EFFECT OF PLYOMETRIC AND CIRCUIT TRAINING ON SPEED AMONG COLLEGE LEVEL FOOTBALL PLAYERS

Vinayachandran. K. P
Lecturer in Physical Education,
Sobha College of Education, S.L. Puram, Kerala University, Kerala, INDIA

Abstract

The aim of the study was to find out the effectof plyometric training and circuit training on speed among college level football players. Forty five male (n = 48) college football players were randomly selected as subjects and their age ranged from 18 to 22 years. The selected subjects were randomly assigned into three equal groups of fifteen subjects each (n= 15), namely experimental group I was underwent plyometric training (PT), group II underwent circuit training (CT) was designed by the investigator and was administered for a period of 8 weeks 3 days a week, a session each day, and group III control was not exposed to any specific training (CG). Speed was selected as variable for this study. Analysis of covariance (ANCOVA) was used to analyse the data. Scheffe's test was used as a post hoc test to determine which of the paired mean difference significantly. The result of the study revealed that bothplyometric training (PT) and circuit training (CG) produced significant improvement on speed ($p \leq 0.05$) as compared to CG.

Keywords: Plyometric training, circuit training and speed

Introduction

Plyometric training has been established as a training method that improves the muscle-tendon unit's ability to tolerate stretch loads and the efficiency of the stretch-shorten cycle (SSC) (Allerheiligen, 1994). It is a type of exercise training designed to produce fast, powerful movements and improve the functions of the nervous system, generally for the purpose of improving performance in sports – plyometric movements, in which a muscle is loaded and then contracted in rapid sequence, use the strength, elasticity and innervations of muscles and surrounding tissue to jump higher and run faster, depending on the desired training goal (Brooks, 1996). Plyometric exercises that involve stretching an active muscle prior to its shortening have been shown to en-hance performance during the concentric phase of mus-cular contraction.

Circuit training is an excellent way to improve mobility, strength and stamina. The circuit training comprises of 6 to 10 strength exercises that are completed one exercise after another. Each exercise is performed for a specified number of repetitions or for a set time before moving on to the next exercise. The exercises within each circuit are

separated by a short rest period, and each circuit is separated by a longer rest period. Circuit training is a form of conditioning combining resistance training and high-intensity aerobics. It is designed to be easy to follow and target strength building as well as muscular endurance(Kraemer &Ratamess, 2004.

Speed is the capacity of moving a limb or parts of the body's lever system or the whole body with the greatest velocity (Dick*et al*., 1978). Muscles are made up of a combination of fast-switch and slow-switch fibers. Fast-switch fibers contract rapidly and slow-switch fibers contract more slowly and with lower level of force. If all other things are equal, athletes with longer muscle fibers and greater percentage of fast switch fibers should have ability to run faster (Jarver, 1978) than athlete with shorter slow -switch fibers. Speed is an ability to execute motor action under given condition in maximum possible time (Clarke & Clarke, 1987).

Materials and Methods

The aim of this study was to determine the effects of plyometric training and circuit training on speed among college level football players. Forty five male football (n=45) players studyingdifferent colleges of Alapuzha District, Kerala, India were selected as subjects and the age of students were between 18 and 22 years. The selected subjects were randomly divided into three equal groups of fifteen subjects each (n=15). The groups were plyometric training group (PT), circuit training group (CT) and one control (CG). During the training period, the experimental groups underwent their respective training programme for eight weeks 3 days per week and a session on each day. Control group (CG) was not engaged any specific trainingapart from their regular regular activities. Moderate intensity (60-70%) was used in this experimentation. Speed was selected as dependent variable for this study. It was measured by using fifty meters sprint. These are the exercise used as resistance 1.push ups 2. hip rotation 3.military press with weights 4. Box jump 5.stationary high knee running 6.sit ups 7.medicine ball push 8.vertical jomping. 9. Pull ups 10. duck walk. These plyometric exercises are used to perform this study for strengthening the lower body 1. drop jump; 2. tuck jump; 3. split jump; 4. bounding; 5. single leg hop; 6. hurdling; 7. medicine-ball exercises; 8. stepping. 9. box jump.

Data Analysis

Mean and standard deviation were calculated for speed for each training group. And the data were analyzed by using analysis of covariance (ANCOVA). If the 'F' value was found to be significant for adjusted post-test mean, Scheffe's test was applied as post hoc test to determine the significant difference between the paired mean. Statistical significance was fixed at 0.05 levels.

Results

Table – I

ANALYSIS OF COVARIANCE ON SPEED OF EXPERIMENTAL GROUPS AND CONTROL GROUP

Test	PT	CT	CG	SOV	SS	df	MS	F
Pre-test								
Mean	7.71	7.77	7.79	B G	0.05	2	0.03	0.46
S.D (±)	0.23	0.24	0.26	W G	2.5	42	0.06	
Post-test								
Mean	7.21	7.26	7.78	B.G	3.03	2	1.52	17.35*
S.D (±)	0.35	0.31	0.21	W G	3.67	42	0.09	
Adjusted Post-test								
Mean	7.22	7.26	7.79	B G	2.99	2	1.49	16.68*
				W G	3.67	41	0.09	

*****Significant, F = (df 2, 42) (0.05) = 3.22; (P ≤ 0.05), F = (df 2, 41) (0.05) = 3.225; (P ≤ 0.05)

Table I shows that the pre test mean of experimental and control groups are 7.71, 7.77 and 7.79 respectively. The obtained F ratio of 0.46 for pre test mean is lower than the table value 3.22 for df 2 and 42 required for significance at 0.05 level. The post tests mean of experimental and control groups are 7.21, 7.26 and 7.78 respectively. The obtained F ratio of 17.35 for post test mean is higher than the table value 3.22 for df 2 and 42 required for significance at 0.05 level. The adjusted post test mean of experimental and control groups are 7.22, 7.26 and 7.79 respectively. The obtained F ratio of 16.68 for adjusted post test mean is higher than the required table value 3.225 for df 1 and 41 required for significant at 0.05 level. The result of the study indicated that there was a significant difference between the adjusted post tests mean of plyometric training group, circuit training group and control group on speed at 0.05 levels. Since, three groups were compared, whenever they obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test was used to found out the paired mean difference and it was presented in table II.

Table II. Scheffe's post hoc test for the difference between paired mean on speed

PT	CT	CG	MD	CI
7.22	7.26		0.04	
7.22		7.79	0.57*	0.28
	7.26	7.79	0.53*	

*Significance at 0.05 level of confidence (p ≤ 0.05).

Table II showed that the adjusted post test mean difference on speed between plyometric training group and control group and circuit training group and control group are 0.57, and 0.53 respectively. These values are higher than the required confidence interval value of 0.28, which shows significant difference at 0.05 level of confidence. The results of the study showed that there was a significant difference between plyometric training group and control group and circuit training group and control group. The pre, post and adjusted post test mean values of experimental groups and control group on leg strengthis graphically represented in the figure 1.

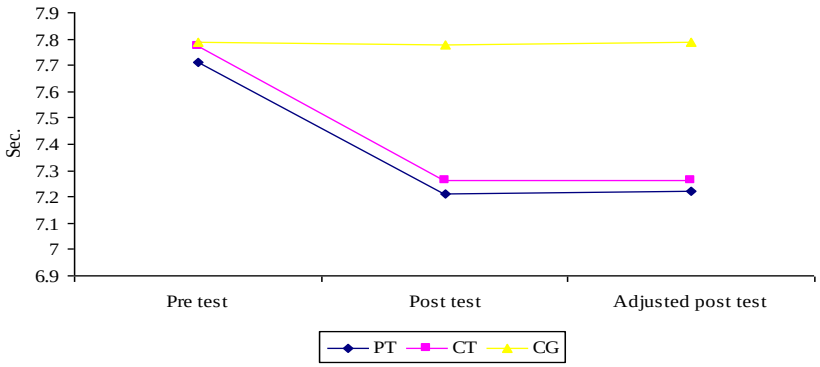

Figure 1: The pre, post and adjusted post test mean values of experimental groups and control group on speed

Discussion

The analysis of the data reveals that there was a significant improvement in adjusted post test mean among the groups speed. Several research studies suggested that plyometric training may be valuable for determining the variable such as maximum speed (Pedro *et al*., 2008). According to Wilson *et al*. (1993) circuit training in the form of weight training used as the means to enhance the muscular strength, power, size and speed. Moir et al. (2007) & Cronin and Hansen (2005) showed that most important fundamental requirement for speed is strength.Christou (2006) investigated that strength qualities influence the maximum speed. Blakey (1987) pointed out the circuit training is best suited for developing strength and the reason may be due to the increase in fiber diameter, number among size of the myofibrils, especially in the myosin filaments and capillary density per fiber. Delecluse (1995) examined that the effect of circuit training on different phases of 100 meters sprint and he found that it improved acceleration phase

also. McBride (2005) and George &Jayan (2011) indicate the training with squat jump helps to increase the movement velocity and speed. Paavolainen*et al.* (1999) explains explosive training improves muscle power and running economy. Kelly *et al.* (2007) found out multiple set of circuit training is better than single set to improve power and speed. Hence, it is recommended that systematic designed plyometric training and circuit training helps to improve speed.

Conclusion

Plyometric exercises are specialized, high intensity training techniques used to develop athletic speed). This training involves high-intensity, explosive muscular contractions that invoke the stretch reflex (stretching the muscle before it contracts so that it contracts with greater force). Circuit training is one of the best methods to improve strength and speed. Any practical application requires careful implementation and individual experimentation. In summary, the speed can be improved during the age between 18 and 22 years of male football players and favour the prescription of moderate intensity plyometric training and circuit training during the initial adaptation period. There was no significant difference between training groups. From this study we can concluded that circuit training is the top to improve leg speed followed by plyometric training. Finally, the studies presented in this review demonstrate that there was a significant improvement on speed due to the eight weeks of moderate intensity plyometric training and circuit training as compared to control group.

References

1. Alcaraz, Pedro E., Palao, Jose M., Elvira, Jose L L., &Linthoene Nicholas, P. (2008). Effects of Three Types of Resisted Sprint Training Devices on the Kinematics of Sprinting at Maximum Velocity. *Journal of Strength & Conditioning Research*, Vol.22 (3), pp.890-897.
2. Allerheiligen, W. B. (1994). Speed development and plyometric training. In Baechle TR (Eds). *Essentials of Strength Training and Conditioning* (p. 314-344). Champaign, IL: Human Kinetics.
3. Blakey, J.G., & Southard, D. (1987). "The Combined Effects of Weight Training and Plyometric on Dynamic Leg Strength and Leg Power". *Journal of Applied Sports Science Research*, 1.
4. Brooks, G.A., Fahey, T.D. and White, T.P. (1996). *Exercise Physiology: Human Bioenergetics and its Applications.* (2nd Ed.) Mountain View, California: Mayfield Publishing Co.
5. Clarke Harrison, H., & David, H. Clarke. (1987). *Application of Measurements to Physical Education.* (6th Ed.). Englewood Cliffs, New Jersey: Prentice Hall Inc.
6. Damon, P.S. Andrew. (2010). Effects of three modified plyometric depth jumps and periodized weight training on lower extremity power, *The Sports Journal of America's Sports University*, Vol. 13(4).
7. Delecluse, C. *et al.* (1995). "Influence of High Resistance and High Velocity Training on Sprint Performance". *Medical Science and Sports Exercise*, 27: 8.
8. Dick, Franck W, Carl Johnson and W.H. Paish. (1978). *Strength Training for Athletes.* London: British Amateur Athletic Board

9. Eicher Tom. (1975). "Improving Sprinting Speed through Strength Training". *Athletic Journal,* Vol. 65, 12-14.

10. Gavin Moir., Ross Sandress., Chris Button & Mark Glaister. (2007). The effect of periodized resistance training on accelerative sprint performance. *Journal of Sports Biomechanics,* Vol. 6(3), pp. 285-300.

11. George Abraham and P. Jayan. (2011). Modes of resistance training and its impact on sprinting speed among teenage boys, *Voice of sports*, Vol.4(1), pp.38-45.

12. Jarver J. (1978). Sprinting in a nutshell in-Jarver. J(Ed).*Sprints and Relays*. Ist Edison. Mountain view, CA: TAFNEWS press.

13. Jeffrey, M. McBride. (2005). The acute effect of heavy load squats and loaded countermovement jumps on sprint performance, *The Journal of Strength and Conditioning Research,* Vol. 19(4), pp. 669-674.