

ORIGINAL ARTICLE



The Effects of Plyometric and Resistance Training on Selected Fitness Variables among University Soccer-Playing Adults

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ABSTRACT

Background. Soccer players need a very high level of fitness to play and avoid injuries; it reveals that soccer is an extremely challenging game and players has to perform a variety of skills during the play and needs speed, strength, agility, quickness. **Objectives.** The purpose of this study was to find out the impact of plyometric and resistance training on selected fitness variables among university soccer-playing adults. **Methods.** A group of (N = 60) soccer-playing adults were selected randomly to participate in this study. The age of the participants was in the range of 18 - 24 years, plyometric and resistance-training program was employed for 12 weeks, two days in a week, 40 minutes of training per session. These participants were segregated into two groups namely Group-A (N = 30, plyometric training group), Group -B (N = 30 resistance training group). The pre and post-test considered as follows; Leg strength (leg press), muscular strength endurance (sit-ups test) muscular power (standing long jump), speed (30 M sprint) and agility (Illinois agility test). **Results.** The improved performances among the participants with regard to the selected fitness variables presented by “p” values and percentages. Plyometric training group: Leg press (p < 0.001), Sit-ups test (p < 0.001), standing long jump (p < 0.001), 30 M Sprinting performance (p < 0.001), and agility (p < 0.001). Resistance training group: Leg press (p < 0.001), Sit-ups test (p < 0.001), standing long jump (p = 0.02), 30 M Sprinting performance (p < 0.001), and agility (p < 0.001). Plyometric and resistance training had shown significant performance from pre to post-test. **Conclusion.** It was also concluded that the plyometric training group had shown better performance with regard to muscular power and speed. Resistance training group had shown improved performance in leg strength, muscular strength endurance, and agility.

KEYWORDS: Soccer, Performance, Plyometric Training, Resistance Training

INTRODUCTION

Soccer players needs a very high level of fitness to play and avoid injuries (1) reveals that the soccer game is extremely challenging and players has to perform variety of skills during the play and needs speed, strength, agility, quickness and etc. (2) mentions that the plyometric movement, in which a muscle is loaded and then contracted in rapid sequence, use the strength, and innervations of muscles and surroundings tissue to jump higher and run faster, depending on the desired training goals. Plyometric training

involves a repeated series of exercise work bouts intercepted with rest / relief periods. Moreover, due to the discontinuous nature of this form of training the exercise intensity and the total amount of works performed can be greater than that of continuous training. Plyometric training protocol is very beneficial in enhancing speed, anaerobic endurance, and aerobic endurance. Furthermore, the plyometric training prescription may be modified in terms of intensity, and duration of the exercise interval and the number

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of repetitions, blocks of sets per workout. Resistance training appropriate program and perfect design training is essential to maximize the benefits associated with resistance training (3). Plyometric exercises exploits the stretch shortening cycle shown to enhance the performance of the concentric phase of movement (4) and increases power out-put (5, 6). Muscular strength is an important variable of health related fitness and the amount of force that a muscle can exert and it is vital fitness component in performing motor skills (7). Resistance training program planned mostly to improve muscular strength and endurance through increased workload demand and includes variety of body weight exercises, free and machine weights, elastic tubing/stretch bands, and hydraulic machines (8). Resistance training is valuable for all athletes and significant for enhancing performance. Athlete's upper body strength is dynamic and part of the training protocol for the following sports i.e., cricketers, basketball players, boxers, baseball players, wrestlers, judo players, etc (9). Comparable gains of maximal strength is testified with traditional strength training and plyometric training, moreover, concluding approach appears to induce greater gains in muscle power (2). Resistance training improves athletic performance in various sports and maintains quality of life. Moreover, maximum range of motion is required in resistance training since muscle overload happens only at the specific joint angles where the muscles worked (10). Resistance training benefits as the driving force for a healthy life and is the key reason for improving athletic performance in various sports (10). Resistance training improves quality of life (11). Resistance training is an imperative component of exercise protocol with the main aim to improve physical fitness for health or athletic performance (11). Plyometric training provides significant training stimulus and has shown evidence to improve explosive actions in athletes (12). This was stated by one of the scholars that coaches, strength, and conditioning professionals should devote additional time for plyometric training in elite male handball players during the season to improve physical performance (13). Resistance training program plays an important role for improving muscle strength and hypertrophy (14).

The purpose of this study was to find out the impact of plyometric and resistance training on

selected fitness variables, such as leg strength, muscular strength endurance, explosive power, speed and agility performance from pre to post-test among university soccer playing adults.

MATERIALS AND METHODS

A group of 60 soccer-playing adults was selected randomly during the year 2018, from the Physical Education Department, King Fahd University of Petroleum & minerals, Dhahran, Saudi Arabia. The age of the selected subjects was between 18 to 24 years. The selected participants were divided into two groups namely plyometric training group (N = 30), and resistance training group (N = 30). Plyometric training group was engaged in plyometric training schedule and resistance-training group was engaged in resistance training protocol for 12 weeks, weekly 2 times, 40 minutes of training per session respectively.

Selected fitness variables are as follows; leg strength, muscular strength endurance, explosive power, speed and agility. The tests considered for this study was leg press, sit-ups (30 seconds), standing long jump, 30 M. Sprint and Illinois agility test. BMI of subjects was find out by weight (kgs), height (meters), with the help of electronic weighting machine and stadio-metre respectively, and calculated with the help of simple calculation (weight in kgs / height in (m) 2). Selected fitness variables were tested at the stadium by the help of standard sports equipment. Furthermore, the data was collected for pre and post-test and recorded by the tester.

Plyometric training schedule was engaged for 12 weeks, 40 minutes of training per session, two days in a week. The training program consisted of warming-up and stretching for five minutes, selected plyometric training exercises i.e. squat jumps, jump to box, depth jump, and bounding. The intensity, volume and rest as follows; three sets, ten repetitions and 90 seconds rest between the sets was given and at last cool down exercise was given for five minutes (Table 1).

Resistance training exercises consisted with the following ten exercises, they are as follows; leg press, leg extensions, leg curls, parallel bench press, chest press, lat pull down front, sitting rowing, sitting shoulder press, preacher curls, and triceps extensions.

Table 1. Details of Dependent and Independent Variables

Selected Fitness Variables
Dependent variables
Leg strength
Muscular strength endurance

Explosive power
Speed
Agility
Independent variables
Plyometric training group
Resistance training group

Moreover, the training includes with two sets, 15 reps, and 30 seconds rest between the sets. Warmup and cool down exercise was prescribed before and after the resistance training protocol.

For analyzing research data the following statistical tools were considered, percentages with the help of calculator online, mean, standard deviation, and independent t-test, with the help of SPSS 16 software.

RESULTS

Table 2. Analysis of Data for the Selected Fitness Variables among the Participants from Pre to Post Test

Selected Fitness Variables, Groups N = 30	Pre-Test		Post-Test		p Value
	Mean	S.D	Mean	S.D	
Leg strength					
Plyometric training	59.10	10.22	77.63	8.09	0.001
Resistance training	58.91	10.64	85.10	20.75	0.001
Muscular strength endurance					
Plyometric training	18.26	4.07	20.87	2.69	0.001
Resistance training	18.67	4.38	23.87	3.75	0.001
Explosive power					
Plyometric training	1.61	0.15	1.85	0.26	0.001
Resistance training	1.65	0.29	1.77	0.15	0.02
Speed					
Plyometric training	5.33	0.79	4.63	0.54	0.001
Resistance training	5.5	0.75	4.99	0.49	0.001
Agility					
Plyometric training	23.13	2.34	21.91	1.44	0.01
Resistance training	23.53	1.63	20.77	1.77	0.001

Table 3. Percentages with Regard to Selected Fitness Variables from Pre to Posttest among the Participants

Test	Plyometric Training Group		Resistance Training Group	
	Percentages*	Increase / Decrease	Percentages*	Increase / Decrease
Leg press (1 max rep)	31.35	Increase	44.46	Increase
Sit ups test (30 seconds)	14.29	Increase	27.85	Increase
Standing long jump	14.91	Increase	7.27	Increase
30 M. sprinting performance	13.13	Increase	9.27	Increase
Illinois agility test	5.27	Increase	11.73	Increase

* Data are presented as No. %.

DISCUSSION

The twelve weeks of plyometric and resistance training had revealed significant performance among both groups. The purpose of this research was to compare the plyometric training and resistance training protocols on selected fitness variables among the soccer playing adults in the university. This is evident that both the training protocols has its own aids on the various selected fitness variables i.e. leg strength, muscular strength endurance, muscular power, speed and agility. Remarkably, the findings of this study reveal that both the groups had shown significant

Analysis of the data pertaining to the plyometric and resistance training groups for the selected fitness variables among the participants from pre to post test is presented in the below Table 2.

Analysis of the data pertaining to the plyometric group and resistance training group for the selected fitness variables among the participants from pre to post test is as follows; i.e. leg strength (p < 0.001), muscular strength endurance (p < 0.001), muscular power (p < 0.001), speed (p < 0.001), and agility (p < 0.001). All the selected fitness variables with regard to plyometric and resistance training groups respectively had shown significant performance from pre to post-test (Table 3).

improvement from pre to post-test in all the selected fitness variables. Moreover, both the training protocols, such as plyometric and resistance training is important aspect of the training regime. Furthermore this is evident that both training protocols for athletes it is utmost important for higher level of fitness and sports performance. This is assumed that both the training protocol's is effective training for improving fitness variables among the participants. Lastly, it is also revealed that resistance training protocol is very effective protocol in enhancing leg strength, muscular strength endurance and agility. Plyometric

training protocol had shown greater performance with regard to muscular power and speed. Soccer playing adults should also learn proper skills, knowledge about the plyometric and resistance training program to avoid injuries and better performance. It was observed that participants who added plyometric training to their training program were able to attain greater enhancements in lower body power as compared with subjects who participated in a resistance-training program without plyometric training. Although the acute and chronic effects of static stretching on performance need to be considered, such improvements in lower body power are likely due to the addition of plyometric training.

The following below studies are agreement with the present study; in this earlier study also applied 12 weeks program duration with three sessions and reveals that arm strength increases due to resistance training program (15). In earlier study it was investigated and find improvements in muscle strength and endurance after resistance training in healthy male-college students (16). Progressive associations been stated between strength, power and enhanced quality of life and lower risk related to fractures, reduced morbidity, and mortality (9, 17), reveals in his study that the influence of different intensity of resistance training had shown improved performance among the participants with regard to the selected fitness variables i.e. strength, Anaerobic power and explosive power.

This is evident that the two-day plyometric and resistance training protocols in a week is useful for the university soccer-playing students' in improving fitness level. In fact this is evident

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from the present study that resistance training protocol is more effective than plyometric training in enhancing selected fitness components i.e. leg strength, muscular strength endurance and agility.

CONCLUSION

It is concluded that the impact of plyometric and resistance training from pre to post-test had shown significant performance among both the groups with regard to the all selected fitness variables, such as leg strength, muscular strength endurance, muscular power, speed, and agility. Furthermore it was also concluded that plyometric training group had shown better performance with regard to muscular power and speed. Resistance training group had shown improved performance in leg strength, muscular strength endurance, and agility.

APPLICABLE REMARKS

- This is evident that the two-day plyometric and resistance training protocols in a week is useful for the university soccer-playing students' in improving fitness level.
- This is evident from the present study that resistance training protocol is more effective than plyometric training in enhancing selected fitness components i.e. leg strength, muscular strength endurance and agility.

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