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Effects of pre-season strength training and plyometric training on selected physical fitness variables, physiological variables and skill performance variables of male inter-collegiate volleyball players

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Abstract

Sports have become as competitive as other fields in the world. In ancient times, our ancestors exhibited the extraordinary talents in terms of physical activity. But now it has become completely professional. Somehow or other irrespective of age the human race is involved in different kinds of sports either for recreation or competition. In the present world, Sports have become extremely competitive. It is not mere participation or practice that makes an individual victorious. Sports life is affected by various factors like physiology, biomechanics, sports training, sports medicine, sociology and coaching, computer application and psychology and so on. The purpose of the present study, 90 players were selected as samples from Anna University affiliated colleges, Coimbatore District in the year of 2019 - 2020. Finally sixty men volleyball players were randomly selected as subjects for the present study. They were divided into three groups. Each group consists of 20 subjects. Group -I Pre-Season Strength Training Group (PSTG), Group - II Pre-Season Plyometric Training Group (PPTG) and Group - III control group (CG). The ages of subjects were ranged from 18-25. In the present study are significant source to maintain the skill performance variables is serving ability and with its related physical fitness variables is speed and the physiological variables is resting heart rate. The present study pays attention mainly on testing the means of three groups (two experimental and one control) and secondarily deals with the increase of means in each group from baseline to post treatment for various measures. The statistical tools used are the analysis of co-variance was applied. To determine whether the training programmes produced significantly different improvements in selected variables after 12 weeks of training the analysis of co-variance was used. The result of this study indicates that there is insignificant difference in speed and resting heart rate among players of volleyball game. The hypothesis of this study stated that there would be significant difference in serving ability among players of volleyball game. From the result of this study it is observed that there is significant improvement in all the variables.

Keywords: Resting heart rate, speed and serving ability

Introduction

Sports have become as competitive as other fields in the world. In ancient times, our ancestors exhibited the extraordinary talents in terms of physical activity. But now it has become completely professional. Somehow or other irrespective of age the human race is involved in different kinds of sports either for recreation or competition. In the present world, Sports have become extremely competitive. It is not mere participation or practice that makes an individual victorious. Sports life is affected by various factors like physiology, biomechanics, sports training, sports medicine, sociology and coaching, computer application and psychology and so on.

Methodology

The purpose of the present study, 90 players were selected as samples from Anna University affiliated colleges, Coimbatore District in the year of 2010 - 2011. Finally sixty men volleyball players were randomly selected as subjects for the present study. They were divided into three groups. The ages of subjects were ranged from 18-25. In this study the physical fitness variable was speed and the physiological factors was resting heart rate.

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The skill performance was serving ability were recorded. The statistical tools used are analysis of co-variance was applied. To determine whether the training programmes produced significantly different improvements in selected variables after 12 weeks of training the analysis of co-variance was used. Since the initial means were not matched, comparisons between actual could not be made, all means were adjusted by regression to a common mean. The significance on difference of pairs of adjusted final group means were tested for significance by applying Scheffe post hoc test. Further, the group means gains recorded by the various groups in the pre-test and post-test was tested for significance by applying paired 't' test.

Training procedure

In the present study as invention strategies pre-season strength training, pre-season plyometric training were used. These invention strategies are differed from one another in nature and the degree of influence on changes of physical and physiological variables. In the effect of pre-season strength training and pre-season plyometrics training would be higher rather than the individualized effect on physical and physiological and skill performance variables.

Table 1: F-ratio for pre-test and post-test among the pre-season strength training pre-season plyometric training and control groups on speed.

	Group	Mean	Source	Sum of Square	DF	Mean Square	F-ratio
Pre-test	PSTG	7.21	Between set	1.81	2	0.91	2.05
	PPTG	6.78	Within Set	25.21	57	0.44	
	CG	6.97					
Post test	PSTG	6.58	Between set	3.18	2	1.59	4.11*
	PPTG	6.25	Within Set	22.06	57	0.39	
	CG	6.82					
Adjusted Mean	PSTG	6.45	Between set	2.33	2	1.17	5.39*
	PPTG	6.39	Within Set	12.12	56	0.22	
	CG	6.83					

Table 1 reveals that the F-value for pre-test 2.05 and post-test 4.11 among the experimental groups (pre-season strength training group and pre-season plyometric training group) and control group on speed. The obtained F-ratio for pre-test and post-test to be significant at 0.05 level for degree of freedom 2, 57 the required critical value was 3.16. Hence the F-ratio (2.05) obtained for pre-test was found to be not significant since it do not reach the required critical value 3.16. regarding this F-ratio for post-test mean 4.11 was found to statistically significant since it was higher than their required critical value 3.16. Based on F-ratio it was informed that experimental group and control group are equal in this performance of speed before they included into their respective treatment whereas, after completion of 12 week treatment period, experimental group as control group were significantly different from one another in the performance of speed. The F-ratio for speed 5.39 obtained for adjusted posttest was found to be significant at 0.05 level for degree of freedom 2, 56 the required critical value was 3.16. Based on the results, in testing the hypothesis No.2 that there may be significant difference among the effects of training namely pre-season strength training group, pre-season plyometric training group and control group on physical fitness variables, physiological variables and skills performance of volleyball players is accepted. The mean value of speed among pre-season strength training group pre-season plyometric training group and control group are graphically represented in figure 1.

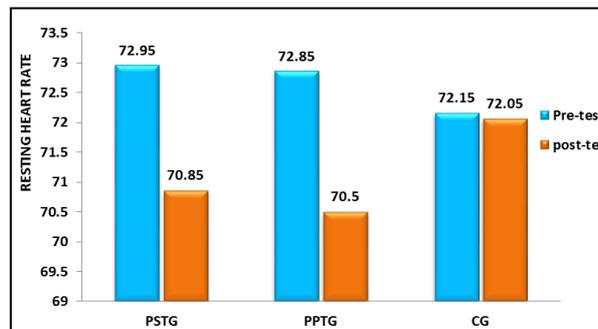


Fig 1: Bar diagram showing the mean values of pre-test and post-test on Resting Heart Rate of PSTG, PPTG and CG

To identify the specific differences among the three groups as post hoc test was used. The results of post hoc testes are presented in table 2

Table 2: Table showing the scheffes post hoc test on speed

Variables	ST	PT	CG	MD	F
Speed	6.45	6.39	-----	0.06	0.16
	6.45	-----	6.83	-0.38	6.88
	-----	6.39	6.83	-0.44	9.13

Table 2 shows that the mean differences of speed among pre-season strength training group, pre-season plyometric training group and control group were 0.06, 0.38 and 0.44 respectively. The required confidence interval value is 3.16. Since the mean difference between speeds among pre-season strength training group, pre-season plyometric training group and control group were lesser than the confidence interval value 3.16, it was observed that there was insignificant difference on speed between these groups. The mean value of speed among pre-season strength training group, pre-season plyometric training group and control group are graphically represented in figure 2.

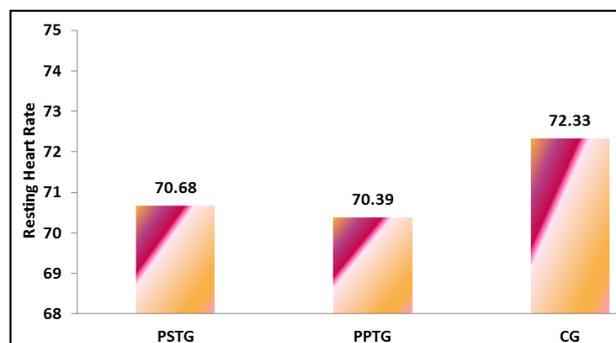


Fig 2: Adjusted mean values on resting heart rate of PSTG, PPTG and CG

Table 3: F-ratio for pre-test and post-test among the pre-season strength training pre-season plyometric training and control groups on resting heart rate.

	Group	Mean	Source	Sum of Square	DF	Mean Square	F-ratio
Pre-test	PSTG	72.95	Between set	7.60	2.00	3.80	3.11
	PPTG	72.85	Within Set	68.05	57.00	1.19	
	CG	72.15					
Post test	PSTG	70.85	Between set	26.43	2.00	13.22	13.33*
	PPTG	70.50	Within Set	56.50	57.00	0.99	
	CG	72.05					
Adjusted Mean	PSTG	70.68	Between set	39.75	2.00	19.87	31.75*
	PPTG	70.39	Within Set	35.06	56.00	0.63	
	CG	72.33					

Table 3 reveals that the F-value for pre-test mean 3.11 and post-test mean 13.33 among the experimental groups pre-season strength training group, pre-season plyometric training group and control group on Resting heart rate. The obtained F-ratio for pre-test mean 3.18 and post-test mean 13.33 to be significant at 0.05 level for degree of freedom 2, 57 the required critical value was 3.16. Hence, the F-ratio 3.18 obtained for pre-test mean was found to be significant since it do not reach the required critical value 3.16. Regarding this F-ratio for post-test mean 13.33 was found to statistically significant since it was higher than their required critical value 3.16 based on F-ratio it was informed that experimental group and control group are equal in this performance of resting heart rate before they included into their respective treatment whereas, after completion of 12-week treatment period, experimental group as control group were significantly different from one another in the performance of Resting heart rate. The F-ratio for resting heart rate 10.67 obtained for adjusted posttest was found to be significant. To be significant at 0.05 level for degree of freedom 2, 56 the required critical value was 3.16. Based on the results, in testing the hypothesis No.2 that there may be significant difference among the effects of training namely pre-season strength training group, pre-season plyometric training group and control group on physical fitness variables, physiological variables and skills performance of volleyball players is accepted. The mean value of resting heart rate among pre-season strength training group, pre-season plyometric training group and control group are graphically represented in figure 3.

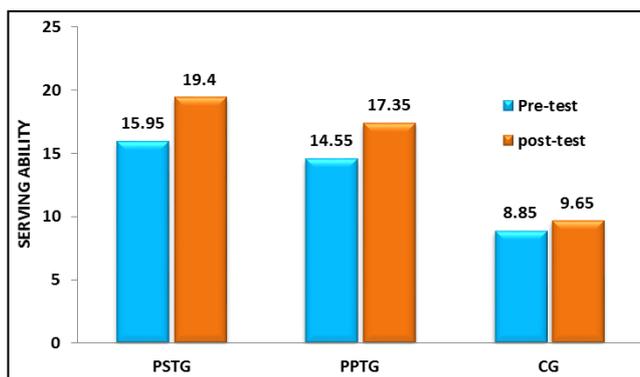


Fig 3: Bar diagram showing the mean values of pre-test and post-test on Serving Ability of PSTG, PPTG and CG

To identify the specific differences among the three groups as post hoc test was used. The results of post hoc testes are presented in table 4.

Table 4: Table showing the scheffes post hoc test on resting heart rate

Variables	ST	PT	CG	MD	F
Resting Heart rate	70.68	70.39	-----	0.29	1.38
	70.68	-----	72.33	-1.65	43.44
	-----	70.39	72.33	-1.94	60.30

Table 4 shows that the mean differences of resting heart rate among pre-season strength training group, pre-season plyometric training group and control group were 0.29, 1.65 and 1.94 respectively. The required confidence interval value was 3.16. Since the mean difference between resting heart rate among pre-season strength training group, pre-season plyometric training group and control group were lesser than the confidence interval value 3.16, it was observed that there

was insignificant difference on Resting Heart Rate between these groups. The mean value of resting heart rate among pre-season strength training group, pre-season plyometric training group and control group were graphically represented in figure 4.

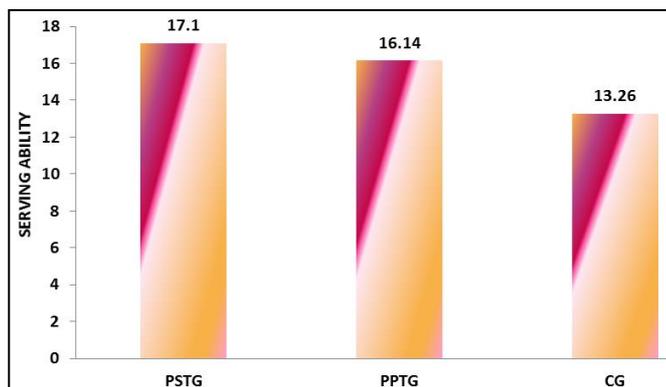


Fig 4: Adjusted mean values on Serving Ability of PSTG, PPTG and CG

To identify the specific differences among the three groups as post hoc test was used. The results of post hoc testes are presented in table 5

Table 5: F-ratio for pre-test and post-test among the pre-season strength training pre-season plyometric training and control groups on serving ability

	Group	Mean	Source	Sum of Square	DF	Mean Square	F-ratio
Pre-test	PSTG	15.95	Between set	565.73	2.00	282.87	58.75*
	PPTG	14.55	Within Set	274.45	57.00	4.81	
	CG	8.85					
Post test	PSTG	19.40	Between set	1057.03	2.00	528.52	94.17*
	PPTG	17.35	Within Set	319.90	57.00	5.61	
	CG	9.65					
Adjusted Mean	PSTG	17.00	Between set	50.09	2.00	25.05	11.41*
	PPTG	16.14	Within Set	122.94	56.00	2.20	
	CG	13.26					

Table 5 reveals that the F-value for pre-test 58.75 and post-test 94.17 among the experimental groups (pre-season strength training group, pre-season plyometric training group) and control group on service. The obtained F-ratio for pre-test and post-test to be significant at 0.05 level for degree of freedom 2, 57 the required critical value was 3.16 hence, the F-ratio 58.75 obtained for pre-test was found to be significant since it do not reach the required critical value 3.16 regarding this F-ratio for post-test 94.17 was found to statistically significant since it was higher than their required critical value 3.16 based on F-ratio it was informed that experimental group and control group are equal in this performance of service before they included into their respective treatment whereas, after completion of 12-week treatment period, experimental group as control group were significantly different from one another in the performance of service. The F-ratio for serving ability 10.67 obtained for adjusted posttest was found to be significant at 0.05 level for degree of freedom 2, 56 the required critical value was 3.16. Based on the results, in testing that there may be significant difference among the effects of training namely pre-season strength training group, pre-season plyometric training group and control group on physical fitness variables, physiological variables and skills performance of volleyball players is

accepted. The mean value of serving ability among pre-season strength training group, pre-season plyometric training group and control group are graphically represented in figure 5

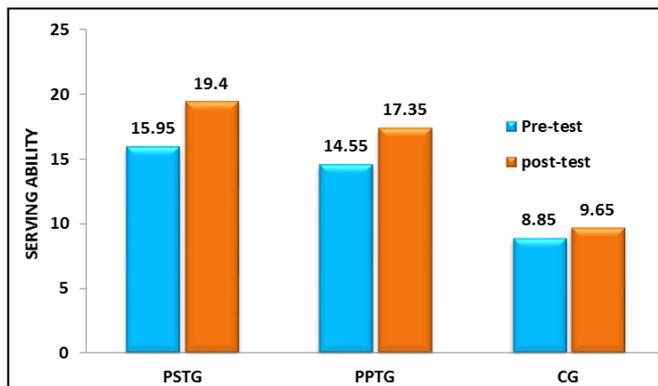


Fig 5: Bar diagram showing the mean values of pre-test and post-test on Serving Ability of PSTG, PPTG and CG

To identify the specific differences among the three groups as post hoc test was used. The results of post hoc testes are presented in table 6.

Table 6: Table showing the scheffes post hoc test on serving ability

Variables	ST	PT	CG	MD	F
Serving Ability	17.00	16.14	-----	0.86	3.40
	17.00	-----	13.26	3.74	63.55
	-----	16.14	13.26	2.88	37.55

Table 6 shows that the mean differences of serving ability among pre-season strength training, pre-season plyometric training and control group were 0.86, 3.74 and 2.88 respectively. The required confidence interval value was 3.16. Since the mean difference between serving ability among pre-season strength training, pre-season plyometric training and control group were lesser than the confidence interval value 3.16 it was observed that there was insignificant difference on serving ability between these groups in figure 4.14.

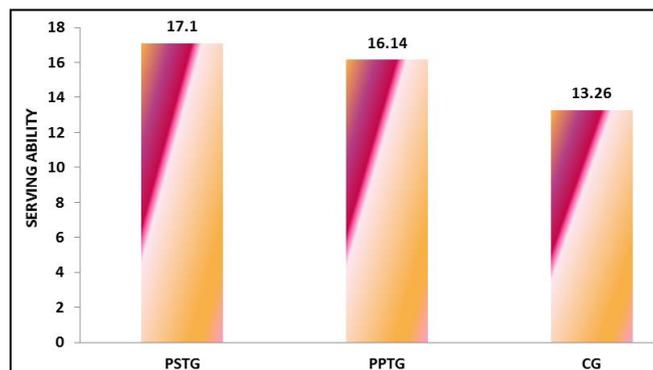


Fig 6: Adjusted mean values on Serving Ability of PSTG, PPTG and CG

Discussion of findings

The pre-test before the related training showed that there was an insignificant and variation on speed, Resting Heart Rate and Serving ability among the three groups. The post-test after the related training showed significant improvement on speed, Resting Heart Rate, Serving ability. In the strength training group and in the plyometric training group than the control group. Comparison among these three groups resulted that the strength training group shows better improvement in

all the selected variables than the plyometric training group and control group. The result also revealed that the explosive power and passing were comparative better in the plyometric group than the strength training group after the related training.

Conclusion and Recommendations

Based on the results of the study, the following recommendations have been made.

In the physical exercise, while designing the training programme the effect of varied training modalities is explained positively on muscle fitness parameters and skill performance variables of volleyball players. This is due to integrating the plyometrics with resistance training which requires the players to perform the plyometrics exercises in a fatigue stage, resulting in potentially increasing explosive power production. Hence the volleyball players can use this type of training as a module in order to achieve high level skill performance in the game of volleyball. In a combined training routine, a player performs a heavy set of traditional resistance training exercise, which is followed almost immediately by a plyometric exercise. Another training strategy is known as complex training in which a player alternates biomechanically similar high load resistance training exercises with plyometric exercises, set forest, in the same workout. Since this type of training also proves to be effective in developing the fitness parameters and skill performance of the volley ball players the coaches can utilize this technique in their conditioning programme to develop the fitness and skill performance.

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