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The effects of anaerobic exercise on speed, agility and power in female youth basketball trainees at Bonga town, Kaffa Zone, Ethiopia

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Abstract

The study was conducted to evaluate the effects of anaerobic exercise on speed, agility and power in female youth basketball trainees at Bonga town, Kaffa Zone, Ethiopia. The study design was quasi-experimental. Simple random sampling technique was used to select subjects, experimental groups, while purposive sampling was used to select the sample sex and the study place. The data were analyzed. 15 female subjects were taken from a population of 30 female trainees by lottery sampling technique. Their age range was from 15-17 years. EG who performed in 3 days per week for 3-month anaerobic exercise training program. The result was taken pre and post-test result. PT of EG groups of 15 subjects power was measured by vertical jump test, speed was measured using 30m sprint run test, and agility was measured by Illinois agility test. Consequently after 12 weeks of anaerobic exercise, posttest measurement on the same variable was taken. The difference between the tests were analyzed statistically, with paired sample "t" test at $P < 0.05$ to determine the difference between initial and final mean for participant. According to analyzed data, the mean difference value increased in vertical jump performance by 3.73 cm. In 30 meter sprint run, 1.00 second mean difference was recorded. After 12 weeks anaerobic exercise in Illinois agility test, 3.24 second increments were observed throughout the study period. The result obtained in this study indicated that there was significant improvement in power, speed, and agility. Based on this finding, it can be concluded that anaerobic exercise has a positive effect on the improvement of basketball female trainees specifically speed, agility and power. Basketball clubs and projects should encourage and finance coaches in order to have more participation of anaerobic exercise to improve physical fitness qualities like speed, power and agility.

Keywords: Basketball, anaerobic exercise, speed, agility, power

1. Introduction

Anaerobic exercise is any activity that breaks down energy without using oxygen. Generally, these activities are of short length with high intensity. It is used by athletes in non-endurance sports to promote strength, speed and power, for body builders to build muscle mass, build tolerance to lactic acid that causes fatigue, helps to strengthen bones, burns fat, and increases stamina for physical activities. Metabolic changes due to anaerobic activity help increase the amount of energy available to muscles, which allows them to act more quickly and powerfully when recruited.

The required energy for short time and narrow space technical skills applications are produced by anaerobic way; so it is known that basketball is a game that requires a high level of anaerobic fitness. It has been concluded that basketball consists 20% of aerobic whereas 80% of the total energy contribution of anaerobic energy systems, including anaerobic-aerobic-anaerobic approximately are continuously variable (Matthew, D 2009) [7].

Basketball is characterized by high intensity short-duration activities as sprinting, jumping, passing, and shooting; (Christou, E. A. 2011) [3], interspersed by low-to-moderate intensity motion patterns such as standing, walking, and jogging. Therefore, high-intensity actions throughout the game are crucial for basketball players (Benabdallah, B. F 2010) [1].

Basketball is an extremely dynamic sport that requires movements in multiple planes of motion as well as rapid transitions from jogging - sprinting to jumping. The ability to quickly elude defenders, rapidly decelerate to take a jump shot, or explosively jump up to grab a

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rebound are all skills required to effectively play the game. Research has demonstrated that speed and agility training follows the principle of specificity, showing that linear speed training produces improvements in straight ahead speed with little carry-over to agility and vice versa. Thus, it is important to train these elements as separate components to ensure both speed and agility are being developed maximally. It has been shown that eight weeks of sprinting training can improve performance in the maximum speed phase of sprinting (20-40 meters) and resisted sprint training (pulling a sled weighted with a 5-kg load) can improve the acceleration phase of sprinting (10 meters). Research has further demonstrated that agility training can improve one’s ability to change direction Zafeiridis (2004)^[9].

Speed can be defined as the amount of velocity a person has in any given direction. Typically, this refers to how fast someone can run in a forward directed, straight path of motion. The speed drills that would be appropriate for a basketball player would include 30-yard sprint, acceleration and maximal speed Yilmaz, G. (2014)^[8].

Agility is the ability to start (accelerate), stop (decelerate and stabilize), and quickly change direction while maintaining proper postural alignment. This requires high levels of neuromuscular efficiency because the athlete is constantly regaining their center of gravity over their base of support while changing directions at various speeds. All of these elements are very common in basketball and will be important to train for Chamari (2015)^[2]. Agility is an important component of many team sports, though it is not always tested, and is often difficult to interpret results. The Illinois Agility Test (Getchell, 1979)^[5] is a commonly used test of agility in sports.

Explosive training is training that combines strength and speed to increase players power output. Explosive power drills are often used by athletes who need to generate a quick burst of maximal effort. The types of exercises used to build quick, explosive power are movements that require a maximum or near-maximum power output from the athlete in a short amount of time. This type of training is helpful for sports including football, track and field sports, court sports, and even cycling Gissis, I (2006)^[6].

Research supports the idea that explosive (speed and strength) exercise builds athletic power, but is more effective when combined with other types of training. Other published reports suggest that in order to maximize strength, power, and speed of movement, a combination of heavy and light explosive exercise provides superior results when compared to either training style alone Yilmaz, G. (2014)^[8].

Sports performance is the outcome of multiple factors, and it

3. Result and discussion

3.1 Results of Speed, Agility and Power in Female Youth Basketball Trainees at Bonga Town, Kaffa Zone, Ethiopia

Table 2: Variables and Tests

No	Variables and Methods/Tests	Equipment and unit of measurements
1	Power, Explosive leg (vertical jump test)	Measuring tape and marking powder, Centimeter
2	Speed, 30m run test	Sport field, Stopwatch, Whistle and cones, Second
3	Agility, Illinois’ agility Test	Sport field, Stopwatch, Whistle and cones, Second

The above table 2 shows that the types of variables, methods, test items and its measurement units which designed to do this experimental research. The results of selected physical fitness

would be difficult to control and assess the net impact of resistance training. After participating in resistance training programs, sport performance of youths is expected to improve. The sport of basketball requires many changes in direction, quick movements and explosive jumping. To ensure the athlete can perform these skills properly and handle the stresses that come with the sport, speed and agility training can be an important component to include in the training regimen. These drills can be incorporated into any basketball program for athletes across all levels to help maximize performance and decrease the risk of injury Getchell, B. (1979)^[5].

Different study’s was conducted on female basketball players, there is little or no study conducted on the effects of anaerobic exercise on speed, agility, and power for youth female basketball trainees. Thus, it would be interesting to examine, if anaerobic exercise training would have a positive impact on speed, agility and power upon Female youth Basketball trainees. Therefore, the purpose of this study was to examine the effects of basketball training combined with anaerobic exercise upon physical capacities as running speed, agility, and power in Female youth Basketball project trainees at Bonga town.

2. Methods and Materials

2.1 The study subjects and Research design

For this study Quasi-experimental study designs that do not use control groups and the 1-group pretest-posttest design were employed. The volunteered 15 female athletes between the ages 15-17 years, playing basketball participated in this study. Quasi experiments are studies that aim to evaluate interventions but that do not use randomization and it aim to demonstrate causality between an intervention and an outcome. Such designs are frequently used when it is not logistically feasible or not ethical to conduct a randomized, controlled trial—the “gold standard” of causal research design De Ste Croix (2001)^[4].

A 12-week anaerobic training program 3 days/week, 30 minute duration was designed to increase speed, power and agility in addition to their usual training program.

Table 1: 12-Week Training Period

Week	Session	Set * repetitions	Intensity (%1RM)
1 – 12	1. Speed training	3 x 30m sprint	60-80
	2. Agility training	3 x Illinois agility	60-80
	3. Power training	3 x vertical jump	60-80

Speed, agility and power training program for 12-week training period.

variables of experimental group pre and post-test data were analyzed.

3.2 Results of Anaerobic Exercise on power

Table 3: The Mean value result of power, vertical jump test for EG

Group	Test	PT(X±SD)	PoT(X±SD)	(MD)	P=value
EG	Power (Vertical jump test)	25.67±4.53	29.40±4.92	3.73	.000

EG= experimental groups, X=mean value of each tests, SD= Standard deviation, (MD) mean difference, PT=pretest result, p=significance level.

As shown from table 3 the average pretest score of EG (N=15) was found to be 25.67 with a standard deviation of 4.53 after 12 week anaerobic exercise training of experimental group result was found out 29.40 with SD of 4.92 and the mean difference between pre and post result was scored 3.73 at p value of .000 these data indicated that there is a significant difference and gradual improvement between PT and PoT test results. Based on the finding of the result anaerobic exercise training had improvement on vertical jump test of Female youth Basketball trainees at Bonga town, Kaffa Zone, Ethiopia

3.3 Result of Anaerobic Exercise on speed

Table 4: The Mean value result of 30 meter sprint run test for EG

Group	Test	PT (X±SD)	PoT (X±SD)	(MD)	P-value
EG	30 meter sprint run	6.13 ±0.99	5.13± 0.63	1.00	.000

EG= experimental groups, X=mean value of each tests, SD= Standard deviation, (MD) mean difference, PT=pretest result, PoT= post test results p=significance level.

The above table 4 shows that the average pretest score of EG (N=15) was found to be 6.13 with a SD of 0.99 After 12 week anaerobic exercise training of EG was found out 5.13 with SD of 0.63 These data indicated that there is a significant difference and gradual improvement between PT, and PoT test results of EG. 30 meter sprint run test was significantly improved by a mean difference of 1.00 at P=0.000 after three

3.5 Comparison Results of Variables (vertical jump, 30meter sprint run, and Illinois agility) results of EG

Table 6: 12 week anaerobic exercise results of (power, speed and agility)

Variables and its test	PT(X±SD)	PoT (X±SD)	(MD)	P-value
Power (vertical jump)	25.67±4.53	29.40±4.92	3.73	0.000
Speed (30meter sprint run)	6.13 ±0.99	5.13± 0.63	1.00	0.000
Agility (Illinois' agility test)	21.31 ±1.14	18.07± 0.85	3.24	0.000

X=mean value of each tests, SD= Standard deviation, (MD) = mean difference, PT=pretest result, PoT= post test results p=significance level.

The above table showed that EG there was significance difference in between the pre to post test score of (vertical jump test, 30 meter run test, Illinois agility test) results due to 12 week anaerobic exercise in the selected physical fitness components (power, speed and agility).All test had changes was due to Anaerobic exercises in which they were engaged in. the mean score value of power pretest before training result was (25.67) and posttest after training mean score values was (29.40) The mean difference score of pretest with mean difference score of posttest mean difference value increased by (3.73).

As indicated the tables mean value of speed from pretest 6.13 increased to 0.99 post test. Speed score of pretest to posttest mean difference value of EG increased 1.00 recorded. The mean value of agility from pretest 21.31 improved to 18.07 post result. Agility score of pretest mean to posttest mean difference value of EG increased 3.24 scored.

4. Conclusion

Anaerobic exercise improved different physical fitness

months anaerobic exercise training.. The implication therefore is anaerobic exercise training had improvement on speed of in Female youth Basketball trainees at Bonga town, Kaffa Zone, Ethiopia

3.4 Result of Anaerobic Exercise on Agility

Table 5: The Mean value result of Agility test for EG

Group	Test	PT (X±SD)	PoT (X±SD)	(MD)	P-value
EG	Agility (Illinois' agility test)	21.31 ±1.14	18.07± 0.85	3.24	.000

EG= experimental groups, X=mean value of each tests, SD= Standard deviation, (MD) mean difference, PT=pretest result, PoT= post test results p=significance level.

As shown from table 5 the average pretest score of EG (N=15) was found to be 21.31with a SD of 1.14 and after 12 week anaerobic exercise training of EG was 18.07 with SD of 0.8 One can pick up that these numbers in pretest and posttest mean scores achievement levels are different. Therefore, these data indicated that there is a significant difference and improvement between PT,and PoT test results of EG. After three months anaerobic exercise training EG in Illinois agility test was improvement by a mean difference 3.24 at P=0.000. The implication therefore is anaerobic exercise training had improvement on agility of in Female youth Basketball trainees at Bonga town, Kaffa Zone, Ethiopia

qualities among basketball trainers at different age and sex levels. But, it remains lack of understanding between basketball drills and anaerobic exercise. The purpose of this study was to evaluate effects of anaerobic exercise on Speed, agility and power in Female youth Basketball trainees at Bonga town, Kaffa Zone, Ethiopia. Data was drawn from a pre and posttest after 12 weeks of anaerobic exercise training within selected physical fitness tests i.e. Power (vertical jump to assess), Speed (30 meter sprint run), and Agility (Illinois agility run). The data was administered to selected sample female trainers (N=15). As a result, the following conclusion was made. This study indicate that anaerobic exercise has its own advantage on improving speed, agility and power experimental groups showed a significant difference ($p<0.05$) on the above physical fitness qualities.

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