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Effects of plyometric training on skill performance in soccer players

Abolghasem Memarzadeh[1], Mehrzad Moghadasi[2] and Karim Zare[3]

[1]Department of Exercise physiology, Islamic Azad University, Fars Science & Research Branch, Iran
[2]Department of Exercise physiology, Shiraz branch, Islamic Azad University, Shiraz, Iran
[3]Assistant Professor in Statistics, Fars Science & Research branch, Islamic Azad University, Fars, Iran
Corresponding author

KEYWORDS

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A B S T R A C T

Plyometric training (PT) is a widely used method to improve muscles' ability to generate explosive power. Plyometric may improved skill performance of soccer players; however it is not clear. The aim of this study was to investigate the effect of PT on skill performance in soccer players. Twenty soccer players participated in this study as the subject. The subjects were randomly assigned to PT group (n=10, age: 22.5 ± 0.5 years) or control group (n=10, age: 22.4 ± 0.5 years). The PT group performed 8 weeks lower extremities PT besides the soccer team training. The control group performed only the soccer team training during the study. The results showed that the time of sprint running test, dribbling, agility with and without ball and VO_{2max} improve after PT ($P<0.05$). For accuracy of shooting no significant change was observed after 8 weeks PT. In conclusion, although the time of sprint running test, dribbling, agility with and without ball and VO_{2max} improve after PT, these training have not effective to improve accuracy of shooting in soccer players.

Introduction

Plyometrics are training techniques used by athletes in all types of sports to increase strength and explosiveness [1]. Plyometrics consists of a rapid stretching of a muscle (eccentric action) immediately followed by a concentric or shortening action of the same muscle and connective tissue [2]. The stored elastic energy within the muscle is used to produce more force than can be provided by a concentric action alone [3]. Researchers have shown that plyometric training (PT), when used with a periodized strength-training program, can contribute to improvements in vertical jump performance, acceleration, leg strength, muscular power, increased joint awareness, and overall proprioception [3,4].

During a 90-minute soccer match, professional soccer player makes numerous

explosive bursts, like kicking, tackling, jumping, turning, sprinting, and changing pace [5]. Plyometric drills usually involve stopping, starting, and changing directions in an explosive manner.

These movements are components that can assist in developing skill performance in soccer players [6]. Although PT has been shown to increase performance variables in sports, little scientific information is available to determine if PT actually enhances skill performance in soccer. Therefore, the purpose of this study was to determine the effects of an 8-week PT on skill performance in soccer players.

Materials and methods

Participants

Twenty soccer players (22.4 ± 0.5 mean ± SD years of old) participated in this study as the subject. The subjects were randomly assigned to PT group (n=10) or control group (n=10). All subjects were nonsmokers and none used ergogenic aid or were users of medications known to affect cardio respiratory function during the study. The protocol of this study was in accordance with the guidelines of the Islamic Azad University, Fars Science & Research branch Ethics Committee and all participants gave their written consent.

Training protocols

The training protocols included only leg exercises. None of the subjects had used PT before. General and specific warm-up was performed prior to each training session. All subjects a standardized warm-up prior to the exercise training. Subjects jogged for an 8-minute period at a moderate pace and then performed 7 minute stretching movements. PT group performed 8 weeks lower extremities PT besides the soccer team training. PT programs were designed to overload the leg muscles involved in the vertical jumping motion and explosive performance. The subjects in the PT group performed four plyometric drills – the Depth jump, the Split squat jump, the Rim jump, the Box to box depth jump. The depth jump height started at 22 centimeters on the first week and progressed to 50 centimeters in the last week. The distance between boxes started at 1 meter on the first week and progressed to 2 meter in the last week. The control group performed only the soccer team training during the study.

Measurements

Anthropometric and body composition measurements

Height and weight were measured, and body mass index (BMI) was calculated by dividing weight (kg) by height (m^2). Waist circumference was determined by obtaining the minimum circumference (narrowest part of the torso, above the umbilicus) and the maximum hip circumference while standing with their heels together. The waist to hip ratio (WHR) was calculated by dividing waist by hip circumference (cm) [7]. Body fat percentage was assessed by skinfold thickness protocol. Skinfold thickness was measured sequentially, in triceps, subscapular, and chest by the same investigator using a skinfold caliper (Harpenden, HSK-BI, British Indicators, West Sussex, UK) and a standard technique [7].

Sprint performance

Each subjects runs as fast as possible 20-m for three times. A 20-m sprint test was used to assess speed. The best time was recorded.

Accuracy of shooting measurement

Accuracy of shooting was measured, by kick a role ball into a 0.8×2.3 meters target constructed in the center of goal. Strike zone was constructed with dimensions of 1×1 meter then this zone 7 meters away from the target. Subjects with 5.5 meters away from this area were located. Four balls were rolled from the player right-hand side and followed by four balls from the players' left-hands side. Balls were rolled at 6 seconds intervals. Players were instructed to kick the ball with their dominant kicking foot when it reached to strike zone. Between each ball strike, player returned to a baseline position 5.5 meters behind the strike zone before approaching the next ball. Subject repeated this procedure until striking the ball eight. For every ball into the target, one score for subjects was recorded [8].

Agility without ball: The Slalom test was performed to evaluate the agility [9]. All the subjects started with both feet behind starting point. Six cones were located 2 m apart, the first cone 1 m away from the starting line. Every player stood still facing the starting line, with his feet apart and the cone between his legs. He started after the signal and ran from point to point. The player at second point had to be passed on his right-hand side. The player continued to run as fast as possible constantly, changing the direction from right to left until he reached. The player stood at the last point. Afterward, the player turned 180°, and kept on running based on the Slalom style to the starting line [9].

Agility with ball: The Slalom test with ball was performed to evaluate the agility with ball. This test is structurally the same as the Slalom test, but the only difference was utilizing ball in this one [9].

Dribbling: Dribble test consists of five cones on a line with 1 m distance between them. The starting point was 1 meter far from the first cone. Each subject stood at the start point while holding the ball under his dominant foot. Hearing the whistle, he began the dribble test with maximum speed. As soon as passing the last cone, he returned to the starting point with his maximum speed. Time of performance was recorded by the timer [8].

Physiological demands: VO_{2max} was measured by Yo-Yo Intermittent Recovery test. Subjects started running back and forth a 20-m course and must touch the 20-m line. The initial speed was 8.5 km/hr. The speed got progressively faster (0.5 km/hr every minute), in accordance with a pace dictated by a sound signal on an audiotape. Several shuttle runs made up each stage. The subjects were instructed to keep pace with the signal for as long as possible. When the subjects could no longer follow the pace, the last stage announced was used to predict the maximal oxygen uptake using the equation of Leger et al. [10].

The equation:

$Y = -27.4+6.0X$, Where $Y = VO_{2\ max}$ (ml/kg/min)

X= Maximal shuttle run speed (km/hr)

Statistical analysis

Results were expressed as the mean ± SD and distributions of all variables were assessed for normality. Statistical significance was determined by independent and paired sample t-test. The level of significance in all statistical analyses was set at $P \leq 0.05$. Data analyses were performed using SPSS software for windows (version 13, SPSS, Inc., Chicago, IL).

Result and Discussion

Anthropometric and body composition characteristics of the subjects are presented in Table 1. Before the intervention, there were no significant differences in any of variables among the two groups. The results showed that the time of sprint running test, dribbling, agility with and without ball and VO_{2max} improve after PT compare to the control group ($P<0.05$). For accuracy of shooting no significant changes were observed after the PT (Table 2).

The purpose of this study was to determine if PT can enhance skill performance in soccer players. The results are in agreement with previous reports showing that PT significantly improved sprint performance in soccer players [6]. Haghighi et al. (2012) noted that sprint performance was improved after 8 weeks PT in young soccer players [6]. However; Fry et al. (1991) and Wilson et al. (1993) reported no significant increase in sprint acceleration or velocity after PT and resistance training in trained subjects [11,12]. This may be related to the lack of specific sprint training during the intervention period. Furthermore, it has been reported that strength training not always improves 20m-100m sprint time [13]. The group in the study of Kotzamanidis et al. (2005), which performed sprint training in addition to strength training, improved their 30m-sprint performance while the group who had no sprint training did not improve [13]. Similarly, in the study of Delecluse (1997) there was a significant increase in sprint acceleration when strength and sprint training was combined [14]. It seems that the concurrent sprint training (performed during the regularly soccer practices) in the present study may be important for sprint adaptations. Another possible explanation for the improved sprint performance in the current study may be the inclusion of a specific hip flexor exercise in the PT, shown to relate to improvements in sprint performance [13].

The results showed that the time of dribbling and agility with and without ball improved after PT. Agility refers to the capability to change the direction of the body abruptly, thus it seems that there is a positive relationship between agility and dribbling performance. Haghighi et al. (2012) reported that dribbling performance improves after 8 weeks PT in soccer players [6]. On the other hand, previous studies reported that the skill of dribbling had a positive correlation with speed and agility on other sports [15]. Miller et al. (2006) stated that the relationship between PT and increased performance in agility tests may be high due to their similar patterns of movement to facilitate power and movement efficiency by the immediate change in direction upon landing [16]. Our results showed that although 8 weeks PT increase accuracy of shooting, but did not achieve statistical significance. Haghighi et al. (2012) in an only available study reported PT had no significant effect on accuracy of shooting in young soccer players [6]. Additional research is needed to examine the effects of PT on the accuracy of shooting in the soccer players.

Conclusions

In conclusion, PT effective on skill performance in soccer players however additional research is needed to examine the effects of PT on the accuracy of shooting in these players.

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Table.1 Anthropometric and body composition characteristics (mean ± S.D.) of the subjects

	PT	Control
Body weight (Kg)	62.0 ± 4.5	61.4 ± 4.8
BMI (Kg/m^2)	20.3 ± 1.5	20.6 ± 1.5
Body fat (%)	9.8 ± 0.8	9.2 ± 0.6
WHR	0.81 ± 0.03	0.81 ± 0.02

Table.2 Skill performance (mean ± S.D.) of the subjects before and after 8 weeks of PT

	PT		Control			
	pre	post	pre	post	t	P
Sprint (s)	4.4 ± 0.1	3.3 ± 0.2*†	4.7 ± 0.1	4.6 ± 0.1	15.2	0.001
Agility with ball (s)	11.9 ± 0.5	10.4 ± 0.3*†	12.8 ± 0.07	12.7 ± 0.06	11.3	0.001
Agility without ball (s)	10.4 ± 0.2	9.4 ± 0.2*†	10.8 ± 0.05	10.7 ± 0.04	12.2	0.001
Accuracy of shooting (n)	4.5 ± 0.8	4.2 ± 0.7	4.1 ± 0.7	4.0 ± 0.6	- 0.6	0.5
Dribble (s)	12.5 ± 0.2	11.2 ± 0.2*†	12.7 ± 0.07	12.6 ± 0.07	16.3	0.001
VO_{2max} ($ml.kg^{-1}.min^{-1}$)	46.6 ± 0.4	51.8 ± 0.3*†	46.2 ± 0.4	46.6 ± 0.5	- 22.4	0.001

* Significant difference (P<0.001) between PT and control trials

† Significant difference (P<0.001) between pre *vs.* post training

References

1. Chu, D.A. 1998. Jumping into plyometrics. Champaign, IL: Human Kinetics.
2. Baechle, T.R. and R.W. Earle. 2000. Essentials of strength training and conditioning. 2nd edition. Champaign, IL: National Strength and Conditioning Association.
3. Miller, M.G., D.C., Berry, S. Bullard, and R. Gilders. 2002. Comparisons of land-based and aquatic based plyometric programs during an 8-week training period. J Sport Rehab, 11: 269-283.
4. Paasuke, M., J. Ereline, and H. Gapeyeva. 2001. Knee extensor muscle strength and vertical jumping performance characteristics in pre and postpubertal boys. Ped Exerc Sci, 13: 60-69.
5. Bangsbo J., M. Mohr and P. Krustrup. 2006. Physical and metabolic demands of training and match-play in the elite football player. J Sports Sci, 24: 665-674.
6. Haghighi, A., M. Moghadasi, A. Nikseresht, A. Torkfar, and M. Haghighi. 2012. Effects of plyometric versus resistance training on sprint and skill performance in young soccer players. Eur J Exp Biol, 2:2348-2351.
7. ACSM. 2005. Guidelines for exercise testing and prescription. Philadelphia: Lippincott Williams & Wilkins; pp 57-90.
8. Ostojic, S.M. 2004. Creatine supplementation in young soccer players. Inter J Sport Nutr Exerc Metab, 14: 95-103.
9. Milanović Z, G. Sporiš, N. Trajković, and F. Fiorentini. 2011. Differences in agility performance between soccer and soccer players. Sport Science, 2: 55-59.
10. Leger L, and C. Gadoury. 1989. Validity of the 20-m shuttle run test with 1 minute Stages to predict VO_2 Max in Adults. Canadian J Sports Sci, 14: 21-6.
11. Fry A.C, W.J. Kraemer, C.A. Weseman, B.P. Conroy, S.E. Gordon, J.R. Hoffman, and C.M. Maresh. 1991. The effects of an off-season strength and conditioning program on starters and non-starters in women's intercollegiate volleyball. J Appl Sport Sci Res, 5:174–181.

12. Wilson, G.J., R.U. Newton, A.J. Murphy, and B.J. Humphries. 1993. The optimal training load for the development of dynamic athletic performance. Med Sci Sports Exerc, 25:1279-1286.
13. Kotzamanidis, C., D. Chatzopoulos, C. Michailidis, G. Papaiakovou, and D. Patikas. 2005. The effect of a combined high-intensity strength and speed training program on the running and jumping ability of soccer players. J Strength Cond Res, 19:369-375.
14. Delecluse, C. 1997. Influence of strength training on sprint running performance. Current findings and implications for training. Sports Med, 24: 147-56.
15. Raut, T.S. 2012. Relationship between skill performance and selected motor fitness variables of tribal women handball players, Indian Stream Res J, 2: 1.
16. Miller, M.G., J.J. Herniman, M.D. Ricard, C.C. Cheatham, and T.J. Michael. 2006. The effects of a 6-week plyometric training program on agility. J Sports Sci Med, 5: 459-465.