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Effects of Twelve Weeks Resistance Training on Physical Performance of Young Football Players of Dessie City, Amhara Region, Ethiopia

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ABSTRACT

This study scrutinizes effects of resistance training on physical performance of young male football players. 34 amateur volunteered football players were grouped randomly as control or nonresistance training group (n=17, age = 19.47±1.33 years, weight = 58.74±3.23 kilogram and height = 166.24±4.44 centimeter) and experimental or resistance training group (n=17, age = 19.88±1.36 years, weight = 59.65±2.46 kilogram and height = 167.12±4.39 centimeter). During the intervention, both groups continued their customary training sessions but the experimental group performed resistance exercises 2 times a week for 12 weeks, while control group did not. Participants' agility, speed, and power skills of both groups were assessed by Illinois agility run test, 30-meters sprint test, and vertical jump test respectively before and after 12 weeks of resistance training. The result of the investigation indicated that the mean difference of speed, agility, and power in the control group was found to be (0.03 seconds, 0.01 seconds, and 0.53 centimeters respectively) revealed insignificant ($p>0.05$) when compared to the pre and post-test mean scores. While the mean difference of speed, agility, and power in the experimental group was found to be (0.67 seconds, 0.75 seconds, and 4.82 centimeters respectively) showed that there were significant differences between the pre-test and post-test results ($p<0.05$). According to the outcomes of this study, resistance training which was employed in addition to football training can improve players' agility, speed, and power skills.

Keywords: Agility, Performance, Power, Resistance Training, Speed.

INTRODUCTION

Football is a branch of sport where fast strength, jumps, sprints, tackles, and loco-motor movements are executed. It is also a high-level skill sport that all bio-motor abilities are affected that need aerobic and anaerobic strength and which includes skill-related physical fitness like speed, agility, strength, and power (Little & Williams, 2003; Afyon et al., 2017).

Sprinting capability is an integral element of successful enactment in a variety of sports and the capability to accelerate in soccer triggers a successful game (Little & Williams, 2003; Murphy et al., 2003). At the top level, football is also considered by short-term periods of intense movement followed by phases of recovery (Bradley et al., 2009; Turner et al., 2011; Oberacker et al., 2012).

The other motor performance factor is agility which distinguished as body changing position as a response to invigorating phenomenon (Sheppard & Young, 2006; Young & Farrow, 2006). According to Bidaurrazaga-Letona et al. (2015) in football, agility is an important parameter that is a result of speed, strength, balance, and coordination combination. The capacity to deliver fast-paced variable activities can affect soccer execution (Little & Williams, 2003) since agility covers nearly 11% of player activity (Mirkov et al., 2008; Mohr et al., 2008; Turner et al., 2011) and on average, a player can perform 50 turns during in each match (Wisloeff et al., 1998; Turner et al., 2011). Because of this, a football player's agility must be evaluated (Turner et al., 2011). Mirkov et al. (2008) and Turner et al. (2011) examined the reliability of football-specific field tests and testified that the most appropriate sign of overall soccer playacting maybe agility testing.

Explosive power is an imperative factor in the leg muscles of qualified football players which is exceptionally vital to get a level of explosive power in soccer which empowers them to attain their peak jump height.

In any case, numerous explosive developments require little time. Subsequently, getting the greatest muscle strength from the major muscle bunches of the lower limb for explosive power needs specific resistance training works out (Taheri et al., 2014).

Sprinting ability (Little & Williams, 2003; Jullien et al., 2008; Ronnestad et al., 2008) and the height of

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jumping and distance (Ronnestad et al., 2008), have been displayed to be positively correlated to performance of football and considered as a measure of power generation. It is therefore vital to measure a player's power generation capacity, speed and stretch-shortening cycle (SSC) improvement or reactive strength ability. Power is generally dependent on the capability to apply the highest possible force and maximum strength (Stone et al., 2003).

Football is deliberated a high-intensity discontinuous sport requiring advanced levels of physical fitness specifically related to the capability to perform powerful activities and it is the central goal of strength training which helps to improve the players' specific activities. According to Suarez-Arrones et al. (2019), a strength training program that supplements football-related training sessions might be a viable choice to extend fat-free mass, bone mineral substance, and bone mineral density at both whole-body and regional levels over the competitive season in youth male professional football players. Skill performance in football is negligibly influenced by intense resistance work out free of intensity recommending those first-class players may be able to take an interest in football practice or match after as it were 24 hours taking after a quality training session (Draganidis et al., 2013). An integrator training program grounded in resistance training and motor skill advancement can enhance a youthful athlete's potential to expand their athletic and sporting performance, whereas decreasing the chance of a sports-related injury. Resistance training may be particularly critical for modern-day youth athletes who are more likely to practice in one sport at an early age at the cost of improving common physical wellness and learning sport skills (Faigenbaum et al., 2016).

To be a successful coach and athlete resistance and plyometric preparation can be a prerequisite. Hence the qualifying parts of physical fitness and desirable athletic performance that play a crucial role in most sports, especially football are agility, speed, and explosive power (Zearei et al., 2013).

Although the strength training particularly core strength (Afyon et al., 2017; Afyon, 2019; Dinç & Ergin, 2019; Vigneshwaran, 2017) and lower limbs (Chelly et al., 2009; Jullien et al., 2008; Styles et al., 2016), upper body (Tricoli et al., 2005; Channell & Barfield, 2008) and total body strength training (Christou et al., 2006) have shown a positive effect on some physical capacities of football players, other studies have not indicated a similar effect that makes it is unclear. Thus, it becomes necessary to evaluate the relationship between motor performance and total body strength, and this information could help coaches, players, experts in this area, and scholars to understand the influence of muscle fitness variables on motor tasks. Having in mind, this inquiry aimed to investigate the effects of strength training on physical performance in young male football players.

MATERIALS AND METHODS

Experimental approach to the problem:

A true experimental design with a controlled sample was used to examine the effects of a resistance training program on physical performance of young male football players. Thirty-four subjects were assigned to either the nonresistance training group (control) or resistance training group (experimental) randomly. Before pre-test measurement of the study, subjects of both groups were informed about the tests, and the experimental group is informed about 12-week resistance training program additionally. Before and after the 12 weeks of training of control and experimental groups, pre-tests and post-tests of agility, speed, and power skills were made by Illinois agility test, 30 meters (m) sprint test, and vertical jump test respectively.

Upon application of pre-tests, both groups carry on their programmed normal training for 12 weeks 3 days a week. Besides, the experimental group applied additional resistance preparation after 5 to 10-minute general and specific warm-up exercises for 2 days per week. During this time, they continued their customary training with the control group.

Subjects:

17 players of experimental group (age = 19.88±1.36 years, weight = 59.65±2.46 kilogram (kg), height = 167.12±4.39 centimeter (cm) and body mass index (BMI) = 21.40±1.47 kilogram per meter square (kg/m^2) and 17 players of control group (age = 19.47±1.33 years, body weight = 58.74±3.23 kg, height = 166.24±4.44cm and BMI=21.30±1.70 kg/m^2) totally, 34 voluntary amateur football players participated in the study. The inclusion criteria were age between 16 and 23 years, training age at least 4 years, currently active player, and volunteer to participate. All participants were given an informed consent form and ethical clearance of the study that was obtained from the ethics committee of Health Sciences in Wollo University. Moreover, the physical activity readiness status was also obtained from the participants before the investigation.

Procedures:

After calibrating instruments agility, power, and speed performance skills were measured on isolated days, 3 days apart. Subjects went without training for 1day earlier to testing. Due to testing being conducted on separate days, all assessments were administered at the same time of day and the subjects inquired to standardize their nourishment and liquid admissions earlier to each testing session.

30 Meters speed test:

The sprinting speed test was utilized to diagnose speed potential within the football players. Players run on 30 m decided zone with maximal sprint and the time of run is registered by standardized stopwatch in terms of seconds. The members rehashed the test twice and the foremost suitable result is recorded.

Illinois agility run test:

It was piloted following proven methods (Amiri-Khorasani, 2010; Jarvis et al., 2009; Dinç & Ergin, 2019). The Illinois agility run includes four markers being set to demonstrate a region that's 10 m long and 5 m wide. Within the center of the region, 4 markers are put 3.3 m separated. Two-timing doors were utilized; one at the beginning line and one at the end. No specialized advice was given as to the foremost successful performance technique. Subjects were as it was instructed to complete the test as rapidly as conceivable. Subjects were told not to cut over the markers; they were to run around them. On the off chance that a subject failed to do this, the trial was ceased and re-attempted after the essential recovery period, so that 3 fruitful trials were completed.

Vertical jump Test:

Vertical jump execution was evaluated for each subject after a sound warm-up using the Vertec. A two-handed reach was used to displace the maximum number of points possible from a flat-footed, standing position. After the stand and reach, a countermovement jump was performed to displace the highest reachable strip. Subject's performance was considered as the difference between the height of the highest point moved during a vertical jump and standing reach (Sargent, 1921; Channell & Barfield, 2008).

Training protocol:

Resistance training exercises were performed two days a week during the 12 weeks. The resistance training program started with warm-up and ended with a cool down. The detailed training program of the resistance group is prearranged in Table 1.

Data analysis:

The anthropometric/demographic variables particularly age; weight, height, and BMI were expressed in descriptive statistics methods as means (x) and standard deviations (±SD).

Upon the completion of 12-week training program, differences between the pre-test / post-test result values of both experimental and control groups are analyzed through paired t-test, and to identify the variations between experimental group and control group, the independent sample t-test is used. The findings obtained are displayed 5% (0.05) significance with a 95% confidence interval. Apart from this, all data analysis was performed using the IBM-SPSS statistical software version 20

RESULTS

In both experimental and control group participated in the study, taking pre-test values of; 30m sprint test, Illinois agility run test and vertical jump test results were summarized in the following tables.

As displayed in Table 2, when the pre-test results of the participants of resistance group before training are compared with pre-test results of the participants of the nonresistance group who train normally we can say that there were no significant differences in the results of speed, agility, and power values ($p > 0.05$).

After the 12 weeks strength training statistically significant differences were found in speed, agility and power performances ($p < 0.05$) in resistance group participants but there was no significant difference found in speed, agility and power performances ($p > 0.05$) in nonresistance group participants (Table 3).

DISCUSSION

The results showed that twelve weeks of total body resistance training had significant effects on increasing power displacement height and reducing sprinting and agility records. The finding in speed performance of the current study was similar to (Christou et al., 2006). Research results of various body parts and types of resistance training applications demonstrated improvements in athletic performances. According to Afyon et al. (2017), 8-weeks of core resistance training provided for amateur football players has a significant effect on 30m sprint performance with a mean difference of 0.09 second, and Styles et al. (2016) observed simple in-season strength training on short sprint performance of 16-20 years old professional football players and found 5%, 3%, and 1% improvements in sprint performance over 5 m, 10 m, and 20 m, respectively. Chelly et al. (2009) stated back half-squat exercises of 2 training sessions a week improved sprinting performance in junior soccer players ($p < 0.05$ for both V(first step) and V(first 5 m). The dribbling and time of sprint running tests improve after plyometric training and resistance training but have not succeeded in the improvement of shooting accuracy in youth football players (Franco-Márquez et al., 2015). However, this study is disparate from (Taheri et al., 2014) stated that eight weeks of resistance training had no significant effects on reducing speed records. These could be due to technical performance, reacting ability, and physiology of the subjects' response to training adaptation. Research results show that resistance training improves speed in professional soccer players by affecting leg extensor muscles (Christou et al., 2006). Hence apart from increasing strength,

other factors such as reaction time, technique, body shape, and flexibility also should be noted in speedy performances.

football players with p=0.000. Dinç and Ergin (2019) also reported that core strength training had significant effects on balance, agility, and explosive

Table 1: Strength training program throughout the 12 weeks training period

Working muscles	Exercises	1-4 week		5-8 week		9-12 week	
		Intensity	Reps.	Intensity	Reps.	Intensity	Reps.
Thigh	Alternate Legs Lunge	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Half Squat	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	6-10
	Leg Press	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Leg Curl	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
Calf	Standing Leg Raises	*Own body*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
Chest	Push up	*Own body*	*10*	*Own body*	*20*	*Own body*	*25-40*
	Flat Bench Press	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Incline Bench Press	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Decline Bench Press	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Cable Pec. Flay	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
Triceps	Lying Extension	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Triceps Dip	*Own body*	*5*	*Own body*	*8*	*Own body*	*12*
	Cable Triceps Press	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
Biceps	Biceps Curl	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Biceps Hammer Curl	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Concentration Curl	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
Shoulder	Shoulder Press	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
& back	Lat- Pull Down	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Lateral Raise	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Pull Up	*60% 1RM*	*8-15*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Low Row	*60% 1RM*	*6*	*70% 1RM*	*7-12*	*80% 1RM*	*6-10*
	Crunch & sit up	*Own body*	*30*	*Own body*	*35*	*Own body*	*30*
Core/ab	Lying Twist Trunk	*Own body*	*30*	*Own body*	*30*	*Own body*	*35*
dominal	Plank	*30 sec*	*2*	*40 sec*	*1*	*60sec*	*2*
muscles	Mountain Climber	*Own body*	*20*	*Own body*	*40*	*Own body*	

Reaps=repetitions, 1RM=repetition maximum, sec=second and number of set was 1-3, the recovery time between set was ranges from 0.5-2 minutes and the training equipment used during the training program were calisthenics/own body barbell, dumbbell, cable crossover machine and dual adjustable pulley.

The results showed that twelve weeks of total body resistance training had significant effects on increasing agility performance (Table 3). The finding was consistent with Afyon et al. (2017) recorded a 1.45 second mean difference after 8 weeks of core training investigation on amateur

force of athletes (p=0.00). Neuromuscular training essentially improved agility performance in first-class football players (Zouhal et al., 2019).

The results found in this study is similar to the average found in the literature chosen for this study

but did not match with (Prieske et al., 2016) and (Sever & Zorba, 2018) reported that core training has no effect on agility skills as a result of their work on football players. The reason why the agility results of the studies mentioned above differ from ours can be related to the age, training methods, and activeness in sports. Agility performance reduction is predictable if there is a strong difference between and explosive force of athletes. Back half-squat exercises, 2-training sessions per week improved leg power and jump performance in junior soccer players (SJ, $p < 0.05$ and 5-JT, $p < 0.001$). Chelly et al., (2009) and Taheri et al. (2014) resistance and plyometric training provided for 8-weeks has a significant effect on male football players explosive power capacity. Related literature reports showed

Table 2: Physical performance (speed, agility and power) pre-test values comparison analysis of experimental and control group

Variables	Experimental Pre-test X±Sd.	Control Pre-test X±Sd.	t	df	p
Speed (sec)	5.22±0.38	5.21±0.45	0.095	32	0.925
Agility (sec)	18.60±1.94	18.56±2.21	0.056	32	0.956
Power (cm)	40.47± 7.11	38.94± 5.44	0.705	32	0.486

Where X=Mean, Sd. = standard deviation, sec = second, cm = centimeter, t = t-value, df = degree of freedom, and p = significance level.

Table 3: Physical performance (speed, agility and power) pre-test and post-test values comparison analysis of control and experimental group.

Variables	Study group									
	Experimental					Control				
	Pre-test X±Sd	Post-test X±Sd	t	df	p	Pre-test X±Sd	Post-test X±Sd	t	df	p
Speed (sec)	5.22 ± 0.38	4.55 ± 0.33	5.806	16	0.000	5.21 ± 0.45	5.18 ± 0.43	1.992	16	0.064
Agility (sec)	18.60 ± 1.94	17.85 ± 1.80	4.303	16	0.001	18.56 ± 2.21	18.55 ± 2.23	0.157	16	0.877
Power (cm)	40.47 ± 7.11	45.29 ± 8.79	-6.203	16	0.000	38.94 ± 5.44	39.47 ± 4.87	-1.643	16	0.120

Where X=Mean, Sd. =standard deviation, sec=second, cm=centimeter, t=t-value, df=degree of freedom, and p=significance level

muscle groups or a defect in the angles of a biomechanical movement working during agility. These factors mentioned above should be carefully examined to achieve accurate results.

The finding in power performance of the current study was positively significant and consistent with (Christou et al., 2006; Pacholek & Zemková, 2020). Reports related to resistance training of core, lower, and combination with plyometric training studies demonstrated positive effects in power performances. For example, Afyon (2019) investigated 8-weeks core training effects on 21.4±2.12 years old university level footballers jumping performance and found a 2.5 cm mean difference with P=0.000 in the experimental group versus 1.5cm with p=0.203 in the control group. Dinç and Ergin (2019) examined that core strength training had significant effects on balance, agility, that core, lower extremity, and whole-body resistance training could improve power performance in football players. Our results showed similar findings however, it contradicted Schilling et al. (2013). Observed significant increases in back extensor and flexor endurance and side muscle strength of a 6-week core force and endurance training intervention applied 2-times a week on non-active individuals; however, no change in a sprint, agility, and vertical jump was reported. This difference may come from age, activeness level, leg muscle strength, and (Channell & Barfield, 2008) speed variation between study subjects. Power is the product of speed and strength, so that, people with sedentary life lacks.

In conclusion, resistance training is applied to football training to improve the progress of players'

speed, agility, and power skills. Therefore it is prescribed that physical conditioning coaches, football players and coaches, and specialists in this range ought to increase and maintain strength without neglecting technical and tactical training programs.

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