

Comparative Effect of Plyometric Training and Circuit Training on Volleyball Playing Ability.



PHYSICAL EDUCATION

KEYWORDS : Circuit Training, Plyometric Training, Volleyball Playing Ability.

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ABSTRACT

The purpose of this study was to know the comparative effect of Plyometric Training and Circuit Training on volleyball playing ability. One hundred twenty professional trainees, age ranging between 20 to 23 years acted as subjects and assigned to three groups (two experimental and one control group) with 30 students each. The two experimental groups were Circuit Training and Plyometric Training groups. Selected physiological variables were measured before and after training. All the experimental Groups (Circuit training and Plyometric training) were administered with the selected exercises, thrice in a week for a duration of 12 weeks under direct supervision of the researcher. The analysis of data revealed that the two experimental groups, showed significant gains in performance on volleyball playing ability after administration of training for duration of 12 weeks. The control group did not show any significant increase in the performance.

INTRODUCTION: Sports training cannot be equated to physical activity or play activity. Both these activities include physical movements like sports training. Sports training aims at the improvement of performance. It is formulated in such a way that the sportsman is able to win or at least successfully participate in a competition. It is realized from past studies that volleyball playing ability of a person can well be predicted through evaluation of his explosive strength, speed, agility, endurance and flexibility ability. Keeping in view the above facts, the present study is envisaged at highlighting the effect of plyometric exercises and circuit training on different parameters contributing to the playing ability of volleyball players. *The purpose of this study was to determine the effect of a plyometric exercise programme in comparison with a circuit training programme on volleyball playing ability.*

METHODOLOGY: A total of 90 (Ninety) college male students were taken as subjects for the study. All the subjects were the students of Prabharani College of Physical Education, Malda, West Bengal during 2013-14 and 2014-15 sessions. Their ages ranged from 20 to 23 years. Groups A, B and C underwent the pre-test on all the parameters, pertinent to the study. Group A and B underwent the plyometric training and circuit training, respectively for a period of 12 weeks, as designed under careful supervision of the investigator. The group C served as control and was not allowed to undergo the exercises. After the end of twelve weeks training programme, the three groups underwent post test on all the variables on which pre test was made. To obtain the data pertinent to the purpose of study, the following volleyball playing ability variables were selected. 1. Brady volleyball test, 2. Straight smash, 3. Single block, AND 4. Overall playing ability (under expert judgment).

FINDINGS: The statistical analysis of data on Volleyball Playing Ability of subjects belonging to three experimental groups and one control group, each comprising of thirty subjects, is presented below.

TABLE – 1 (Significance of Difference Between Pre-Test and Post-Test Means of the two Experimental Groups and the Control Group in Brady Volleyball Test)

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' Ratio
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Plyometric Training	13.667±0.260	13.700±0.187	0.033	0.155	0.215
Circuit Training	13.467±0.274	17.067±0.126	3.600	0.252	14.292*
Control	13.333±0.198	13.367±0.277	0.034	0.189	0.177

* Significant at 0.05 level of confidence, $t'_{0.05} (29) = 2.045$.

Table 1 clearly reveals that circuit training group improved significantly yielding 't' value of 14.292, where as plyometric training group and control group did not show any significant improvement in Brady volleyball test performance of subjects indicating 't' values of 0.215 and 0.177, respectively. The needed 't' value for significance at 0.05 level of confidence with 29 degrees of freedom was 2.045

TABLE - 2 (Analysis of Variance and Covariance of the Means of two Experimental Groups and the Control Group in Brady Volleyball Test)

	Plyo-metric group	Circuit group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	13.667	13.467	13.333	B 1.689 W 156.800	2 87	0.844 1.802	0.469
Post-test means	13.700	17.067	13.367	B 251.356 W 111.133	2 87	125.678 1.277	98.386*
Ad-justed post-test means	13.609	17.078	13.446	B 252.491 W 69.908	2 86	126.245 0.813	155.306*

* Significant at 0.05 level of confidence, N = 90, B = Between group variance, W = Within group variance. The analysis of covariance for Brady volleyball test showed that the resultant 'F' ratio of 0.469, which was not significant in case of pre test means. The post test and adjusted final means yielded the 'F' ratio of 98.386 and 155.306, respectively and were found to be significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df 2, 87) was 3.07.

TABLE – 3 (Paired Adjusted Final Means and Differences between Means for the Two Experimental Groups and the Control Group in Brady Volleyball Test)

Plyometric group	Circuit group	Control group	Difference between means	Critical differences for adjusted mean
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13.609	17.078		3.469*	0.333
13.609		13.446	0.163	0.333
	17.078	13.446	3.632*	0.333

* Significant at 0.05 level of confidence. It is very much clear from the Table 3 that the mean difference with respect to performance in Brady volleyball test of circuit training group was found to be significantly greater than that of both plyometric training group and control group. No significant difference between plyometric group and control group was found with respect to Brady volleyball test performance.

TABLE – 4 (Significance of Difference Between Pre-Test and Post-Test Means of the Two Experimental Groups and the Control Group in Straight Smash)

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' Ratio
Plyometric Training	6.033±0.195	8.067±0.135	2.034	0.212	9.608*
Circuit Training	6.233±0.213	6.400±0.123	0.167	0.145	1.153
Control	6.167±0.136	6.033±0.189	0.134	0.157	0.849

* Significant at 0.05 level of confidence, 't'_{0.05} (29) = 2.045.

Table 4 clearly reveals that, plyometric training group improved significantly yielding 't' value of 9.608, whereas, circuit training group and control group did not show any significant improvement in straight smash performance of subjects indicating 't' values of 1.153 and 0.849, respectively. The needed 't' value for significance at 0.05 level of confidence with 29 degrees of freedom was 2.045

TABLE – 5 (Analysis of Variance and Covariance of the Means of Two Experimental Groups and the Control Group in Straight Smash)

	Plyo-metric group	Cir-cuit group	Con-trol group	Sum of squares	df	Mean square	F ratio
Pre-test means	6.033	6.233	6.167	B 0.622 W 88.500	2 87	0.311 1.017	0.306
Post-test means	8.067	6.400	6.033	B 70.467 W 60.033	2 87	35.233 0.690	51.060*
Adjusted post- test means	8.111	6.365	6.025	B 74.737 W 46.218	2 86	37.368 0.537	69.533*

* Significant at 0.05 level of confidence, N = 90, B = Between group variance, W = Within group variance. The analysis of covariance for straight smash showed that the resultant 'F' ratio of 0.306 was not significant in case of pre-test means. The post test and adjusted final means yielded the 'F' ratio of 51.060 and 69.533 and were found significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df 2, 87) was 3.07.

TABLE –6 (Paired Adjusted Final Means and Differences between Means for the Two Experimental Groups and the Control Group in Straight Smash)

Plyometric group	Circuit group	Control group	Difference between means	Critical differences for adjusted mean
8.111	6.365		1.746*	0.372
8.111		6.025	2.086*	0.372
	6.365	6.025	0.340	0.372

* Significant at 0.05 level of confidence.

It is clear from the Table 6 that the mean difference with respect to performance in straight smash of plyometric group was found to be significantly greater than that of both circuit train-

ing group and control group. No significant difference between circuit training group and control group was found with respect to straight smash performance.

TABLE – 7 (Significance Of Difference Between Pre-Test And Post-Test Means Of The Two Experimental Groups And The Control Group In Single Block)

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' Ratio
Plyo-metric Training	6.333±0.221	7.700±0.137	1.367	0.227	6.011*
Circuit Training	6.500±0.213	6.633±0.155	0.133	0.178	0.750
Control	6.333±0.175	6.367±0.222	0.034	0.182	0.183

* Significant at 0.05 level of confidence, 't'_{0.05} (29) = 2.045.

Table 7 clearly reveals that plyometric training group improved significantly yielding 't' value 6.011, whereas, circuit training group and control group did not show any significant improvement in single block performance of subjects indicating 't' values of 0.750 and 0.183, respectively. The needed 't' value for significance at 0.05 level of confidence with 29 degrees of free from was 2.045

TABLE – 8 (Analysis Of Variance and Covariance of the Means of Two Experimental Groups and the Control Group in Single Block)

	Plyo-metric group	Circuit group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	6.333	6.500	6.333	B 0.556 W 108.833	2 87	0.278 1.251	0.222
Post-test means	7.700	6.633	6.367	B 29.687 W 80.233	2 87	14.933 0.922	16.193*
Adjusted post-test means	7.722	6.589	6.389	B 31.009 W 62.579	2 86	15.504 0.728	21.307*

* Significant at 0.05 level of confidence, N = 90, B = Between group variance, W = Within group variance. The analysis of covariance for single block showed that the resultant 'F' ratio of 0.222 was not significant in case of pre test means. The post test and adjusted final means yielded the 'F' ratio of 16.193 and 21.307, respectively and were found to be significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df 2, 87) was 3.07.

TABLE – 9 (Paired Adjusted Final Means and Differences between Means for the Two Experimental Groups and the Control Group in Single Block)

Plyometric group	Circuit group	Control group	Difference between means	Critical differences for adjusted mean
7.722	6.589		1.133	0.317
7.722		6.389	1.333	0.317
	6.589	6.389	0.200	0.317

* Significant at 0.05 level of confidence. It is clear from the Table 9 that the mean difference with respect to performance in single block of plyometric group was found to be significantly greater than that of both circuit training group and control group. No significant difference between circuit training group and control group was found with respect to single block performance.

TABLE – 10 (Significance of Difference Between Pre-Test and Post-Test Means of the two Experimental Groups and the Control Group in Overall Playing Ability)

Groups	Pre-test mean±SE	Post-test mean±SE	Difference between mean	SE	't' Ratio
Plyometric Training	5.867±0.171	8.033±0.140	2.166	1.053	11.268*
Circuit Training	6.066±0.166	7.667±0.138	1.601	0.183	8.733*
Control	5.933±0.135	5.867±0.171	0.066	0.166	0.403

* Significant at 0.05 level of confidence, 't'_{0.05} (29) = 2.045.

Table 10 very clearly reveals that, both the experimental groups improved significantly yielding 't' value of 11.268 and 8.733, whereas, control group did not show any significant improvement in overall playing ability performance of subjects indicating 't' values of 0.097. The needed 't' value for significance at 0.05 level of confidence with 29 degrees of freedom was 2.045

TABLE – 11 (Analysis Of Variance and Covariance of the Means of Two Experimental Groups and the Control Group in Overall Playing Ability.)

	Plyometric group	Circuit group	Control group	Sum of squares	df	Mean square	F ratio
Pre-test means	5.867	6.066	5.933	B 0.622 W 65.200	2 87	0.311 0.749	0.415
Post-test means	8.033	7.667	5.867	B 80.689 W 59.100	2 87	40.344 0.679	59.390*
Adjusted post-test means	8.060	7.633	5.873	B 80.612 53.248	2 86	40.306 0.619	65.097*

* Significant at 0.05 level of confidence, N = 90, B = Between group variance, W = Within group variance. The analysis of covariance for overall playing ability showed that the resultant 'F' ratio of 0.415 was not significant in case of pre test means. The post test and adjusted final means yielded the 'F' ratio of 59.390 and 65.097, respectively and were found to be significant. The 'F' ratio, needed for significance at 0.05 level of confidence (df 2, 87) was 3.07.

TABLE – 12 (Paired Adjusted Final Means and Differences between Means for the Two Experimental Groups and the Control Group in Overall Playing Ability)

Plyometric group	Circuit group	Control group	Difference between means	Critical differences for adjusted mean
8.060	7.633		0.427	0.490
8.060		5.873	2.187*	0.490
	7.633	5.873	1.760*	0.490

* Significant at 0.05 level of confidence. It is clearly evident from Table 43 that the mean difference with respect to performance in overall playing ability of both plyometric training group and circuit training group was found to be significantly greater than that of control group. No significant difference between circuit training group and plyometric training group was found with respect to overall playing ability performance.

DISCUSSION ON FINDINGS

The analysis of data revealed that the two experimental groups, administered with plyometric exercises and circuit training showed significant gains in performance of volleyball playing ability after administration of training for duration of 12 weeks. The control group did not show any significant increase in the performance. The results of the study coincided with the general conception that plyometric exercise improves speed and agility and circuit training helps improve strength and endurance of the players in a progressive manner.

Explosive power is a function of both strength and speed of muscular contraction, Plyometric exercises might have enhanced the health status of players' neuromuscular system to apply a greater level of force in a shorter period of time, thereby improved the parameters related to speed and agility. Plyometric training also placed a high level of stress on joints, connective tissue and in the neuromuscular system, which was well reflected in the present study as revealed by the gain in vertical jump, straight smash, single block and overall volleyball playing ability under present study.

The researcher thinks that these improvements are due to the application of the recommended plyometric training program that led to improve the explosive power of leg muscles as plyometric training works on improving the ability to jump through explosive power exercises using stretch reaction. It also stimulates the largest possible number of motor explosive power of leg muscles (Hosam El-Din, T., 1994). This is due to enhancement of muscle force penetrating capacity, increasing the quality of key enzymes, increased myosine, controlling the anaerobic phase of glucose break-down, significant and selective hypertrophy of first-twitch fibers and increase in capacity for level of blood lactic acid tolerance and the increase in contractile nature with relative de-composition of fat, causing the muscles relax and contract more forcefully.

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