

An Assessment of the Impact of Anaerobic Exercise Training on Enhancement of Physical Fitness Quality of U-17 Female Football Project in Case of Gish Abay Town

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Abstract

Anaerobic training in soccer is important to increase a player's potential to perform high-intensity exercise during a game and also it has contributed a lot for improve the capacity, produce power and energy continuously with the anaerobic energy-producing pathways. To do this, the aims of the study is to compare the effects of anaerobic exercise training on enhancement of selected physical fitness variables in female football project which is found in Gish Abay town. For this study, a total of 44 Subjects were divided into 2 equal groups as an experimental and control groups. Those group ages were categorized as 15 - 16 years. Subjects were comprehensive sample technique assigned to experimental or anaerobic exercise training group (22 females) and control group (22 females). The experimental groups were participated in a supervised anaerobic training program 3 days/week for 12 weeks. The control group did not participate in any of the program. The physical fitness variables selected for this study were: leg strength, speed and Agility. To do this, both had taken pre and post- testing. Experimental method had employed to collect data used to analyze the change mean scores to experimental and control for (pre- post) values. The data had analyzed and compared with the help of statistical procedures in which arithmetic mean, standard deviation and Paired-Samples t-test had worked. The level of $p \leq 0.05$ was considered significant. The result shows that there is a significant relationship of playing ability with leg strength, Speed and Agility. The results of this study showed that the selected physical fitness quality training improved players' physical performance. Generally anaerobic physical fitness quality training had a significant effect on players' performance through the required tests. Hence, physical fitness quality training has been preferential for the enhancement of football player performance.

Keywords: Anaerobic exercise, performance enhancement, physical fitness variables, Gish Abay

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1. Background and statement of the problem

Soccer is the most popular sport in the world, and it is being played in every nation without exception. And also it is a physical activity that requires a high level of conditioning in addition to proficient technical and tactical skills (Reilly and Williams, 2003). The soccer game which requires very fast body movements is determined by situations within the competition; such as opposing team's player with and without the ball, ball movement and team movement. Because of these reasons modern soccer game seems to be all about speed (fast movements) which becomes prominent in short and long sprints (Kapidzic *et al.*, 2011). Now a day, players are faster and sharper than ever (Davis, 2005).

Jens Bangsbo in (1994) stated that the overall aim of anaerobic training in soccer is to increase a player's potential to perform high-intensity exercise during a game. Soccer is a multifaceted sport that requires well developed physical fitness to be successfully played. (Stolen *et al.*, 2005, Sayers, 2000, Gunay and yucei, 2008).

Several authors have recommended special attention to fitness programs for players, consisting of intermittent sessions of aerobic exercises combined with activities to increase speed, agility, and the range of movements. Football includes a lot of high intensity running, therefore calls for high levels of physical fitness for players (Reilly, 1997).

In playing soccer, a natural movement running is a predominant one where as there are also additional explosive type activities such as sprinting, jumping, tackling and kicking are vital for performance (Thorlund, 1998). From the physical fitness components, speed is the most vital component to determine the level of success and performance in soccer (Reilly, 2000, Jovanic, 2011, Bangsbo, 1991).

Soccer players must be able to perform anaerobic exercise (exercise at high-intensity, sprint, and develop high levels of power /force/ when kicking and tackling). Good levels of agility and coordination are also necessary and distinguish between elite and average players. Many sports require a combination of physical fitness components. For instance; soccer players should have the skill of shooting, passing and dribbling. A combination of short-duration strength, speed, and agility training is essential (Khodadad, 2008). Training should involve regular use of the ball as this will not only help develop the specific muscles involved in match play, but improve technical and tactical skills and help keep players interested.

The fitness requirements for football depend on the level of performance. They vary also with age groups, between men and women, and at different stages of the playing season. Coaches, trainers and sports scientists acknowledge that preparation for competitive match-play calls for a systematic approach. This includes consideration of fitness levels of individual players as well as overall throughout the team. Attention to fitness profiles is relevant not just in the build-up towards key matches and tournaments but also throughout the competitive league season. To succeed based on results trainees need being testing selected parameters. These parameters have designed to predict performance capacity, taking in to account the player's current level of fitness and maturity (Peltola with Thomson & Beavis, 1985). The test items may either be part of a comprehensive physiological assessment or be dedicated to performance in soccer.

In the study area, there was a lack of physical fitness (speed, strength and agility) on each player and have no any registered fitness profiles and they have no used any parameters to evaluate and identify the players' current performance level with the required test. Therefore, the researcher was attempt to fill gaps between each subjects by being experimental and control group with two categories on the training and taking a pre-test and post-test evaluation methods. Therefore this study attempts to see and investigate the impact of anaerobic exercise training on enhancement of physical fitness qualities of U-17 female football players. And this study tries to see various aspects on their training session in Gish Abay town female's football project.

Objectives of the study

The overall objective of the study is to investigate the impact of anaerobic training on enhancement of physical fitness qualities of U-17 female football project in the case of Gish Abay town. Specifically, it tries to examine the impact of anaerobic exercise training on enhancement of speed, evaluate the impact of anaerobic exercise training on enhancement of leg strength, assess the impact of anaerobic exercise training on the enhancement of agility performance and finally to compare the difference between pre-test and post-test of the experimental and control.

2. Description of the area

The study was conducted at Gish Abay town which is located 162 km away from Bahirdar in West Gojjam zone of Amhara region, Ethiopia. The town is divided in to 1 town administrative werdas and 27 rural kebeles. In this town there is 1 local project in different sports. Under -17 female football projects is one of the town projects. The reasons for the selection of this project was based on the geographical location, the researcher birth place and well known the project. So selection of this football project is convenient.

3. Research methodology

3.1. Subjects

The present study had been conducted on 44 female football players' of Gish Abay town. The subjects selected were 22 players experimental group from Gish Abay football project and 22 players control group from Abay Minch high school football players. The subjects were in the age group of fifteen to sixteen years old. All the subjects were healthy and residents in the hostel of the town. The subjects participated throughout the testing period and cooperated for the success of collection of necessary data.

3.2. The Research Design

The study was design to examine the effect of additional twelve weeks of speed, leg strength and agility of anaerobic exercise training program, 3 days per week for 1 hr session per day in addition to normal training for the experimental group. The design of the study is experimental. This method had selected because it is helpful to identify the player physical fitness quality with pre-test and post- test.

3.3. Sample and Sampling Techniques

For this study, comprehensive sampling techniques were used. This is because there was only one female football project in Gish Abay town, which hold 22 players, and then the researcher used this project as a whole for experimental study purpose. However, for the control group 22 players who were participating actively in Abay Minch high school football team was used. Therefore, the total subjects were consisted of 44 players from Gish Abay town females' football project.

3.4. Data gathering procedures

The data for the study was collected from the results of test conducted from pre-test and post-test for both the experimental and control group. pre-test was conducted for all 44 football trainees before giving twelve week leg strength, speed and agility anaerobic exercise training program for the experimental group (n=22). However, in control group (n=22), the data was collected on the given physical qualities with testes but it did not include the training event given to the experimental group. Post-test was conducted to determine the effect of twelve week

leg strength, speed and agility of anaerobic exercise training program on experimental group. The appropriate physical quality test such as leg strength, speed and agility test for football project players was measured.

3.5. Materials used

The following equipment such as cone, stop watch, whistles, recording sheets, wall, chalk, measuring tape, flat surface and meter were used during the training sessions and testing player's performance during pre-test and post-test.

3.6. Testing procedure

The following fitness tests were used before the intervention training start and after the experimental group finishing twelve week leg strength, speed and agility training program. In this study, three tests were conducted both had taken pre and post training to determine the selected physical fitness quality training outcomes. Leg strength (Sergeant Jump) test was to determine of how high an athlete can elevate off the ground from a standstill. 30-meter accelerates speed test was to determine the ability to cover a set distance quickly. The Illinois agility test was to determine the ability to accelerate, decelerate, turn in different directions, and run at different angles. These tests had selected due to the fact that to established criteria data for females because of their reported validity and reproducibility of the tests (Paoule *et al.*, 2000; Roozen, 2004). Prior to training, all subjects had their baseline selected physical fitness quality tested, using the three tests previously mentioned. Each test had explained and demonstrated. Before testing, subjects had given practice to become familiar with the testing procedures.

3.7. Test Administration and Scoring

Data were collected first following the standard procedures. All the necessary information about the study (purpose, procedures etc.) was explained for the participants primarily. Having experts, instruments for measuring purposes, facilities, and sufficient warming up exercises and other necessary data were collected by administering the mentioned standard physical fitness test measures. Tests were administered in proper sequences. Leg strength (sergeant jump) test, 30 Meter (Acceleration) test and agility test (Illinois agility) using standardized equipment's. Three successful trials were use per test for each subject, and the best value had taken for each session.

3.8. Data analysis techniques

The data was gathered from the experimental and control groups results as in the form of pre-test and post-test method of leg strength, speed and agility had been organized using appropriate and relevant statistical method of analysis like SPSS (version 20). A level of significance of 5% was adopted. The method, which assists to come up with findings, including percentage ratio, and arithmetic mean, standard deviation and Paired-Samples t- test method were used.

4. Results and Discussion

4.1. Documental profile and Descriptive analysis

A total of 44 females football players were participated in the pre and post stage of the study. Among them, experimental group 12 (54 %) of the players were 16 years old and 10(45.4 %) were 15 years old and for control group 13 (59 %) of the players were 16 years old and 9(40.9 %) were 15 years old. With regard to their current residents all are living with their parents. The mean weights of experimental and control groups were 41.8 kg and 43.2 kg respectively. Whereas the mean height of experimental and control group was 152.5 cm and 152.4 cm respectively (see Table 4.1).

Table 4.1: Descriptive analysis of weight, height and age of the participants

Personal Information	N	Minimum	Maximum	Mean	Std. Deviation
age of the experimental group	22	9.00	16.00	14.8182	2.15222
age of the control group	22	15.00	16.00	15.5909	.50324
weight of control group	22	41.00	46.10	43.1636	1.34962
weight of experimental group	22	39.20	45.90	41.8700	1.70103
height of control group	22	146.70	156.40	152.4500	2.55152
height of experiment group	22	148.70	158.00	152.5318	2.18204

A paired-samples t-test was conducted to evaluate the impact of the Training intervention on female youths scores on the leg strength change measured in centimeter. the result showed that There was a statistically significant increase/improvement in strength scores from Time 1 (before training) ($M=30.55$, $SD=4.69$) to Time 2 (after training) [$M=32.82$, $SD=3.97$, $t(21)= 4.49$, $p < .0005$].

Table 4.2: Leg strength(pre and post-test) of the respondents

Variables	Group	Test	No	Mean	MD	Std. Deviation	t	P-Value
Leg strength	Experimental	Pre-test	22	30.55	2.27	4.69	4.49	0.00
		Post-test	22	32.82		3.97		
	Control group	Pre-test	22	29.36	0.27	3.16	1.82	0.083
		Post-test	22	29.64		3.11		

As indicated in above table 4.2, experimental players had 30.55 result of mean for pre-test and 32.82 for post- test leg strength. While, control players had 29.36 pre-test and 29.64 post-test for this physical quality recorded and the level of significance was set at 0.05 (95% level of confidence). Experimental and control players difference of mean value were 2.27, 0.27 and P-Value were 0.00 and 0.08 respectively. This indicates that the mean change in leg strength observed after training was statistically significant and the result can be inferred to the whole population around the study area.

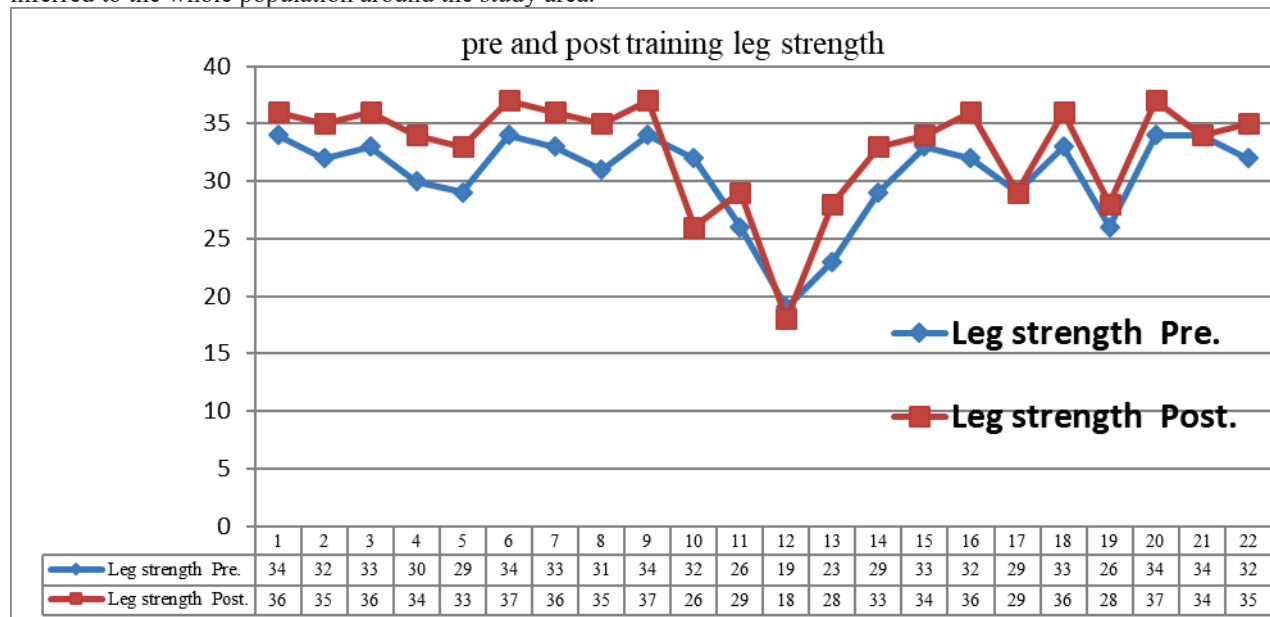


Figure 4.1: Pre and post training leg strength for experimental group (score in centimeter)

A paired-samples t-test was conducted to evaluate the impact of the Training intervention on female youths scores on the speed change measured in meter per second. There was a statistically significant decrease/improvement in speed scores from Time 1 (before training) ($M=5.054$, $SD=0.165$) to Time 2 (after training) [$M=4.968$, $SD=0.173$, $t(21) = -8.66$, $p < .0005$].

Table 4.3: Speed (30 meter acceleration) run pre and post test

Variables	Group	Test	No	Mean	MD	Std. Deviation	t	P-Value
30-meter run	Experimental	Pre-test	22	5.054	-0.086	0.165	-8.66	0.000
		Post-test	22	4.968		0.173		
	Control	Pre-test	22	5.068	-0.0046	0.13	-0.27	0.789
		Post-test	22	5.064		0.146		

As shown in the above table 4.3, the mean of 5.054 and 4.968 for pre and post- test of experimental players for 30-meter run. However, in control players 5.064 and 5.068 pre and post-test respectively and the level of significance was set at 0.05(95% level of confidence). Experimental and control players difference of mean value were -0.086 and -0.0046 and P-Value were 0.00 and 0.789 respectively Indicating that the mean change/improvement in speed observed after training was statistically significant and the result can be inferred to the whole population around the study area.

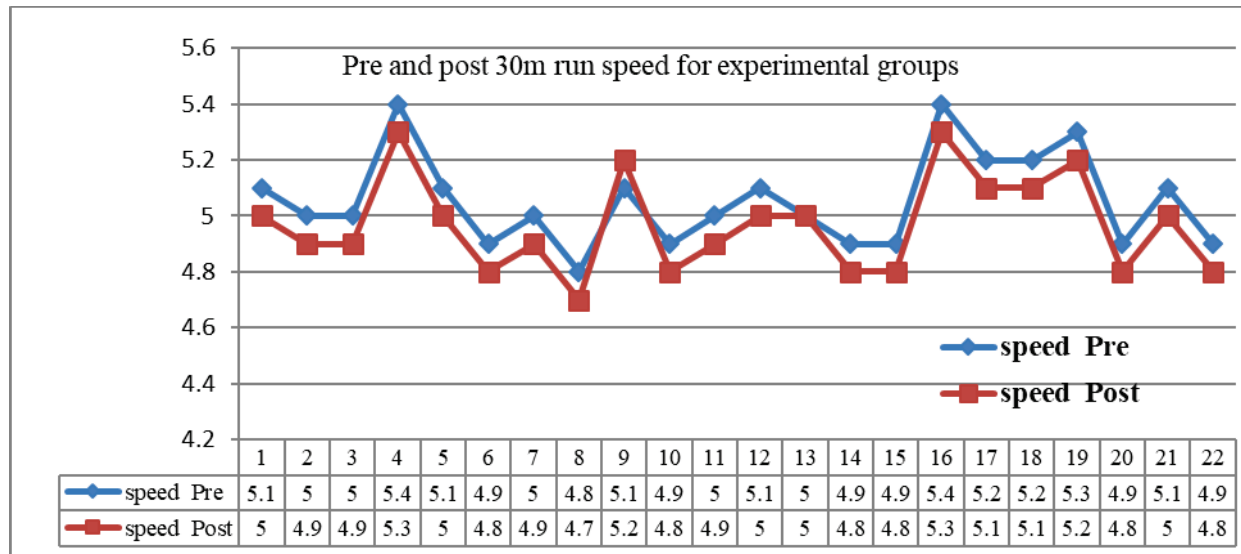


Figure4.2: Pre and post 30m run speed for experimental groups (score in second)

A paired-samples t-test was conducted to evaluate the impact of the Training intervention on female youths scores on the Agility change measured in seconds. There was a statistically significant decrease in AGILITY scores from Time 1 (before training) ($M=20.55$, $SD= 1.47$) to Time 2 (after training) [$M=19.6$, $SD= 1.56$, $t(21)= -7.55$, $p < .0005$].

Table 4.4: Agility (Illinois agility run) pre and post test

Variables	Group	Test	No	Mean	MD	Std. Deviation	t	P-Value
Illinois agility run	Experimental	Pre-test	22	20.5	-0.9	1.47	-7.55	0.000
		Post-test	22	19.6		1.56		
	Control	Pre-test	22	20.87	0.118	1.31	0.88	0.385
		Post-test	22	20.99		1.33		

Table above table reveals the result of Illinois agility mean value for pre-test 20.5 and post-test 19.6 to experimental players. On the other hand, 20.87 pre-test and 20.99 post-test for control players and the level of significance was set at 5% . Experimental and control players difference of mean value were -0.9 and 0.118and P-Value were 0.000 and 0.385 respectively. This indicating that the mean change/improvement in agility observed after training was statistically significant and the result can be inferred to the whole population around the study area.

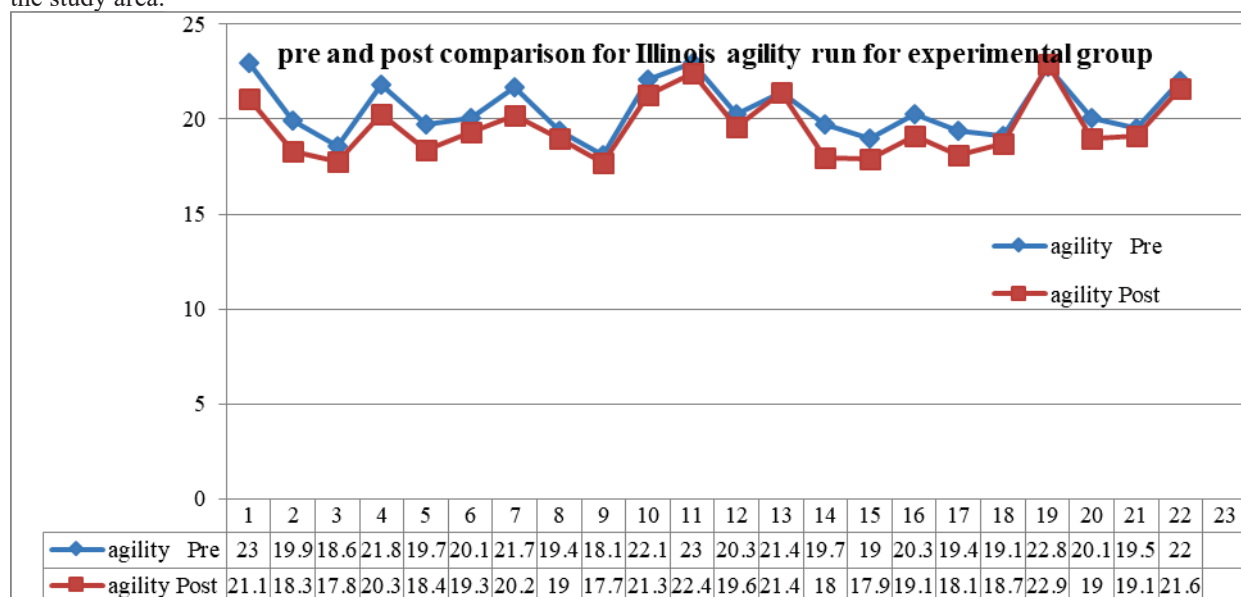


Figure 4.3: Pre and post comparison for Illinois agility run for experimental group

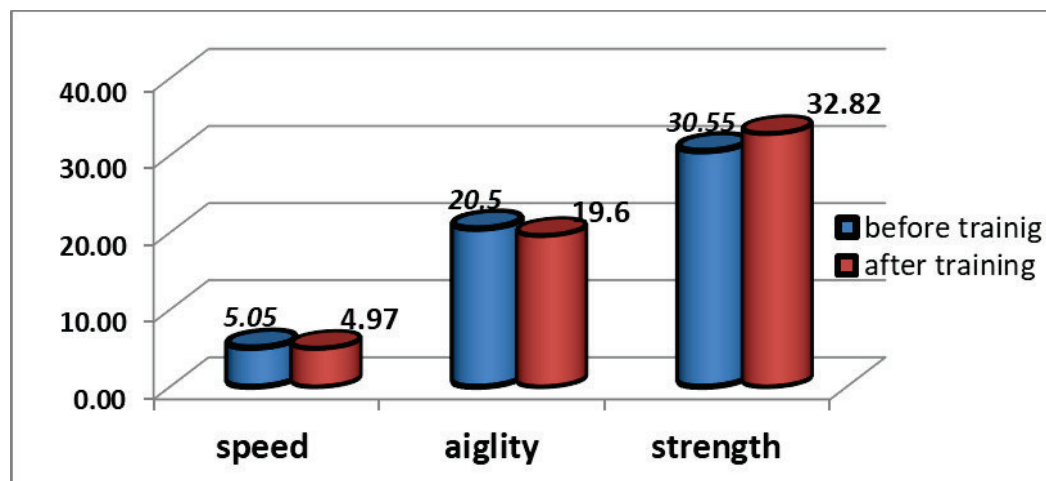


Figure 4.4: pre and post change in speed, agility and strength experimental groups

In general, the provision of practical training to test whether training has significant impact on improving speed, strength and agility has become successfully checked and the result confirmed that training has significant effect on the aforementioned parameters. **Speed** performance has been improved from “average” to the level of speed between 4.9 -5.0 which according to Davis is a position of “fair” rating. Regarding the change in strength, the training has brought an improvement from the average level of 30.55 to the level of strength of 32.82 which according to Davis is a position of “fair” rating. In relation to Agility test, the provision of training has bought a change from **average** level of 20.5 to the level of Agility 19.6 which according to Davis is within the same “average” rating level.

4.2. Discussions

For this study, tests that are being evaluated through leg strength test, speed test and agility test are the main tests for many physical performance test and conditioning programs Davies (2000). These tests are used to make comparisons between pre and post training effect of athletes and training status is the issue of Physical quality (Kraemer and Gotshalk, 2000) many previous investigators showed evaluating skill based on sport specific tests between pre and post training are vital in planning and developing a training program.

The finding shows that all subjects were healthy and residents in the hostel of the town and volunteered to participate in the present study. Before the commencement of tests, the subjects were oriented about the purpose of the study and their cooperation had sought. The subjects participated throughout the testing period and cooperated for the success of collection of necessary data. The experimental training group participated in a 12-week training program performing the selected physical fitness qualities of exercises designed for the players, while the control group did not participate in this selected physical fitness qualities of exercises.

A 12-week selected physical fitness qualities training program had developed using three training sessions per week. The training programs had based on recommendations of intensity and volume derived from (Piper and Erdmann, 1998) using similar drills, sets, and repetitions. The main findings from this investigation show that leg strength, speed and agility training program performed twelve-week period led to a significant improvement in performance measured variables in experimental group compared to control group.

In the case of leg strength results suggest that squat jump exercise had really does have an impact on player’s leg strength for the development of sergeant jump to the football players during the required sessions. Because, the experimental players were achieved the highest average level than their controlled player regarding to the mean value of pre-test and post-test as analyzed. The study of Singh (2007) also support the result of the study he concluded that trained players were found significantly better on all physical fitness variables than non-trained players. As showed the researcher’s result suggest that when players had squat jump exercise, they could have improve their sergeant jumping ability through the development of leg strength than controlled players

In case of speed test: The players were improving their performance in the 30m acceleration test and the difference was observed between the pre and post-tests in both groups. Based on mean score of experimental group was achieved the highest average level of sprint ability then control group after twelve week speed training.

To correspond the study finding with the literature review, according to Wisloff *et al.* (2004). They indicated that increasing strength in soccer players increases parameters of power such as jumps and sprints. They found a strong correlation between squat strength, jumping height and all aspects of 10 – 30 m sprint performance in youth soccer players. Thus, it is beneficial for a youth soccer player to have a high level of

muscular strength. And in addition to this, the finding was supported by another piece of research by Brandon (1997) and colleagues in France, supported this study a 10-week leg-strength training program for footballers improved their 10m and 30m sprint times and their vertical jump performance.

Almost all existing literature that has attempted to describe relationships with some measure of agility or training to improve agility has used a timed task involving one or more changes of direction, also known as change of direction speed. Based on a review of the current paradigm of agility classifications, training and testing, there is a need within the sporting community to recognize what agility involves, how it is trained and what characteristics are being assessed using existing tests of agility. As noted in the review of existing tests, many involve no decision-making or reactive component and could be better described as change of direction speed tests as proposed by Young et al. (2002). They found 12 week speed training in elite youth football players improve change of direction and sprinting ability.

For this study squat jump, bounding speed and Illinois drill on the training events to determine its effects on 30-meter acceleration, Illinois agility testes and leg strength (sergeant jump) test were used. However, the control and experimental players did perform a normal and equal training program scheduled except the selected fitness qualities had given for the experimental players in addition to the normal training plan. So as such, condition the two group players did perform a required training based on the prepared daily plan for three month and all had taken part their own prescribed training schedule for three times in a week for one hours. Thus all players the same as in the beginning situation they under gone a test as already listed test protocols with followed a procedures. Finally the data was gathered from the experimental and control groups results as in the form of pre-test and post-test method of leg strength, speed and agility, had been organized using appropriate and relevant statistical method of analysis.

Regarding to recent literature review, The study of Singh (2007) also support the result of study he concluded in his study that players of trained were found significantly better on all physical fitness variables i.e. strength, speed, power, flexibility, agility and endurance that of non- trained one. The researcher had used experimental pre-post-test methods to assess the effect of anaerobic exercise training on enhancement of selected physical qualities. Hence, experimental players result depicted that they had more physical quality performance than control players. Anaerobic training had an effect on enhancement of players' physical quality performance on speed, agility and leg strength.

Jens Bangsbo in (1994) stated that the overall aim of anaerobic training in soccer is to increase a player's potential to perform high-intensity exercise during a game. The specific aims of anaerobic training in soccer were to improve the ability to act quickly and to produce power rapidly. Thus, a player reduces the time required to react and elevates performance during a game. The authors conclude that the anaerobic training that is given to the experimental group such as leg strength, speed and agility had a significantly enhance the overall performance of player when compared to the control player that did not perform such training program.

Reilly et al. (2000) found that performance on any physical quality was the best distinguishing feature of the elite individuals. The study showed that training through the selected physical quality had a great improvement for football players better than the player they were did not perform such training event. Bangsbo (1994) described various running tests specifically designed for soccer players. The researcher disclosed that the footballer had record the reliable data about the selected physical quality test for experimental and control players. So, the experimental players were had scored a good results as compared to the control players. The previously discussed studies support the finding of the current study that the practitioners' had well physical quality performance when they had participated football training on fitness component program and the current study formed a significant effect on players' the set quality of fitness.

5. Conclusion

Leg strength test of experimental players had 30.55 result of mean for pre-test and 32.82 for post-test. While, control players had 29.36 pre-test and 29.64 post-test physical fitness qualities recorded values recorded and the level of significance was set at 5%. Experimental and control players difference of mean value were 2.27 & 0.27 and P-Value were 0.000 & 0.083 respectively. Therefore, the experimental players had a greater mean values than the control players.

30-meter acceleration of run test of experimental players had 5.05 results of mean for pre-test and 4.96 for post-test. However, control players had 5.068 pre-test and 5.064 for post-test of the physical fitness qualities results and the level of significance was set at 5%. Experimental and control players difference of mean value were -0.9 & -0.046 and P-Value were 0.000 & 0.789 respectively. Therefore, the experimental players had better mean results as compare to the control players.

The Illinois agility run test of experimental players' had 20.5 results of mean for pre-test and 19.6 for post-test. Nevertheless, control players had 20.87 pre-test and 20.99 post-test of physical fitness qualities recorded players and the level of significance was set at 5%. Experimental and control players difference of mean value were -0.9 & 0.11 and P-Value were 0.000 & 0.385 respectively. Therefore, the experimental players had a great

level of fitness than control players. That means Illinois agility drill had significantly enhanced the physical fitness performance of players.

Generally the finding of this study revealed there is improvement in leg strength, speed and agility tests in experimental group. There for the training program planned for the experimental group was conducive, effective and have a positive influence in improvement of fitness level and soccer playing ability of the players. But the control group was not in the intervention training program they could not improve their performance during posttest. There for control group was possessed or less significant mean value on leg strength, speed and agility.

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