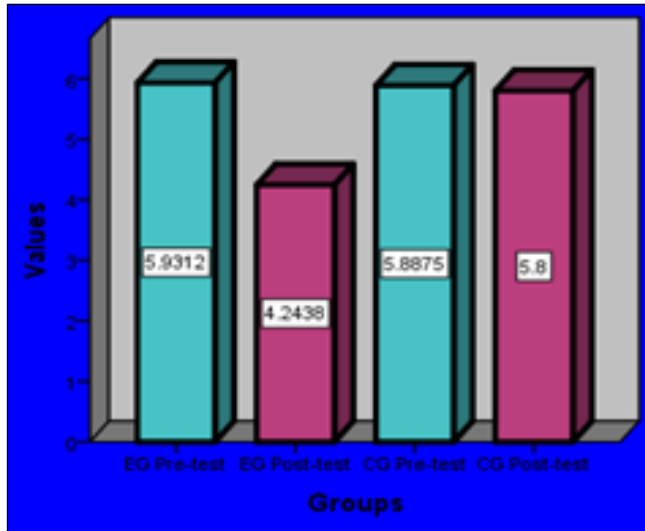
Table 3: PT & POT results of Zig-Zag test and IAT of the Groups

Groups	N	PT(X,±SD)	PoT (X, ±SD)	ΔX(PoT and PT)	P
Zig-Zag test result of EG	16	5.931±0.1815	4.244±0.1788	1.6875	.000
Zig-Zag test result of CG	16	5.888±.1408	5.800±.1506	.0875	.008
IAT result of EG	16	17.875±0.1915	15.750±0.4885	2.1250	.000
IAT result of CG	16	17.800±.2280	17.763±.1746	.0375	.270

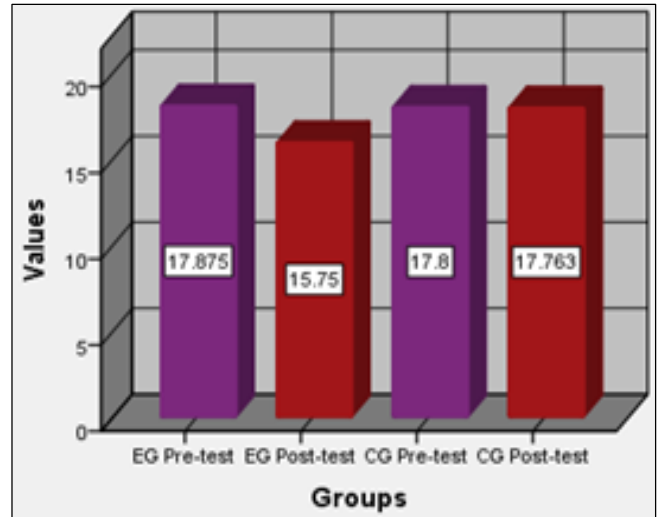
EG= experimental groups, CG= Control Group, N= Participant in each group, Zig-Zag Test, IAT= Illinois Agility Test, PT=pretest of each test result, PoT= post test results, X=Mean Value, SD= Standard Deviation, ΔX =Mean difference of PT and PoT, P=significance level

As Table 3: shows that Pre and post Zig-Zag test mean of EG was 5.931 and post Zig-Zag test mean was 4.244 respectively. And of the CGPT and PoT result of Zig-Zag test mean was 5.888 and 5.800 respectively. And also Pre and Post IAT mean of the EG was 17.875 and 15.750 respectively. And also the CG was 17.800 and 17.763 respectively. So these data indicated that there is a significant difference and gradual improvement between Pretest and Post test results of both the EG and CG. In which incase of the EG, duration of Zig-Zag test was significantly increased by a mean difference of 1.6875 at P=0.000 and duration of Illinois agility test was significantly increased by a PT and PoT mean difference of 2.1250 at P=0.000 after two months of resistance training. And also in

case of the CG, in which duration of Zig-Zag test was significantly less by a mean difference of .0875 at P=.008 and duration of Illinois Agility test was significantly decreased by a mean difference of .0375 at P=.270.As a result the investigator accepted alternative hypothesis 1 and rejected the null hypothesis. And is confirmed with this finding [14], Effects of combined power band resistance training on sprint speed, agility, vertical jump height, and strength in collegiate soccer players, six weeks of power band resistance training improves agility of male collegiate soccer players.



Graph 3: PT & POT results of Zig-Zag test of the Groups



Graph 4: PT & POT results of IAT of the Groups

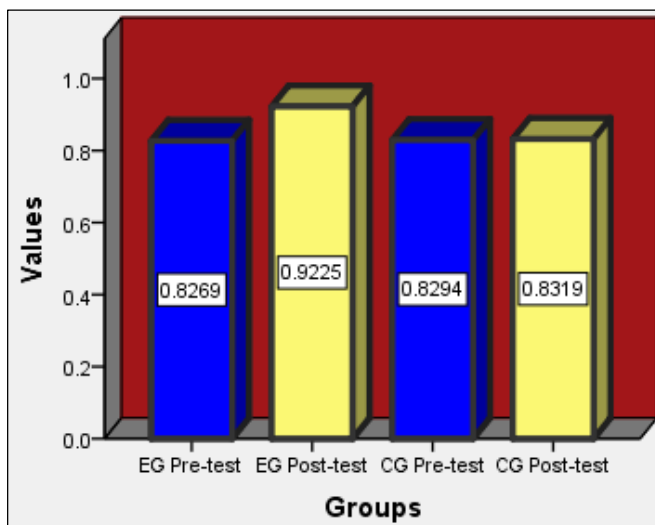
Table 4: PT & POT results of PMT and SJT of the Groups

Groups	N	PT(X,±SD)	PoT (X, ±SD)	ΔX(PoT and PT)	P
PMT result of EG	16	0.8269±0.02469	0.9225±0.03000	-.09563	.000
PMT result of CG	16	.8294±.01769	.8319±.01682	-.00250	.104
SJT result of EG	16	47.0625±1.73085	62.3125±4.42295	-15.25000	.000
SJT result of CG	16	46.5625±2.42126	46.4375±2.96578	.12500	.609

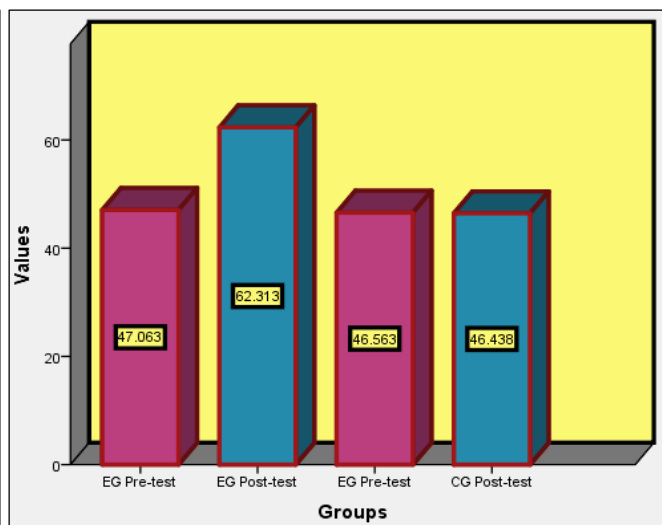
EG= experimental groups, CG= Control Group, N= Participant in each group, PMT=Power Maintenance Test, SJT= Sargent Jump Test, PT=pretest of each test result, PoT= post test results, X=Mean Value, SD= Standard Deviation, ΔX =Mean difference of PT and PoT, P=significance level.

As Table 4: shows that Pre and post PMT test mean of EG was 0.8269 and post PMT test mean was 0.9225 respectively. And of the CGPT and PoT result of PMT test mean was .8294 and .8319 respectively. And also Pre and Post SJT mean of the EG was 47.0625 and 62.3125 respectively. And also the CG was .8294 and .8319 respectively. So these data indicated that there is a significant difference between Pretest and Post test results of both the EG and CG. In which incase of the EG, duration of Power Maintenance test was significantly increased by a mean difference of -.09563 at P=0.000 and duration of Sargent Jump test was significantly increased by a PT and PoT mean difference of -15.25000. At P=0.000 after two

months of resistance training. And also in case of the CG, surprisingly in which duration of Power Maintenance test was significantly increased by a mean difference of -.00250 at P=.104 and duration of Sargent Jump test was significantly decreased by a mean difference of .12500 at P=.609. As a result the investigator accepted alternative hypothesis 1 and rejected the null hypothesis. And is confirmed with this finding [15], found in their research conducted on effect of plyometric and resistance training on agility, Speed and explosive power in kabbadi players that, twelve weeks of resistance training improves agility and power in selected kabbadi players.



Graph 5: PT & POT results of PMT of the Groups



Graph 6: PT & POT results of SJT of the Groups

Conclusions

Based on the major findings of the study the following points were stated as a conclusion. The result of the study showed that two months of resistance training has relative positive effect on speed of Mekane Selam football club as measured by 30 MAT and 60 MST. The output of the study showed that two months of resistance training has a significant improvement on agility of players as measured by Zig zag test and Illinois agility test. The finding of this study yields a significant benefit on improvement of football player's power as measured by PMT and SJT. In general after two months of resistance training, statistically significant improvement and change were observed in Mekane Selam football club player's speed, agility and power.

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