Effect of Plyometric Training and Circuit Training on Motor Ability Components among College Level Men Volleyball Players

D.Natarajan, Ph.D Scholar, Department of Physical Education
I.Lillypushpam., Assistant Professor, Department of Physical Education
V. Muruguvalavan, Assistant Professor cum Medical Officer, Tamil Nadu Physical Education and Sports University.

Abstract

The purpose of the study was to find out the effect of plyometric training and circuit training on motor ability components among college level men volleyball players. To achieve this purpose forty five college students were selected randomly as subject from government arts and science college, Tindivanam. Their age ranged between 18 to 25 years. They were divided into three equal groups. Experimental group I underwent plyometric training. Experimental group II underwent circuit training and control group was not exposed to any training, pre test were conducted to three groups in explosive power and muscular strength. Plyometric training and circuit training was given to the experimental group for a period of 6 weeks for 3 days in a week. After 6 weeks of training the post test were taken from the subjects of three groups. Test was conducted for explosive power and muscular strength at the end of each session and data were recorded. Analysis of Covariance (ANCOVA) were used to test significance. Wherever significant differences is found scheffe's post hoc test was used. The result of the study reveals that the plyometric training showed greater improvement on explosive power that the circuit training. On muscular strength further the circuit training showed greater improvement on muscular strength than the plyometric training.

Key Words: Plyometric training, circuit training, motor ability components, explosive power, and muscular strength.

Introduction

Sports training aims to improving the performance of sports persons weight training and plyometric training are very popular now a days and effective training methods to promote higher performance in sprinting and jumping events. Plyometric exercises are included depth jumping hopping boundary drills etc are less plyometric and medicine balls exercise are arms plyometric exercise. The exercises are used to improve speed explosive strength and other motor ability components. Weight training is an activities of high intensity and short duration and opposite side low intensity and high volume or duration. Weight training exercises helps to build muscle, strength and endurance. Sport training is the basic form of an athlete's training. It is the preparation systematically organized with the help of exercises, which is face is a pedagogically organized process of controlling an athlete's development. (Johnson Barry Land Jack K Nelson1986)

Plyometric Training

Plyometric training may be viewed as an extension of the 'Shock' method of strengthening muscles for athletes performance recommended by" Verkhoshonki" a Russian jumping event coach.

Plyometric exercises are the rapid deceleration and acceleration of muscles that create a stretch shortening cycle. The exercise training the muscles, connective tissue and nervous system to effectively carry out the stretch-shortening cycle, thereby improves an athelete's performance. (James E et al., 1976)

Circuit Training

Circuit training is very special form of training which concentrates on different parts of the body and general endurance. Circuit training is a method of physical conditioning that employs both resistance training and callisthenic training exercises. The method was originally introduced by Margan and Adamson in the late 1930s at the University of Leads, England. The intensity and vigor of circuit training are indeed challenging enjoyable to the performer. This system produced positive changes in future in motor performance. General fitness, muscular power, endurance and speed have show decided improvement as well. (Uppal A.K.2001).

Objective of the Study

The objective of this study was to find out the effect of plyometric training and circuit training on selected motor ability components among college level men volley ball players.

Review of Related Literature

Sedano S et. al., (2011) The main aim of this study was to determine the effects of a 10-week plyometric training program on explosive strength, acceleration capacity and kicking speed in young elite soccer players. Twenty-two players participated in the study: control group (CG), (N.=11; 18.2 ± 0.9 years) and treatment group (TG) (N.=11; 18.4 ± 1.1 years). Both groups performed technical and tactical training exercises and matches together. However, the CG players followed the regular physical conditioning program, which was replaced by a plyometric program for TG.Plyometric training took place three days a week and included jumps over hurdles, horizontal jumps and lateral jumps over hurdles. Jumping ability, 10 m sprint and kicking speed were measured on five separate occasions. Two-way analysis of variance (ANOVA) with repeated measures reflected that the TG demonstrated significant increases ($P<0.05$) in jumping ability and acceleration capacity after six weeks of training and in kicking speed with dominant and non-dominant leg after eight and ten weeks respectively. On the other hand there were no significant changes in CG players throughout the study. The main findings revealed that a 10-week plyometric program may be an effective training stimulus to improve explosive strength compared to a more conventional physical training program. The improvements in explosive strength can be transferred to acceleration capacity and kicking speed but players need time to transfer these increases.

Kaikkonen et. al., (2005) Studied the effects of a 12-week low resistance circuit weight training (CWT) on cardiovascular and muscular fitness were studied in 90 healthy sedentary adults. The subjects were randomized into three equally fit groups: CWT, Endurance (END) and Control (CON) according to their maximal aerobic power (VO_{2max}). Both training groups exercised for 12 weeks, 3 days a week in sessions of 40 min, with a heart rate (HR) level of 70–80% HR_{max}. The CWT group trained with air resistance machines. Heart rate was controlled by setting the speed of movement. The END group walked, jogged, cross-country skied or cycled. The net differences (between pre- and post training changes) between the CWT and CON groups was statistically significant for VO_{2max} (2.45 ml · min^{1} · kg^{1}, 95% CI 1.1; 3.8), for abdominal muscles (3.7 reps, CI 0.3; 7.1), for push-ups (1.1 reps, CI 0.2; 2.1), and for kneeling (2.25 reps, CI 0.01; 4.5). The net difference (between pre- and posttraining changes) in the END and CON groups was statistically significant for VO_{2max} (2.75 ml · min^{1} · kg^{1}, 95% CI 0.9; 4.6), and kneeling (3.0 reps, CI 0.7; 5.3). Low resistance CWT with moderately hard HR level has effects comparable to an equal amount of endurance training on the cardiovascular fitness of sedentary adults. The CWT model was beneficial also on muscular fitness. Based on the results, this type of exercise can be recommended for beginners because of its multilevel effects.

Methodology

The sample for the present study consisting of forty five college men volley ball players were selected from Government Arts and Sciences college, Tindivanam. The subjects were selected using random sampling method. Their age ranged between 18 to 25 years. They were divided into three equal groups. Experimental group I underwent Plyometric training group, Experimental group II underwent Circuit training group, and control group was not exposed to any training. The training for the period of 6 weeks 3 days per week both morning as well as evening the training programme was administered for 2 hr per session. The load was fixed based on the pilot study. The pre test and post test were taken before and after the training programme. Tests were conducted on explosive power and muscular strength at the end of each session and data were recorded. Analysis of covariance was used for test of significance. Wherever significant difference in found scheffe's post hoc test was used.

Table-I

Analysis of Covariance for Pre and Post Tests on Explosive Power in Plyometric Training Group Circuit Training

Test	Control group	Plyometric training	Circuit training	Source of variance	Sum of squares	df	Mean square	'F' ratio
Pre-test Mean	2.489	2.59	2.58	Between	0.10	2	0.048	0.86
				Within	2.35	42	0.06	
Post-test Mean	2.488	2.70	2.65	Between	0.36	2	0.18	3.44*
				Within	2.23	42	0.05	
Adjusted Post-test Mean	2.55	2.66	2.62	Between	0.09	2	0.05	83.00*
				Within	0.023	41	0.00	

*Significant at 0.05 level of confidence with df = df (2, 42) = 3.22., df (2, 41) = 3.23

Table I shows that the obtained 'F' ratio value of 0.86 for pretest mean on explosive power is not significant. It reveals that there is statistically no significant difference among experimental and control groups on explosive power before the commencement of training.

The 'F' ratio value of 3.44 for post-test data on explosive power is significant at 0.05 level.

The 'F' ratio value of 83.00 for adjusted post- test on explosive power is significant at 0.05 level. It reveals that there is significant difference among the groups on explosive power.

The result of scheffe's post- hoc test was applied to find out is presented in table II

Table-II

Ordered Scheffe's Posthoc Test Means and Differences between the Means for Explosive Power of Three Groups

Circuit training	Plyometric training	Control group	Mean difference	CI
2.62	2.55	-	0.07	0.02*
2.62	-	2.66	0.04	0.02*
-	2.55	2.66	0.11	0.02*

*significant at 0.05 level of confidence

Table – II shows that the adjusted post-test mean difference in explosive power between circuit training group and plyometric training group was 0.07 which is significant at .05 level of confidence. The adjusted post-test mean difference between circuit training group and control group was 0.04 which was significant at .05 level of confidence. The adjusted post-test mean of plyometric training group and control group was 0.11 which were significant at .05 level of confidence.

The result of the study shows that there was significant improvement on explosive power due to plyometric and circuit training.

The mean values of plyometric and circuit training groups and control group were graphically represented in Figure – 1

Figure–1

Bar Diagram on Explosive Power

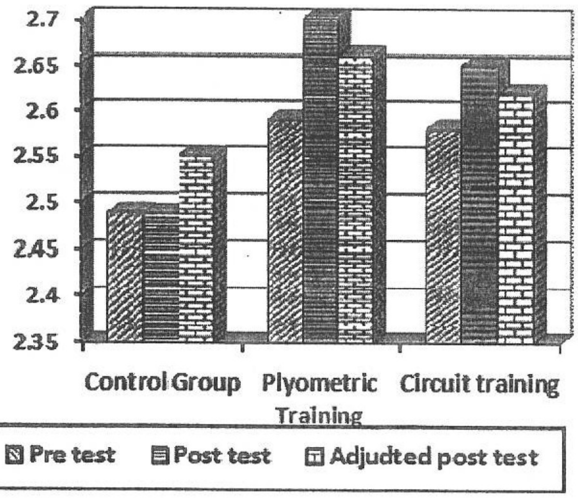


Table-III

Analysis of Covariance for Pre and Post Tests on Muscular Strength in Plyometric Training Group Circuit Training

Test	Control group	Plyometric training	Circuit training	Source of variance	Sum of squares	df	Mean square	'F' ratio
Pre-test Mean	20.600	20.268	20.000	Between	2.711	2	1.356	0.11
				Within	178.533	12	11.391	
Post-test Mean	20.667	23.200	24.867	Between	509.467	2	12.130	5.53*
				Within	134.178	12	67.089	
Adjusted Post test Mean	20.667	23.200	24.867	Between	174.145	2	7.072	129.37*
				Within	27.591	1	.673	

Table III shows that the obtained 'F' ratio value of 0.11 for pretest mean on muscular strength is not significant. It reveals that there is statistically no significant difference among experimental and control groups on muscular strength before the commencement of training.

The 'F' ratio value of 5.53 for post-test data on muscular strength is significant at 0.05 level.

The 'F' ratio value of 129.37 for adjusted post- test on muscular strength is significant at 0.05 level. It reveals that there is significant difference among the groups on muscular strength.

The result of scheffe's post- hoc test was applied to find out is presented in table IV

Table IV
Ordered Scheffe's Post Hoc Test Means and Differences between the Means for Muscular Strength of Three Groups

Circuit training	Plyometric training	Control group	Mean difference	CI
24.867	23.200	-	1.667	1.185*
24.867	-	20.667	4.2	1.185*
-	23.200	20.667	2.533	1.185*

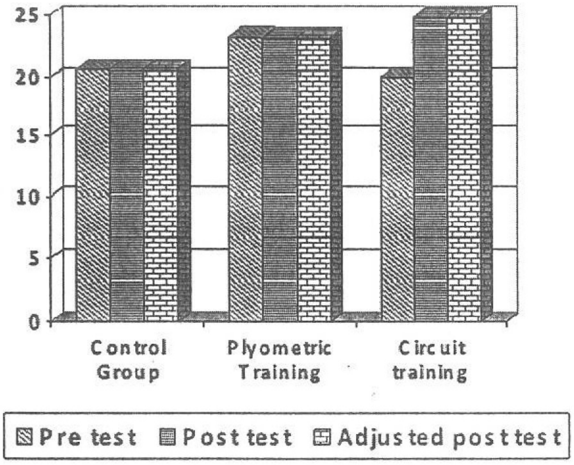
significant at 0.05 level of confidence

Table – IV shows that the adjusted post-test mean difference in muscular strength between circuit training and plyometric training was 1.667 which is significant at .05 level of confidence. The adjusted post-test mean difference between circuit training group and control group was 4.2 which were significant at .05 level of confidence. The adjusted post-test mean of plyometric training group and control group was 2.533 which were also significant at .05 level of confidence.

The result of the study shows that there was a significant improvement of muscular strength due to plyometric and circuit training. The mean values of plyometric and circuit training groups and control group were graphically represented in Figure – 2

Figure- 2

Bar Diagram on muscular strength



Conclusions

Within the limitations of the present study the following conclusions were drawn.

1) Both experimental groups have significantly increased the explosive power as compared to control group. Further, the improvement of explosive power was significantly higher due to plyometric training than circuit training.

2) Both experimental groups have significantly increased the muscular strength as compared to control group. Further, the improvement of muscular strength was significantly higher due to circuit training than plyometric training.

References

Johnson Barry Land Jack K Nelson (1986), **Practical measurements for Evaluation in Physical Education,** 4th Ed,, Burgers publishing.**pp**.23.

James E. Zacha, Zewski, David J. Magee and William s. Quilen. ***Athletic Injuries and Rehabilitation,*** (Philadelphia: Lea and febiger,1976): 220.

Kaikkonen, H. (2005) "The Effect of Heart Rate Controlled Low Resistance Circuit Weight Training and Endurance Training on Maximal Aerobic Power in Sedentary Adults" **Scandinavian Journal of Medicine and Science in Sports pp**10 (4):211–215.

Sedano S et.al (2011) "Effects of plyometric training on explosive strength, acceleration capacity and kicking speed in young elite soccer players" **The journal of sports medicine and physical fitness.** 2011 Mar;51(1):50-8

Uppal A.K.(2001), **principles of Sports Training**, Delhi: Friends publications.**pp**.23.

❖ ❖ ❖ ❖ ❖