



Impact of Cross Fit Training and Complex Training on Selected Physical Physiological and Performance Variables among College Women Volleyball Players

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Abstract: The intention of present study was to find out the impact of cross fit training and complex training on selected physical, physiological and performance variables among college women volleyball players. To achieve the purpose of the present study, forty (N= 45) college women volleyball players from Fatima and Lady Doak College, Madurai, Tamilnadu, India were selected as subjects at random and their ages ranged from 17 to 22 years. The subjects were randomly divided into three equal groups Group-I cross fit training, Group-II complex training and Group-III Control group, each group consisting of 15 subjects. A pre-test, mid-test, and post-test were included in the random group design of the experiment. Every subject completed a pre-test on specific factors. These pre-test results were used to produce the subject's pre-test scores. Group I received cross-fit training, Group II received complicated training, and Group III received no training at all. The experimental group received the particular training packages created by the study's investigator for eight weeks, six days a week with alternate days by morning. Each session lasted 90 minutes. All forty-five subjects were assessed on their chosen variables following the four weeks that we conducted the mid-test, which was likewise created in the experimental treatment. The dependent variables selected for this study were explosive power, vital capacity and service. The explosive power was measured by Sergeant Vertical Jump in centimeter, vital capacity was measured by Peak Flow Meter in centimeter and service was measured by volleyball skill test in score. This final test scores formed as post-test scores of the subjects. Analysis of covariance (ANCOVA) and Scheffe's Post- hoc test were applied to find out the significance of the mean difference among three groups. Finally, the result of the study revealed that there was a significant improvement of explosive power, vital capacity and service for the cross fit training group was better than complex training group and the control group.

Keywords: Cross fit Training, complex training, explosive power, vital capacity, service and Volleyball Players

Introduction

Sports in the present world have become extremely competitive. It is not the mere participation or practice that brings out victory to an individual. Therefore, sports life is affected by various factors like physiology, biomechanics, sports training, sports medicine, and sociology and psychology etc. All the coaches, trainers, physical education personals and doctors are doing their best to improve the performance of the players of their country. Athlete players of all the countries are also trying hard to bring laurels, medals for their countries in International competitions. Training is a programme of exercise designed to improve the skills and to increase the energy capacity of an athlete for a particular event, therefore training is essential for the development of physical fitness components.



Physical training is the basic requirement for sportsmen to achieve a desirable performance. The system of physical training differs in terms of level of competition, nature of sport and gender. The existing system of training in India concentrates more on individualized motor fitness components irrespective of the factors mentioned above through their physical aspects. As this type of individualized training prevails in the present scenario, none of the sportsmen at different levels will get benefited. Hence, the sportsmen who have acquired basic fitness components in their previous training may achieve high level when they switch over from the system of training that is designed from individualized to complex in nature.

Complex training has been defined as combining plyometric training and weight training exercises in the same training session in a bid to realize a greater training effect on the targeted muscle groups, and to provide a more time-efficient method of combining strength and power training, particularly during competitive training cycles (Chu, 1996).

Today, women compete professionally and as amateurs in virtually every major sport, though the level of participation typically decreases when it comes to the more violent contact sports. Women in sports is dedicated to providing role models of women athletes that validate women's accomplishments and perpetuate a new vision of women's abilities, autonomy and self-determination. Women will find the courage and daring to follow their goals. This study mainly focused on women sports participants those who regularly participated in training and sports. The purpose of the study was to find out the effect of complex training on selected physiological variables of women sports participants.

Cross Fit training is an alternative modality to high-intensity functional training. Due to its constantly varied functional movements performed at relatively high intensity through metabolic conditioning, gymnastics, and weightlifting, this modality has been increasing in its popularity across the world. The basic tasks are consisted of little to no resting periods during the activity in order to complete a task as fast as possible (for time) or achieve the greatest number of repetitions in a certain period of time. The high intensity of Cross Fit workouts improves muscular endurance and strength, fitness level, as well as body composition. The huge number of participants and increasing competition and professional athletes of Cross Fit allowed us to characterize it as a training program and sport of fitness. (Meenatchi & Anbalagan, 2022).

It has been shown to create both a broad, overall and inclusive fitness (Turna et al., 2019). In this way, the combined style of cross-fit has been named as a workout of the day which is called both a physical training philosophy and a competitive sports type, called exercise of the day. These wods start and end in a period of 10-50 minutes (Glassman, 2009). After a good warm-up in these training sessions, one of the power or strength programs is applied, and during these applications, high-intensity exercises, rapid repetitions and an aerobic load are performed between the sets with little or no rest period (Sprey et al., 2016).

Body mass index (BMI) and abdominal adiposity assessed using waist circumference (WC), body composition and anthropometric variables, are essential markers to assess overweight and obesity and are associated to metabolic disease and QoL (Klein et al., 2007; Kobo et al., 2019). This measure are non-evasive methods widely used in individual with Intellectual and Developmental Disabilities (IDD) to measure nutritional status (Temple et al., 2010; Waninge et al., 2010) and individuals with IDD are more likely to be overweight or obese compared to the general population (Zwierzchowska et al., 2021).

Playing abilities or specific skills are very important aspect in every game and sports and play a vital role in the performance of individual. Skill is often defined as knowledge or expertise, but in physical education it is the ability to perform certain activities or movements with control and consistency, to bring about a desired results. It takes a long time to acquire a skill because it involves a high level co-ordination and control. The game of volleyball comprises manifold of quick actions and reactions such as arm pass, fore arm pass, blocking, smashing and defencing in the playing situation. Volleyball is characterized by a very high reach out of male and female



volleyball players above the set and highball velocity on jump service and spiking. Many authors consider motor abilities, agility and explosive strength as the major characteristics for successful volleyball performance. A great deal of strength endurance, agile, good explosive and skill are necessary to play volleyball effectively in competitive of national and international level performance. As a consequence, the player must work on a wide-ranging program designs to improve his strength, muscular endurance, cardio vascular efficiency, flexibility and agility. To be successful, teams must be able to control play at the net both offensively and defensively.

Methods And Materials

The intention of present study was to find out the impact of cross fit training and complex training on selected physical, physiological and performance variables among college women volleyball players. To achieve the purpose of the present study, forty (N= 45) college women volleyball players from Fatima and Lady Doak College, Madurai, Tamilnadu, India were selected as subjects at random and their ages ranged from 17 to 22 years. The subjects were randomly divided into three equal groups Group-I cross fit training, Group-II complex training and Group-III Control group, each group consisting of 15 subjects. A pre-test, mid-test, and post-test were included in the random group design of the experiment. Every subject completed a pre-test on specific factors. These pre-test results were used to produce the subject's pre-test scores. Group I received cross-fit training, Group II received complicated training, and Group III received no training at all. The experimental group received the particular training packages created by the study's investigator for eight weeks, six days a week with alternate days by morning. Each session lasted 90 minutes. All forty-five subjects were assessed on their chosen variables following the four weeks that we conducted the mid-test, which was likewise created in the experimental treatment. The dependent variables selected for this study were explosive power, vital capacity and service. The explosive power was measured by Sergeant Vertical Jump in centimeter, vital capacity was measured by Peak Flow Meter in centimeter and service was measured by volleyball skill test in score. This final test scores formed as post-test scores of the subjects.

Statistical Technique

The following statistical techniques were employed to find out the impact of cross fit training and complex training on selected physical, physiological and performance variables among college women volleyball players. Analysis of covariance (ANCOVA) was employed to find out the significant differences if any, among the groups for each variable separately. The Scheffe's test was applied as post-hoc test whenever the 'F' ratio of the adjusted post-test means was found to be significant at 0.05 level of confidence.

Experimental Programme:

8-week Cross Fit Training Program

Frequency: 5 days per week at morning

Intensity: Moderate to vigorous

Duration: 60-80 minutes

Warm-up and cool down: 5-10 minutes each

This schedule might include upper body and conditioning on Monday and Saturday, lower body and conditioning on Tuesday and Saturday, deadlift and conditioning on Wednesday, active rest and recovery on Thursday, upper body and aerobic bodybuilding on Friday, and rest on Sunday. Strength program: This schedule might include back squat and leg accessory work on Monday, overhead press and shoulder/biceps accessory work on Tuesday, deadlift/Oly lift and back and hamstring accessory work on Thursday, and bench press and triceps/chest accessory work on Friday were completed before and after the 8 week Cross Fit exercise program.

Complex Training

During the preparation time frame the trial bunches went through their individual preparing program notwithstanding their day by day ordinary exercises according to the timetable. Test bunches to be complex training preparing went through their particular exploratory preparing on five days in a week for eight weeks at morning. The length of exploratory preparing was made arrangements for a 1 hour and half. The subjects announced for exploratory preparing between 6.30 am and 8.00 pm. Every one of the subjects associated with this examination was painstakingly checked all through the preparation program and accomplished 98% of participation. They following training schedule were fixed for women volleyball.

Seven-day split: This schedule might include upper body and conditioning on Monday and Saturday, lower body and conditioning on Tuesday and Saturday, deadlift and conditioning on Wednesday, active rest and recovery on Thursday, upper body and aerobic bodybuilding on Friday, and rest on Sunday. Strength program: This schedule might include back squat and leg accessory work on Monday, overhead press and shoulder/biceps accessory work on Tuesday, deadlift/Oly lift and back and hamstring accessory work on Thursday, and bench press and triceps/chest accessory work on Friday.

Results Of Agility

The analysis of covariance on analysis of covariance on explosive power, vital capacity and service of pre-test, post-test and adjusted post-test mean of cross fit, complex training and control groups have been analyzed and presented in the table-1

	Crossfit Training	Complex Training	Control Group	SOV	Sum of Squares	DF	Mean Squares	F-ratio
Explosive Power in Centimeters								
Pre-Test Mean	50.12	50.9	50.72	B	14.65	3	4.88	0.35
				W	580.3	42	13.82	
Mid-Test	52.43	51.2	50.71	B	202.78	3	67.59	5.8
				W	489.86	42	11.66	
Post-Test Mean	54.8	53.58	50.71	B	242.1	3	80.7	6.76
				W	501.2	42	11.93	
Adjusted Post-Test Mean	55.45	53.47	50.07	B	120.9	3	40.3	13.66
				W	90.9	41	2.95	
Vital Capacity in liters								
Pre-Test Mean	4.35	4.33	4.31	B	2.7	3	0.9	0.94
				W	40.4	42	0.96	

Mid-Test	3.86	3.65	4.28	B	29.88	3	9.96	6.64
				W	62.98	42	1.5	
Post-Test Mean	4.85	4.7	4.29	B	32.2	3	10.73	8.19
				W	55.2	42	1.31	
Adjusted Post-Test Mean	4.9	4.68	4.31	B	21.85	3	7.28	10.4
				W	2.69	41	0.7	
Service in Scores								
Pre-Test Mean	27.22	28.5	22.28	B	3.78	3	1.13	1.23
				W	38.7	42	0.92	
Mid-Test	28.64	28.05	22.02	B	650.87	3	216.96	12.82
				W	710.76	42	16.92	
Post-Test Mean	33.62	31.39	21.9	B	776.2	3	258.73	13.93
				W	780.56	42	18.58	
Adjusted Post-Test Mean	33.76	39.15	23.98	B	476.9	3	158.97	23.21
				W	280.8	41	6.85	

Table F-ratio at 0.05 level of confidence for 3 and 42 (df) =2.83 * Significant at 0.05 level.

Table- I shows that the pre-test means of explosive power, vital capacity and service among crossfit training, complex training and control group were 50.12, 50.90, 50.72 and 4.35, 4.33, 4.31 and 27.22, 28.50, 22.28 respectively. The obtained F value of 0.35, 0.94 and 1.23 was less than the required table value 2.83. This proved that there was no significant mean difference between the groups at pre-test period.

The mid-test, post-test, and adjusted post-test means of the variable explosive power, vital capacity and service among crossfit training, complex training and control group were 52.43, 51.20, 50.71, 3.86, 3.65, 4.28, 28.64, 28.05, 22.02 and 54.80, 53.58, 50.71, 4.85, 4.70, 4.29, 33.62, 31.39, 21.90 and 55.45, 53.47, 50.07, 4.90, 4.68, 4.31, and also 33.76, 39.15, 23.98 respectively. The obtained F value of mid-test, post-test, and adjusted post-test such as 5.80, 6.76, 13.66, 6.64, 8.19, 10.40, and 12.82, 13.93, 23.21 was greater than the required table value of 2.83. This proved that there was a significant mean difference among the groups after the eight weeks training. Since the obtained F ratio of the adjusted post-test mean was found to be significant, Scheffe's post-hoc test was applied. The obtained paired mean differences among the experimental and control group, between the experimental groups and the confidence interval required for significance are presented in table-II.

Table- II Mean Differences And Confidence Interval Value For Scheffe's Post Hoc On Explosive Power, Vital Capacity And Service

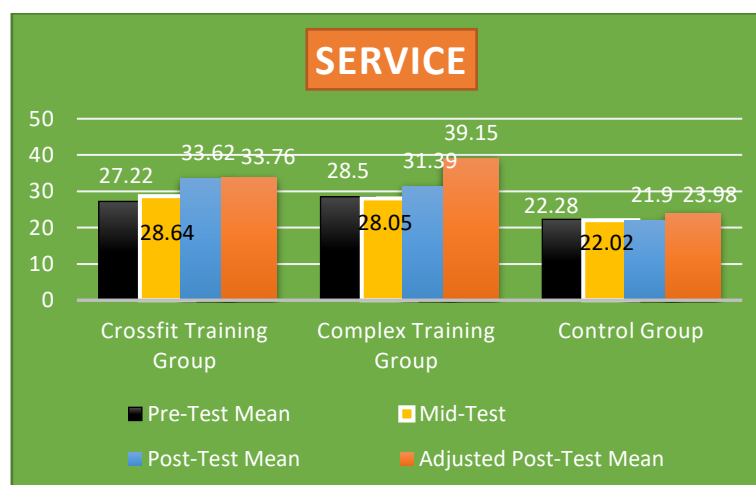
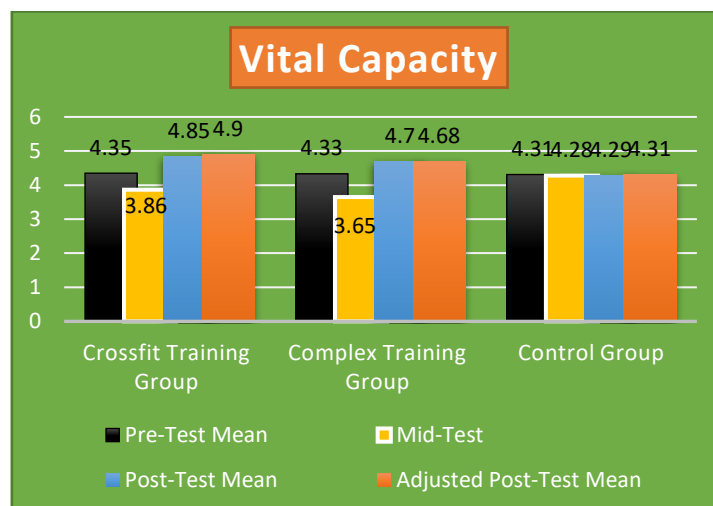
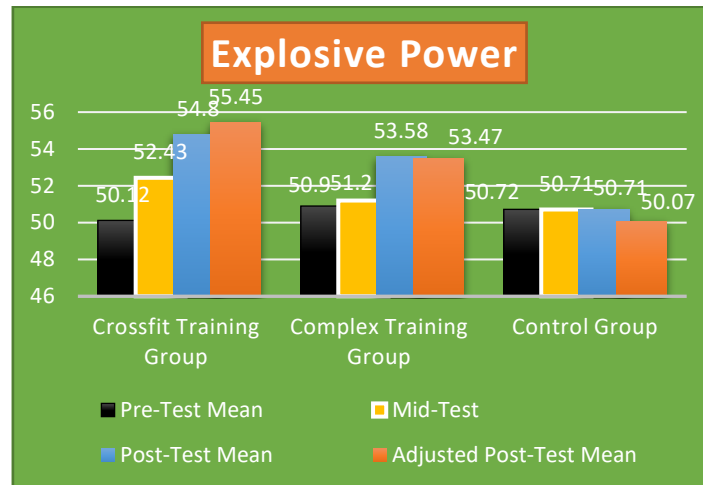
Adjusted Post-Test Mean			Mean Difference	Confidence Interval
Cross Fit Training Group	Complex Training Group	Control Group		
Explosive Power				
55.45	53.47	-	1.98*	1.07
55.45	-	50.07	5.38*	1.07
-	53.47	50.07	3.40*	1.07
Vital Capacity				
4.90	4.68	-	0.28*	0.18
4.90	-	4.31	0.59*	0.18
-	4.68	4.31	0.37*	0.18
Service				
33.76	39.15	-	5.39*	3.97
33.76	-	23.98	9.78*	3.97
-	39.15	23.98	15.17*	3.97

***Significant at 0.05 level**

The paired mean difference obtained for explosive power, vital capacity and service between crossfit training group and complex training group, between crossfit training group control group, between complex training group and control group were 1.98, 5.38, 3.40 and 0.28, 0.59, 0.37 and 5.39, 9.78, 15.17 respectively which are higher than the confidence interval value which showed significant difference among the crossfit training group and complex training group.

The results of the study showed that all the experimental groups had showed in a significant improvement on explosive power, vital capacity and service when a compared to control group. Among the two training groups, crossfit training group was superior, followed by complex training group.

The pre-test, mid-test, post-test and adjusted post-test mean value on explosive power, vital capacity and service among the crossfit training group and complex training group were graphically represented in *figure- I, II and III*.



Discussion

The purpose of the study was to investigate the impact of cross fit training and complex training on selected physical, physiological and performance variables among college women volleyball players. It was observed from

the pre-test results, that there were no significant differences between experimental group and control group while the post-test results of experimental group and control had been analyzed statistically and revealed that, there was a significant mean difference in favour of experimental group. Although there are many studies about cross-fit and complex training, there are limited studies existing related to cross-fit and complex training.

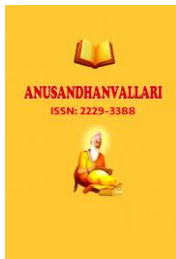
According to Sankar Alagar & Ramesh Kumar (2024), they were proved that the effects complex training involves the integration of strength training and plyometric in a training system designed to significantly improve explosive power. The results were also in conformity with the study carried out by Sezgin Korkmaz et al. (2021), they stated that effects of Complex and contrast training protocols in football significantly improved on player performance. Tadeusz Ambrozy et al. (2022) demonstrated that cross-fit training improved both general and specialized kickboxing physical fitness. As demonstrated by Fouad Abdel Latif Ghaidan, (2024), discovered his study it contributed to tangible changes in both body mass as well as explosive strength and speed, and that the use of cross-fit exercises achieved the advantage of influencing some functional physical abilities compared to the usual by his method of training.

Conclusion

Based on the reviews and results the following conclusions were drawn within limitations of the present study. the result of the study revealed that there was a significant improvement of explosive power, vital capacity and service for the cross fit training group was better than complex training group and the control group.

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