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Effect of Concurrent Resistance and Plyometric Training on Selected Physical Variables among College Women Volleyball Players

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Abstract

The purpose of the study was to investigate the effect of concurrent resistance and plyometric training on selected physical variables among college women volleyball players. To achieve the purpose thirty students were selected at random from Vivekanandha Educational Institutions, Thiruchengode, Namakkal. Age ranged between 18 - 25 years for this study. The subjects were divided into two equal groups namely experimental group 'A' and Control group 'B'. The experimental group 'A' under went six weeks training program. No attempt was made to equate the groups in any manner. Training process has been carried out as per the scheduled Performa. The control group was not allowed any type of training other than the daily day to day activities. The data collected from the two groups prior to and after experimentation on selected variables; physical fitness components of strength, endurance, explosive power, speed and flexibility were statistically examined for significant differences. Analysis of co variance (ANCOVA) was applied to determine whether the training programmes produced significantly different improvements in selected variables after six weeks of training. The group mean gains recorded by the various groups during the experimental period of six weeks to the criterion measures were tested for the significance by applying 't' test. In all the cases 0.05 level of confidence will be utilized which was considered as an appropriate. Based on the result of the study it was concluded that, the concurrent resistance and plyometric training programme produced a significant development on the selected physical variables.

Keywords: Concurrent Resistance, Plyometric, Women, College, Volleyball.

Introduction

In today's age of scientific knowledge, man is making rapid progress in all walks of life and it is true in the area of games and sports. To improve or maintain desired level of physical fitness, there is need to constantly administer an adequate training intensity while exercising. Different training modalities are used for the development of different features of physical fitness, as each sports person requires a different types and levels of physical composure.

Today, must resistance training systems in use are based on Variation, of the De Lorne method. If properly carried out, weight training may improve speed explosive and strength. Resistance training is one of the effective means to improve all round physical and cardiovascular fitness, whereas, plyometric training is one of the most effective method for improving explosive power as started by Fleck and karaemer (2004) with variety of athletics can benefit from power training, particularly if it follows are coincides with a strength training program.

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Although, plyometric training has received much attention recently, it had been a part of the training of athletics in a variety of sports for years. It is used in conjunction with other power development methods in a complete training programme to bridge the gap between maximum strength and explosive power. Scientific research has given use a fundamental understanding of the elastic properties of muscle and its training ability. The cardiovascular exercises and the resistance training workouts during the same training session, or within hours of one another. This sequential exercise regime is referred to as 'concurrent training'.

The effects of resistive type exercise on athletics performance have been largely evident. To now the efficiency of concurrent resistance and plyometric training and its commendable contribution to one's level of fitness, it was decided to take of this study. On the coaching point of view the coaches wish to train their players on the basis of scientific principles for better performance. The investigator was interested to find out experimentally the effect of concurrent resistance and plyometric training programme on the development of selected physical variables among college women volleyball players.

Methodology

To achieve the purpose of the study thirty volleyball players were selected at random from Vivekanandha Educational Institutions, Thiruchengode, Namakkal District. Age ranged between 18 - 25 years for this study. The subjects were divided into two equal groups namely experimental group 'A' and Control group 'B'. The experimental group 'A' under went six weeks training program. Training process has been carried out as per the scheduled Performa. The control group was not allowed any type of training other than the daily day to day activities. The data collected from the two groups prior to and after experimentation on selected variables; The variables under lie the physical fitness components which are highly related to the performance were chosen as criterion variables physical variables of strength, endurance, explosive power, speed and flexibility. 1RM bench press, sit-ups, vertical jump, 50meters run and sit and reach tests were administered respectively as a tool of investigation.

Analysis of Data

The groups were not equated in relation to the factors to be examined, hence the difference between means of the two groups in the pre-test had to be taken into account during the analysis of the post-test differences between the group means. This was achieved by the application of the analysis of covariance, where the final means were adjusted for differences in the initial means, and the adjusted means were tested for significance. The group mean gains recorded by the two groups during the experimental period of six weeks to the criterion measures were tested for the significance by applying't' test. Concurrent resistance and plyometric training group and control group have been analysed and presented in the following tables and figures.

Results

Table I. Summary of 't' Ratio on Selected Variables of Control Group

S. No	Variables	Pre Test mean ± σ	Post test mean ± σ	Mean difference	σDM	't' ratio
01	Strength	26.67 ± 3.30	27.2 ± 3.29	0.53	0.06	0.12
02	Endurance	30.87 ± 0.80	31.47 ± 1.36	0.6	0.28	2.12
03	Explosive Power	24.93 ± 3.73	24.53 ± 3.72	0.4	0.07	0.18
04	Speed	10.03 ± 1.19	9.86 ± 1.10	0.17	0.12	1.34
05	Flexibility	17.6 ± 1.08	17.73 ± 1.53	0.13	0.28	0.48

An examination of table II indicates that the obtained 't' ratios were 0.12, 2.12, 0.18, 1.34 and 0.48 for strength, endurance, explosive power, speed and flexibility respectively. The obtained 't' ratios on all the selected variables were found to be lesser than the required table value of 2.14 at 0.05 level of significance for 1, 14 degrees of freedom. So it was found to be insignificant.

Table II. Summary of 't' Ratio on Selected Variables of Concurrent Resistance and Plyometric Training Group

S. No	Variables	Pre Test mean ± σ	Post test mean ± σ	Mean difference	σDM	't' ratio
01	Strength	27.2 ± 2.88	30.27 ± 3.28	3.07	0.40	7.61*
02	Endurance	30.47 ± 0.62	35.53 ± 2.96	5.06	0.75	6.77*
03	Explosive Power	27 ± 4.24	31.67 ± 3.59	4.67	0.58	7.99*
04	Speed	10.49 ± 0.67	9.27 ± 0.43	1.22	0.13	9.14*
05	Flexibility	17.73 ± 0.77	19.93 ± 1.00	2.2	0.16	13.47*

An examination of table II indicates that the obtained't' ratios were 7.61, 6.77, 7.99, 9.14 and 13.47 for strength, endurance, explosive power, speed and flexibility respectively. The obtained't' ratios on all the selected variables were found to be greater than the required table value of 2.14 at 0.05 level of significance for 1, 14 degrees of freedom. So it was found to be significant. Hence the hypothesis was accepted.

Table III. Analysis of Variance on Pre-Test, Post-Test And Analysis of Covariance on Post-Test Means of Concurrent Resistance and Plyometric Training Group (CRPTG) and Control Group (CG)

STRENGTH							
TEST	**CRPTG**	**CG**	**SOV**	**SS**	**df**	**MS**	**F**
Pre Test	27.2	26.67	between	2.13	1	2.133	0.21
SD	2.88	3.30	within	287.73	28	10.28	

Post Test	30.27	27.20	between	70.53	1	70.53	6.11
SD	3.28	3.29	within	323.33	28	11.55	
Adjusted Post Test	30.00	27.47	between	47.54	1	47.54	44.84
			within	28.625	27	1.06	
ENDURANCE							
TEST	**CRPTG**	**CG**	**SOV**	**SS**	**df**	**MS**	**F**
Pre Test	30.47	30.87	between	1.20	1	1.200	2.17
SD	0.62	0.80	within	15.47	28	0.55	
Post Test	35.53	31.47	between	124.03	1	124.03	21.78
SD	2.96	1.36	within	159.47	28	5.70	
Adjusted Post Test	35.68	31.32	between	132.08	1	132.08	23.56
			within	151.356	27	5.61	
EXPLOSIVE POWER							
TEST	**CRPTG**	**CG**	**SOV**	**SS**	**df**	**MS**	**F**
Pre Test	27	24.93	between	32.03	1	32.033	1.87
SD	4.24	3.73	within	478.93	28	17.10	
Post Test	31.67	24.53	between	381.63	1	381.63	26.64
SD	3.59	3.72	within	401.07	28	14.32	
Adjusted Post Test	30.75	25.45	between	197.89	1	197.89	201.44
			within	26.525	27	0.98	
SPEED							
TEST	**CRPTG**	**CG**	**SOV**	**SS**	**df**	**MS**	**F**
Pre Test	10.49	10.03	between	1.62	1	1.62	1.62
SD	0.67	1.19	within	28.01	28	1.00	
Post Test	9.27	9.87	between	2.64	1	2.64	3.57
SD	0.43	1.10	within	20.73	28	0.74	
Adjusted Post Test	9.09	10.05	between	6.64	1	6.64	70.78
			within	2.534	27	0.09	

FLEXIBILITY							
TEST	**CRPTG**	**CG**	**SOV**	**SS**	**df**	**MS**	**F**
Pre Test	17.73	17.60	between	0.13	1	0.133	0.14
SD	0.77	1.08	within	26.53	28	0.95	
Post Test	19.93	17.73	between	36.30	1	36.30	20.38
SD	1.00	1.53	within	49.87	28	1.78	
Adjusted Post Test	19.89	17.78	between	33.03	1	33.03	24.73
			within	36.070	27	1.34	

An examination of table III indicated that the results of ANOVA for pre test scores of the progressive resistance training programme and control group. The obtained F-ratio for the pre-tests on strength, endurance, explosive power, speed and flexibility was 0.21, 2.17, 1.87, 1.62, and 0.14 respectively. It was found to be less than the required 'F' ratio of 4.20. By this it was inferred that the mean difference among the two groups at pre-test on strength, endurance, explosive power, speed and flexibility was statistically insignificant. Thus the in Significant F- ratio found in the pre-test mean differences provided a confidence that the samples hailed from same population and devoid of sampling bias.

In the post-test data analysis, the progressive resistance training programme and control group on muscular strength, explosive power, speed, and flexibility. The obtained F- ratio for the post-test was 6.11, 21.78, 26.64, 3.57, and 20.38. The F-ratio needed

for significant differences on the mean, for degrees of freedom 1, 28 was 4.20 at 0.05 level of confidence. Since the observed F-ratio on this variable was found to be higher than the F- ratio needed for significance, it was inferred that the mean differences among the two groups on the strength, endurance, explosive power, speed and flexibility used in the study at the end of the treatment period was statistically significant.

The preliminary aim of the analysis of covariance is adjusting the post-test means for the differences in the pre-test means, and adjusted means were tested for significance. The F-ratio obtained from the testing the adjusted post-test means among the two groups' namely progressive resistance training programme and control group on strength, endurance, explosive power, speed and flexibility was 44.84, 23.56, 201.44, 70.78, and 24.73. The obtained F- ratio on strength, endurance, explosive power, speed and flexibility among the two groups was statistically significant since they exceeded the needed F- ratio (4.21) for degree of freedom 1 and 27, at 0.05 level of confidence. From this it was concluded that the strength, endurance, explosive power, speed and flexibility was significantly influenced by the treatments used in this study. Thus the formulated hypothesis was accepted. Result of the study revealed that there was a significant improvement on the strength, endurance, explosive power, speed and flexibility due to the concurrent resistance and plyometric training programme.

Figure I. Bar diagram shows the Mean Values of Strength

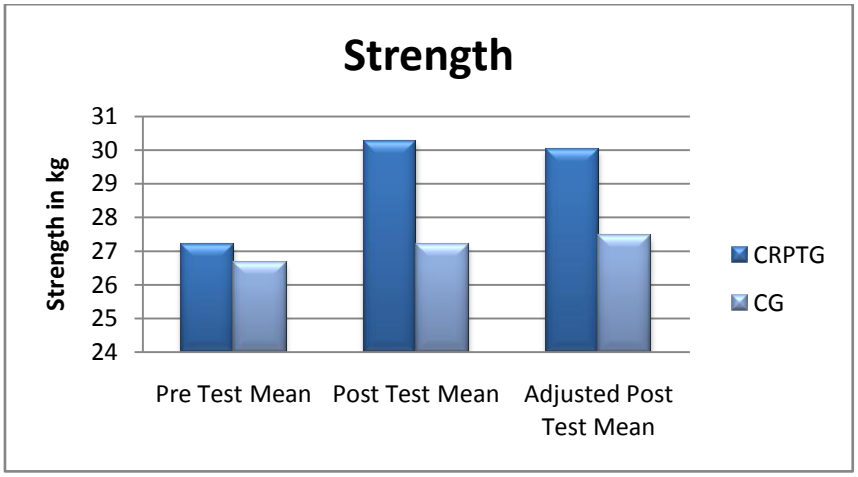


Figure II. Bar diagram shows the Mean Values of Muscular Endurance

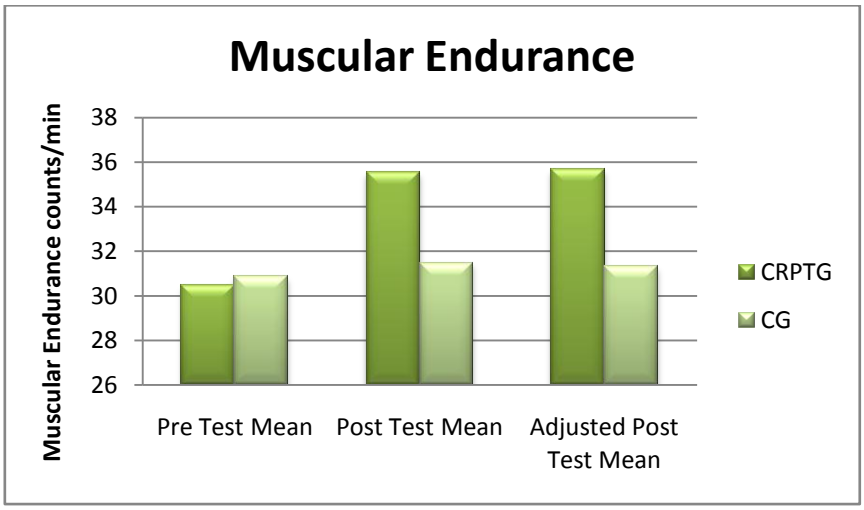


Figure III. Bar diagram shows the Mean Values of Explosive Power

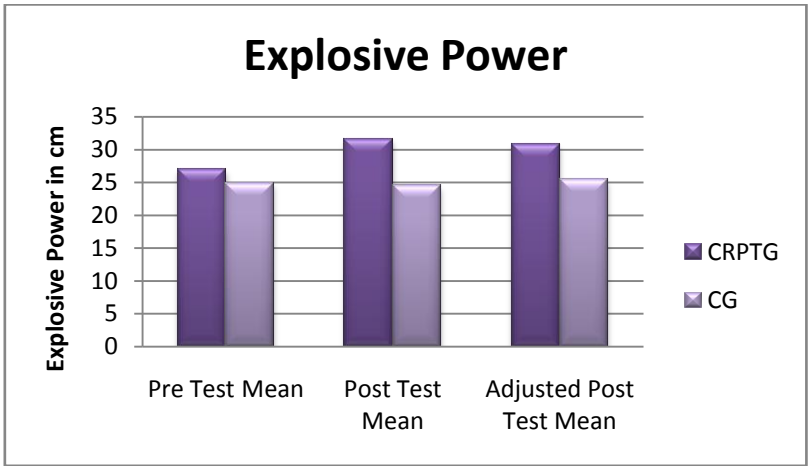


Figure IV. Bar diagram shows the Mean Values of Speed

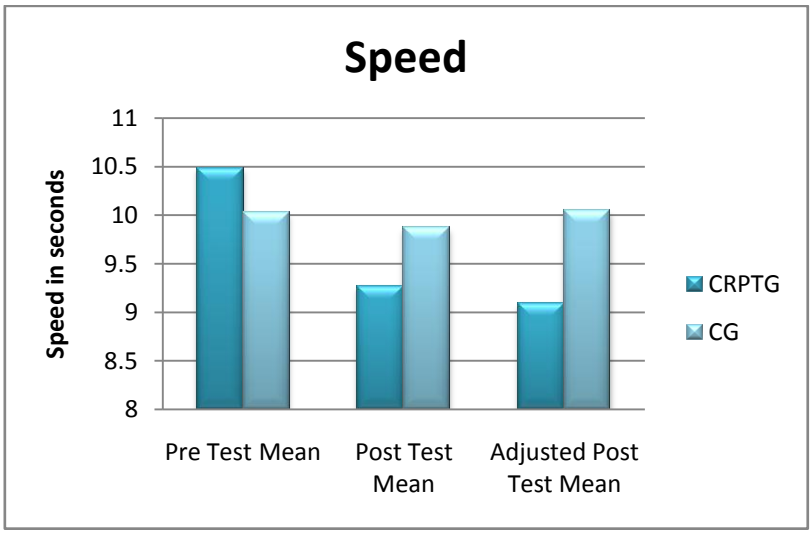
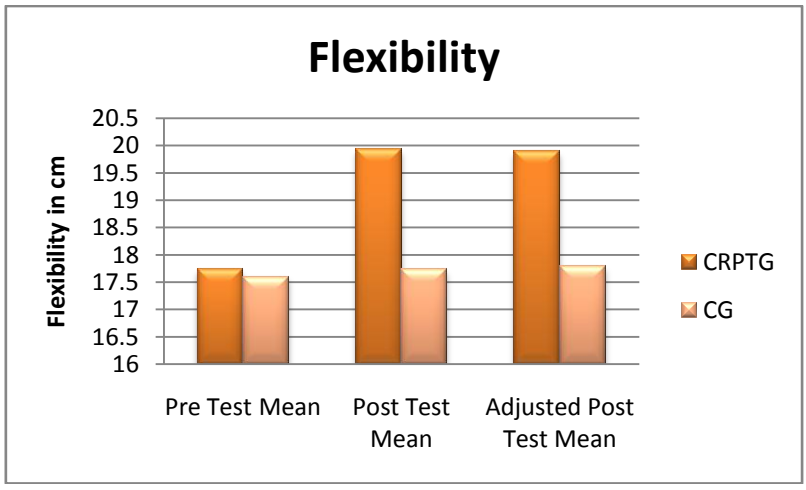


Figure V. Bar diagram shows the Mean Values of Flexibility



Discussion on Findings

The findings of the present study are as follows.

1. It may be concluded from the result of the study that concurrent resistance and plyometric training was a better tool to improve the physical variables among college women. The present study demonstrated an increase in the strength [11.28% (<0.05)], muscular endurance [16.60% (< 0.05)], explosive power [17.29% (<0.05)], speed [11.63% (<0.05)], and flexibility [12.40% (<0.05)] respectively.
2. The control group did not exhibit any significant change during the training period.

The result of the study is in line with the **SedanoS, et.al., (2013)** is concluded that the prescribed concurrent training was able to elicit a significantly improved maximal strength. **Ali Akbar Sadeghi (2011), N.N. Toskovic, D**. **Blessing and H.N. Williford and M.A. Suzana and W. Pieter** who found out that there is an increase of **muscular strength** and endurance due to the training programme. The findings of the study is in par with some of the Literatures (Blackey & Southard, 1987; Gehri *et al*., 1998; Matavulj *et al*., 2001) that a relatively small amount of plyometric training is required to improve performance in vertical jumping, long jumping, sprinting and sprint cycling. A conditioning program consisting of both plyometric training and resistance training can improve power performance in the vertical jump (Blackey & Southard, 1987; Adams *et al*., 1992; Bauer *et al*., 1990; Clutch *et al*., 1983) and 40-yard sprint time (Olhemus *et al*.). The concurrent resistance and plyometric training was a better tool to improve the physical variables among college women volley ball players.

Conclusion

The following conclusions were drawn with in the limitations identified and the subjects' performance in tests.

1. The concurrent resistance and plyometric training was significantly effective in enhancing the physical variables among college women volley ball players.
2. The control group did not exhibit any significant change in physical variables among college women volley ball players.

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