Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

European Journal of Experimental Biology, 2014, 4(1):448-451

ISSN: 2248 –9215
CODEN (USA): EJEBAU

The effect of strength and plyometric training on anaerobic power, explosive power and strength quadriceps femoris muscle in soccer players

Abdul Rahim Khodajo, Asghar Nikseresht* and Ebrahim Khoshnam

Department of Physical Education, Jahrom Branch, Islamic Azad University, Jahrom, Iran

---

ABSTRACT

The purpose of the present study was to investigate the effect of 8 weeks of strength and plyometric training on anaerobic power, explosive power and strength quadriceps femoris muscle in Soccer Players. 20 male soccer players who aged 20-30 voluntarily participated in the study. They were assigned in strength (n=10) and plyometric (n=10) groups. Both groups performed selected soccer-specified strength and plyometric for 8 weeks. Data was analyzed using paired t-test, independent t-test statistical methods. The results showed that strength Quadriceps femoris muscle statistically significant increase in post-test compared to pre-test in strength training group (p=0.015) and explosive power in statistically significant increase in post-test compared to pre-test in plyometric training group (p=0.021). Between-groups comparison showed better records in explosive power for plyometric compared with strength training group after eight weeks (p=0.049). The results showed that both strength and plyometric training improves physical fitness in soccer players. Therefore, recommended that both types of training program to prepare their benefit.

Keywords: anaerobic power, explosive power, strength quadriceps femoris muscle, strength training, plyometric training, Soccer players.

INTRODUCTION

Strength training wide range of types of plyometric training includes strength training as it involves running downhill. This training improves basic motor skills such as sprinting throwing and jumping and advances in basic motor skills can lead to better performance when racing [1,2].

Plyometric training is popular among in soccer players, and plyometric training is executed with a goal to increase dynamic muscular performance. In these exercises, muscles undergo a rapid elongation followed by an immediate shortening, utilizing the elastic energy stored during the stretching phase [3,4]. These exercises also improve performance in sports such as hockey, basketball, rock climbing, soccer and volleyball helps [5].

Most sports activities are implemented as a combination of all three metabolic energy devices with various ratios are used [6]. Soccer players during a football match various forms of skills and performance to exhibit periodic motion. One characteristic of a football game is continuous bursts. The activation status of both aerobic and anaerobic energy systems require energy to do during the game is required [7].

In a football, needs several such shot, jumping, tackling, sprinting and changing pace frequent changes of location shooting, so the ability to jump and anaerobic performance is 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 one's power to be effective [8,9]. Coaches and athletes are keen to improve the ability to enhance athletic performance. Successful

implementation skills, jumping, throwing and other skills, explosive power and muscle strength depends. Athletes have the ability to use power and maximum power is necessary [10]. Plyometric strength training and muscle strength has a strong influence on the rise. These exercises to increase vertical jump height will help [5,11]. The leg muscles in general and specifically the vertical jump is an essential element for the success of the athletes [4,12].

Physical fitness of the two dimensions of wellbeing-Health and competition can be examined. However, after health is more common, however it greater complexity to the competitive and professional and special needs facilities and talent. Given the cost and time spent on the athletes, the importance of physical fitness assessment team members is essential [8]. Therefore, this study investigated the effect of 8 weeks of strength and plyometric training on anaerobic power, explosive power and strength quadriceps femoris muscle in Soccer Players.

MATERIALS AND METHODS

The subjects of this study were 20 male soccer players who aged 20-30 years old. The subjects were divided into strength (n=10) and plyometric (n=10) groups. The subjects were at least 10 years of soccer activities and games practiced in the city and the league. The criteria for participating in the study included general health, lack of a specific diet and medication, age, and sport field. Subjects' characteristics are presented in Table 1. Subjects participating in the study signed a voluntary consent and medical health questionnaire.

Table 1- Participant Characteristics

Parameter	strength training	plyometric training
Age (year)	21.50±4.08	24.20±3.96
Height (cm)	180.20±9.24	177.30±11.16
Body weight (kg)	71.67±7.62	69.90±6.54
Body Mass Index (kg/m2)	22.25±3.15	22.30±1.81

One week before the start of the study, subjects were familiar with how to properly perform exercises and multiple repetitions of the exercises did. The height, weight, body mass index was also measured. RAST test were used to measure anaerobic power, Sargent jump tests were used to measure explosive power, and strength quadriceps femoris muscle measured by dynamometer of the assess subjects of both groups. One day before and one day after the eight-week test of anaerobic power, explosive power and strength of the quadriceps was performed.

Strength Training Program

Strength training circuit performed two days a week (Monday and Tuesday) and 60 minutes of strength. Strength exercises include leg extension, leg press, lying barbell extension, unilateral leg extension, barbell lunge, hack squat, unilateral leg press with the weight of three rounds and each round with a 10, 8 and 6 replicates, respectively 50, 40 and 30% of one repetition maximum and the 10 seconds did. Also, strength training three days a week (Saturday, Monday and Wednesday) for 90 minutes to carry out regular exercises to tackle football.

Plyometric Training Program

Plyometric training groups two days a week (Monday and Tuesday) and did a 30-minute plyometric exercises. Plyometric training include running gait with both feet, foot switch leap upward , jump on 8 cones side, jump from the cone 8 directions, medicine ball move the ball up and down and vice versa, medicine ball wing throwing the ball forward with both hands from behind, and medicine ball throws the ball down the wing upward with both hands was performed. Also, three days a week (Saturday, Monday and Wednesday) for 90 minutes to perform regular exercises to tackle football.

Statistical Methods

Statistical analysis was performed using SPSS version 18. Data normality was investigated using the Kolmogorov-Smirnov test. Paired t-test was used for within-group comparison and independent t-test and covariance were used for between-groups comparison. The significance level of the test was considered $p \leq 0.05$.

RESULTS

Within-group comparison of research variables is presented in table 2. The results showed that the strength quadriceps femoris musclein comparison to the pre-test and post-test increased significantly (p=0.015) but the of anaerobic power and explosive power change was not significant (respectively p=0.874 and p=0.210). Plyometric training group compared to the pre-test and post-test of explosive power increased significantly (p=0.021) but the values of anaerobic power and strength quadriceps femoris muscle did not change significantly (respectively p=0.758 and p=0.104).

Table 2. Comparison of within-group variables in both groups (Means±Sd)

Parameter	Phase	strength training	P value	plyometric training	P value
Anaerobic power	Per	460.91±42.80	0.874	469.23±34.03	0.758
	post	458.88±45.18		473.71±42.29	
Explosive power	Per	42.81±7.01	0.210	43.00±8.26	0.021
	post	45.04±5.37		48.39±6.45	
Strength quadriceps femoris muscle	Per	35.30±5.75	0.015	36.10±6.33	0.104
	post	43.00±4.02		38.50±5.40	

Table 3 compares the measured average between the two groups. Between-groups comparison showed better records in explosive power for plyometric compared with strength training group after eight weeks (p=0.049) but the of anaerobic power and strength quadriceps femoris muscle did not change significantly (respectively p=0.458 and p=0.224).

Table 3. Comparison of between-group variables in both groups (Means±Sd)

Parameter	strength training	plyometric training	P value
Anaerobic power	458.88±45.18	473.71±42.29	0.458
Explosive power	45.04±5.37	48.39±6.45	0.049
Strength quadriceps femoris muscle	43.00±4.02	38.50±5.40	0.224

DISCUSSION

The present study was designed to investigate the effect of 8 weeks of strength and plyometric training on anaerobic power, explosive power and strength quadriceps femoris muscle in Soccer Players. The results showed that in strength training group no changes in anaerobic power and explosive power but strength quadriceps femoris muscle statistically significant increase in post-test compared to pre-test in strength training group. The results were consistent with Chtara et al (2008), Rahimi et al (2005), and Arazi et al (2011) but did not match with Zarezadeh et al (2013) and Clutch et al (1983). Anaerobic power is defined as the use of force in the shortest possible time. Power and speed are also important components of anaerobic power [18]. Probably no change in anaerobic power related to the intensity and duration of training. Biomechanical jumping on people's ability to phosphagen system capacity and rapid deployment of resources is dependent phosphagen system [19]. Probably lack the capacity to adapt and change phosphagen system after eight weeks of strength training led to significant improvements in muscle strength have not footballers. Strength increases, may be due to the greater motor unit of simultaneous calls that may facilitate muscle contraction and increased ability to generate [20]. Possibly increasing quadriceps strength on strength training because there are compatible with this type of training over eight weeks and this adjustment may be due to calls of motor units in these subjects, which may facilitate muscle contraction and is capable.

The results showed that the plyometric anaerobic power and strength quadriceps femoris muscle in post-test compared to pre-test showed no significant change, but Between-groups comparison showed better records in explosive power for plyometric compared with strength training group after eight weeks. The results were consistent with Makaruk et al (2012), and Abass et al (2005) but did not match with Lubebbers et al (2003) and Rahimi et al (2005). One characteristic of a football game is a burst of explosive movements. The activation status of both aerobic and anaerobic energy systems require energy to do during the game is required [24,25]. Plyometric training group compared to the pre-test and post-test values of anaerobic power increased, but this increase was not significant, probably not meaningful due to the severity and duration is training. Phosphagen energy system and anaerobic glycolysis which produces two routes of anaerobic metabolism is adenosine triphosphate [20]. There is probably consistent with plyometric exercises makes phosphagen system and anaerobic glycolysis to generate adenosine triphosphate great ability to have, and this has led to better results in the Sargent jump test eight weeks after the show. Muscle hypertrophy incremental real structural changes in can be induced by increasing the number of muscle fibers or increase the size of existing muscle fibers [20]. Plyometric exercises are not likely to lead to an increase in the number of muscle fibers or increase the size of muscle fibers arise, so there was no significant difference.

CONCLUSION

Limitations of this study include the lack of control mental condition, individual differences, nutrition, subjects working hours were out of practice. According to the results both strength and plyometric training improves physical fitness in soccer players. Therefore, recommended that both types of training program to prepare their benefit.

REFERENCES

[1] Wong P, Chamari K, Visloff U, *J Strength Cond Res*, **2010**, 24, 652.
[2] Jung WS, Yae KS, *J Korean Acad Nurs*, **2012**, 42, 956.
[3] Donoghue O, Shimojo H, Takagi H, *Sports Health*, **2011**, 3, 309.
[4] Vaczi M, TollAr J, Meszler M, uhasz I, Karsai I, *J Hum Kinet*, **2013**, 36, 26.
[5] Thomas K, French D, Hayes P, *J Strength Cond Res*, **2009**, 23, 335.
[6] Chelly M, Ghenem M, Abid K, Hermassi S, Tabka Z, Shephard R, *J Strength Cond Res*, **2010**, 24, 2676.
[7] Meckel Y, Machnai O, Eliakim A, *J Strength Cond Res*, **2009**, 23, 169.
[8] Koklu Y, Alemdaroglu U, Koçak FU, Erol AE, Fındıkoglu G, *J Hum Kinet*, **2011**, 30, 106.
[9] Nikolaidis P, *Hum Mov*, **2011**, 12, 347.
[10] Sankarmani B, Sheriff IS, Rajeev RK, Alagesan J, *Value Health*, **2012**, 2, 180.
[11] Reyment C, Bonis M, Lundquist J, Tice B, *J Undergrad Kin Res*, **2006**, 1, 62.
[12] Markovic G, *Br J Sports Med*, **2007**, 41, 355.
[13] Chtara M, Chaouachi A, Levin GT, Chaouachi M, Chamari K, Amri M, Laursen PB, *J Strength Cond Res*, **2008**, 22, 1045.
[14] Rahimi R, Arshadi P, Behpur N, Boroujerdi SS, Rahimi M, *Physical Educ Sport*, **2005**, 4, 8.
[15] Arazi H , Asadi A, *J Hum Sport Exerc*, **2011**, 6, 111.
[16] Zarezadeh AM, Aminai M, Amiri KM, *Iranian J Health Physical Act*, **2013**, 4, 56.
[17] Clutch D, Wilton M, McGown C, Bryce RG, *Res Q Exerc Sport*, **1983**, 3, 10.
[18] Amir Sasan R, Karimi Asl A, Sari Saraf V, *Olympic quarterly*, **2011**, 4, 51.
[19] Shirazi A, Rajabi H, Agha-alinezhad H, *Olympic quarterly*, **2009**, 4, 41.
[20] Wilmore HJ, Costill LD, *Physiology of sport and exercise*, Moeini Z, Rahmaniniya F, Rajabi H, Mobtakeran Publications, Tehran, **2012**, pp 335.
[21] Makaruk H, Sacewicz T, *Hum Mov*, **2012**, 11, 22.
[22] Abass AO, *International J African & African American Stud*, **2005**, 1, 51.
[23] Luebbers EB, Potteiger AJ, Hulver WM, Thyfault PG, Carper GM, Lockwood HR, **2003**, *J Strength Cond Res*, **2003**, 17, 709.
[24] Haghighi A, Moghadasi M, Nikseresht A, Torkfar A, Haghighi M, *Eur J Exp Biol*, **2012**, 2, 2351.
[25] Shahidi F, Mahmoudlu GA, Mohammad YN, Lotfi G, *Ann Biol Res*, **2012**, 3, 2717.