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Effects of complex training on selected corporeal, functional, and skill performance variables of intercollegiate volleyball players

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Abstract
This study was designed to effects of complex training on selected corporeal functional and skill performance variables of intercollegiate volleyball players. To achieve the purpose of the study, 40 volleyball players was selected affiliated colleges from Bharathiar University Coimbatore district, Tamilnadu. The age of the subjects ranged from 18 to 25 years. The subjects were randomly assigned to two equal groups (n=20). Group- I underwent Complex training (CT), and Group II acted as the control group (CG). The training was given to the experimental group for 3 days per week (Monday, Wednesday and Friday) for the period of twelve weeks. The control group was not given any sort of training except for their routine work. The corporeal variables, Leg explosive power (standing broad jump), and Arm explosive power (seated medicine ball throw), functional variables BMI (body mass index), Resting pulse rate (pulse oximeter), Skill performance variable Volley test (Russel Lange Volleyball) The data collected from the subjects was statistically analysed with 't' ratio to find out significant improvement if any at 0.05 level of confidence. The result of the Leg explosive power, Arm explosive power, BMI, resting pulse rate, volley test improved significantly due to the impact of Complex training (CT) training despite the limitations of (diet, climate, lifestyle) status and previous training. The results of the present study coincide findings of the investigations done by different experts in the field of sports sciences. The Experimental group showed a highly significant result when compared with control group.

Keywords: Volleyball, Complex, Leg explosive power, Arm explosive power, BMI, Resting pulse rate, volley test

Introduction
Volleyball is a highly dynamic team sport that demands a combination of strength, agility, speed, and technical precision for successful performance. Players are constantly required to perform explosive movements such as spiking, blocking, serving, and quick directional changes, all of which depend on the development of both upper- and lower-body power. In addition, functional efficiency, including cardiovascular endurance and optimal body composition, is vital for sustaining high-intensity play throughout the duration of a match. Skill-related performance, such as volley execution, serves as the bridge between physical capacity and game success. Therefore, training approaches that can simultaneously enhance corporeal, functional, and skill performance variables are of great importance in volleyball conditioning. One such approach is complex training, a method that combines resistance training with plyometric exercises within the same training session. This method is grounded in the principle of post-activation potentiation (PAP), in which performing a high-intensity strength exercise enhances the subsequent explosive activity. By alternating between strength and plyometric movements, complex training allows athletes to improve both muscular force and explosive power, making it particularly beneficial for sports requiring rapid, powerful actions such as volleyball. Research has shown that complex training produces significant improvements in athletic performance. Chu (1998) [4] highlighted the effectiveness of integrating plyometric drills with strength training to enhance explosive power, which is crucial in jumping and throwing activities. Similarly, Docherty and Hodgson (2007) explained that the PAP mechanism underlying complex training results in measurable gains in speed, strength, and agility, which can be directly applied to sport-specific skills. For volleyball

players, this translates into greater leg explosive power for higher vertical jumps, improved arm explosive power for stronger spikes and serves, reduced resting pulse rate for enhanced endurance, and overall improvements in skill-based performance such as volley execution. Considering the high physical and technical demands of volleyball, it is essential to examine the influence of innovative training methods on athletic development. Thus, the present study seeks to investigate the effects of complex training on selected corporeal, functional, and skill performance variables of intercollegiate volleyball players. The outcomes of this study may provide practical insights for coaches, trainers, and athletes in designing effective conditioning programs to maximize performance at the competitive level.

Methodology

To test the hypothesis of this study, 40 volleyball players from affiliated colleges of Bharathiar University, Coimbatore district, Tamil Nadu, were selected as subjects. The age of the subjects ranged from 18 to 25 years. They were randomly assigned into two equal groups a Complex Training group (n = 20) and a Control group (n = 20). The experimental group underwent a complex training programme four days per week (Monday, Wednesday, and Friday) for a period of twelve weeks, while the control group did not receive any additional training apart from their regular routine. The corporeal variables assessed in the study included leg explosive power, measured using the Standing Broad Jump, and arm explosive power, measured using the Seated Medicine Ball Throw. The functional variables included body mass index (BMI), assessed using the standard formula, and resting pulse rate, measured with a pulse oximeter. The skill performance variable, volleying ability, was assessed using the Russel-Lange Volleyball Test. The collected data for all the selected variables, both pre-test and post-test, were statistically analyzed using the paired 't'-test to determine significant improvements due to complex training. In all analyses, the criterion for statistical significance was set at the 0.05 level of confidence ($p < 0.05$).

Training Programme

The training program lasted 60 minutes per session, conducted 3 days a week for a total of 12 weeks. Each session consisted of a 10-minute warm-up, 40 minutes of Complex training, and a 10-minute cool-down. The training intensity was progressively increased by 5% every four weeks, ranging from 65% to 80% of the workload. The volume of Complex training was prescribed based on the number of sets and repetitions. Pre-tests and post-tests were administered to the subjects, and the results were recorded as scores.

Table 1: Computation of the 't' ratio on selected corporeal, functional, and skill performance variables of intercollegiate volleyball players in the experimental group

Experimental group						
Variables		**N**	**Mean**	**Std. Deviation**	**Std Error Mean**	**'T' ratio**
Corporeal Variables						
Leg Explosive Power (in meters)	Pre-test	20	2.12	0.11	0.01	14.88*
	Post-test	20	2.28	0.09		
Arm Explosive Power (in meters)	Pre-test	20	5.28	0.21	0.03	22.74*
	Post-test	20	6.12	0.28		
Functional Variables						
BMI (in number)	Pre-test	20	24.57	1.24	0.36	8.42*
	Post-test	20	22.75	1.75		
Resting pulse rate (in pulse/min)	Pre-test	20	73.00	1.68	0.35	7.57*
	Post-test	20	70.35	0.74		
Skill Performance Variable						
Volley test (in Points)	Pre-test	20	14.00	2.10	0.20	12.17*
	Post-test	20	16.60	1.69		

*Significant level 0.05 level (degree of freedom 2.09,1 and 19)

Table I presents the computation of the mean, standard deviation, and 't' ratio for selected corporeal, functional, and skill performance variables, namely leg explosive power, arm explosive power, BMI, resting pulse rate, volley test of the experimental group. The obtained 't' ratios for leg explosive power, arm explosive power, BMI, resting pulse rate, volley test were 14.88,22.74,8.42,7.57 and 12.17, respectively. The critical table value for 19 degrees of freedom at the 0.05 level of significance was 2.09. Since the obtained 't' values exceeded the table value, the results were considered statistically significant.

Table 2: Computation of the 't' ratio on selected corporeal, functional, and skill performance variables of intercollegiate volleyball players in the control group

Control group						
Variables		**N**	**Mean**	**Std. Deviation**	**Std Error Mean**	**'T' ratio**
Corporeal Variables						
Leg Explosive Power (in meters)	Pre-test	20	2.10	0.05	0.00	2.04
	Post-test	20	2.10	0.05		
Arm Explosive Power (in meters)	Pre-test	20	5.29	0.18	0.01	0.11
	Post-test	20	5.38	0.22		
Functional Variables						
BMI (in number)	Pre-test	20	20.84	1.66	0.08	0.23
	Post-test	20	20.68	1.65		
Resting pulse rate (in pulse/min)	Pre-test	20	72.60	1.84	0.51	1.26
	Post-test	20	73.25	2.17		
Skill Performance Variable						
Volley test (in Points)	Pre-test	20	13.65	2.39	0.12	2.03
	Post-test	20	13.90	2.22		

*Significant level 0.05 level (degree of freedom 2.09,1 and 19)

Table II presents the computation of the mean, standard deviation, and 't' ratio for selected corporeal, functional, and skill performance variables, namely leg explosive power, arm explosive power, BMI, resting pulse rate, volley test of the control group. The obtained 't' ratios for leg explosive power, arm explosive power, BMI, resting pulse rate, volley test were 2.04,0.11,0.23,0.1.26, and 2.03, respectively. The critical table value for 19 degrees of freedom at the 0.05 level of significance was 2.09. Since the obtained 't' values exceeded the table value, the results were not statistically significant.

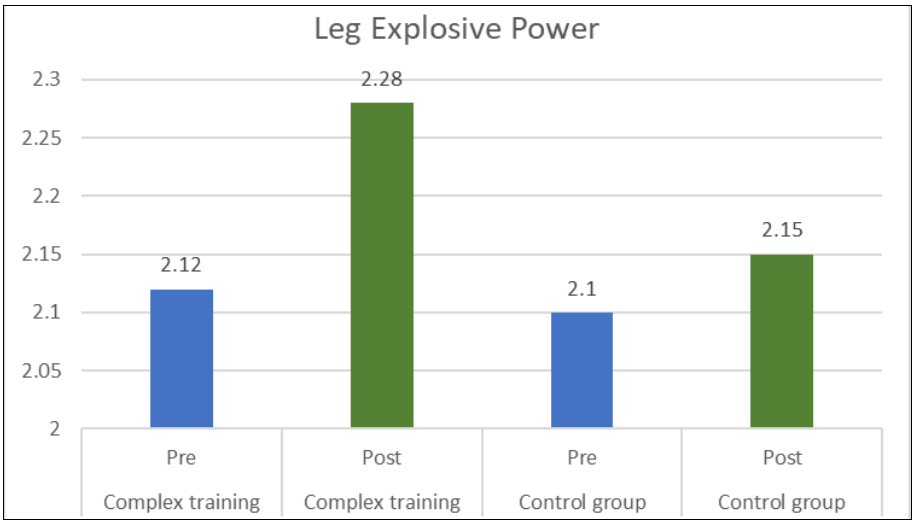

Fig 1: Bar diagram showing the mean value on corporeal variables of Leg Explosive Power intercollegiate volleyball players in the experimental and control groups

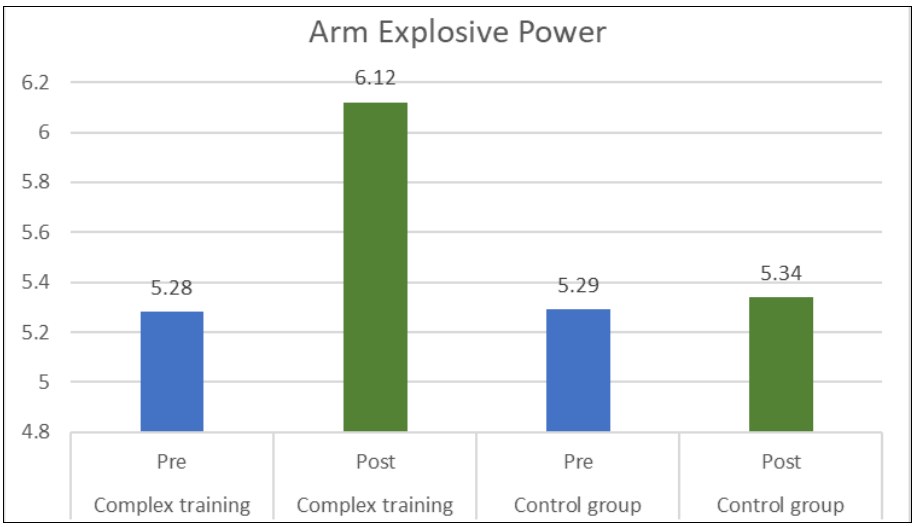

Fig 2: Bar diagram showing the mean value on corporeal variables of Arm Explosive Power intercollegiate volleyball players in the experimental and control groups

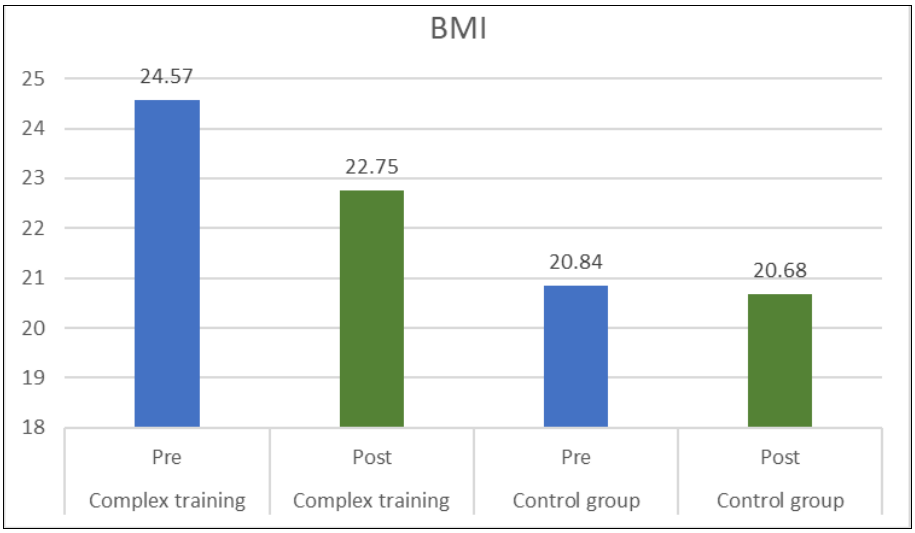

Fig 3: Bar diagram showing the mean value on Functional variables of BMI intercollegiate volleyball players in the experimental and control groups

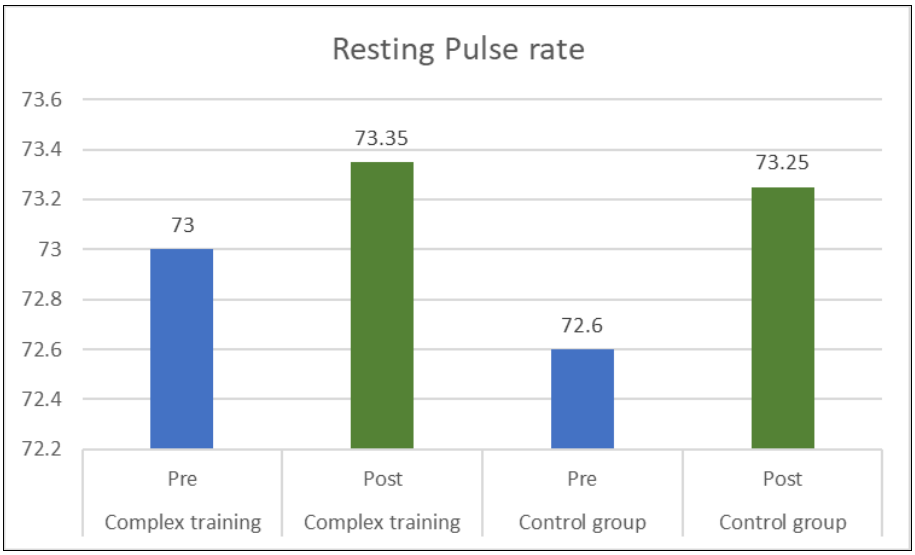

Fig 4: Bar diagram showing the mean value on corporeal variables of resting pulse rate intercollegiate volleyball players in the experimental and control groups

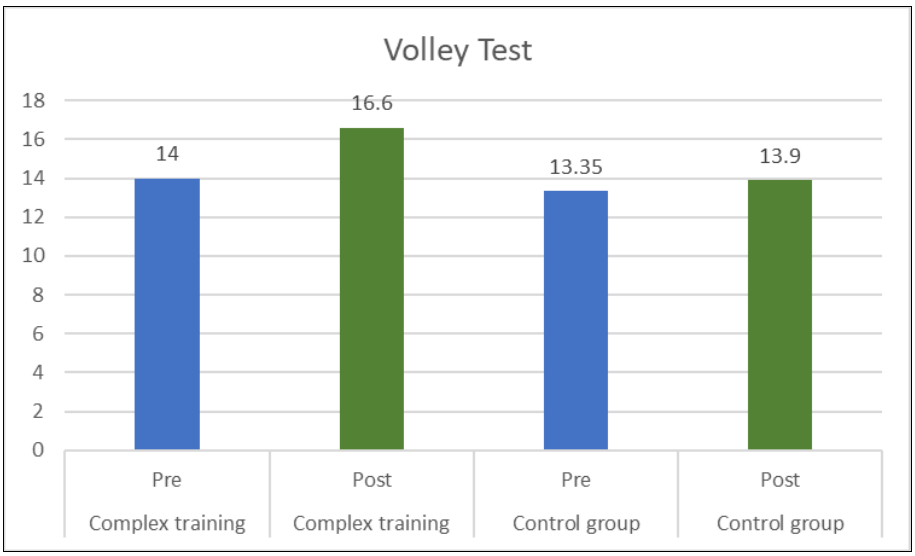

Fig 5: Bar diagram showing the mean value on skill performance variables of Volley Test intercollegiate volleyball players in the experimental and control groups

Findings

The findings observed a study effect of complex training on selected corporeal, functional, and skill performance variables of intercollegiate volleyball players are as follows:

1. In the Complex training group, the mean differences observed between pre–test and post–test for the corporeal variables, Leg explosive power, Arm explosive power, functional variables BMI, resting pulse rate, Skill performance variable Volley test, were statistically significant.
2. In the Complex training group, the mean differences observed between pre–test and post–test for the corporeal variables, Leg explosive power, Arm explosive power, functional variables BMI, resting pulse rate, Skill performance variable Volley test, were statistically not significant.

Discussion and Findings

The purpose of the present study was to investigate the effects of complex training on selected corporeal, functional, and skill performance variables of intercollegiate volleyball players. The results revealed that the experimental group showed significant improvements in leg explosive power, arm explosive power, body mass index (BMI), resting pulse rate, and volley test performance when compared with the control group, which did not show any meaningful changes.

The improvements observed in leg and arm explosive power are consistent with the findings of Soundara (Rajan, 2024) [1], who reported that complex training significantly enhanced strength and power variables among male volleyball players. Similarly, (Annadurai *et al.*, 2021) [2] also confirmed that agility and explosive power improved through complex training interventions in Indian volleyball players. (Navaneethan, 2024) [3] extended these observations by highlighting improvements in aerobic capacity, flexibility, arm strength, and overall playing ability, which align with the present study's outcomes.

International research also corroborates these findings. (Chu, 1998) [4] emphasized that complex training, by integrating plyometric and resistance work, promotes post-activation potentiation and maximizes explosive power output in athletes. Likewise, (Adams *et al.* 1992) [5] demonstrated that combining heavy resistance and plyometric training improved vertical jump performance more effectively than either method alone. More recently, (Ebben *et al.*,1998) [6] reported that complex training produced superior neuromuscular

adaptations, resulting in enhanced strength and power among collegiate players. The functional variables in the present study, specifically BMI and resting pulse rate, also showed significant improvements in the experimental group. These findings support (Navaneethan, 2024) [3] results, where complex training was associated with reductions in BMI and improvements in aerobic indicators. Improvements in resting pulse rate further suggest that complex training may indirectly enhance cardiovascular efficiency through higher training intensity and workload, as noted by (Chu, 1998) [4]. Skill performance, measured through the volley test, also improved significantly in the experimental group. This aligns with (Annadurai *et al.,* 2021) [2], who reported that functional and corporeal improvements achieved through complex training translate into enhanced volleyball-specific skill performance. The positive transfer effect is further supported by (Adams *et al.,* 1992) [5], who observed that enhanced lower-limb explosive strength leads to better execution of sport-specific skills in jumping and striking sports. Taken together, these findings indicate that complex training has a significant and positive impact on the corporeal, functional, and skill performance variables of intercollegiate volleyball players. The improvements observed in this study are in agreement with both Indian and international literature, thereby strengthening the evidence base for the inclusion of complex training in volleyball conditioning programmes.

Conclusion

It was concluded that twelve weeks of complex training significantly improved the of corporeal variables, leg explosive power, arm explosive power, functional variables BMI, resting pulse rate, Skill performance variable volley test the school basketball players. Based on these findings, it is postulated that Complex training is an effective method for inducing desirable improvements in the players. Corporeal, Functional and skill performance variables of intercollegiate volleyball players.

Reference

1. Soundara Rajan R. Effect of complex training on strength and power of male volleyball players. Int J Phys Educ Sports Health. 2024.
2. Annadurai R, Kalarani A. Effect of complex training on physical parameters of volleyball players. Int J Phys Educ Sports Health. 2021.
3. Navaneethan B. Effect of complex training on aerobic capacity, explosive power, flexibility, arm strength and overall playing ability of male volleyball players. Int J Yogic Hum Mov Sports Sci. 2024.
4. Chu DA. Jumping into plyometrics. Champaign (IL): Human Kinetics; 1998.
5. Adams K, O'Shea JP, O'Shea KL, Climstein M. The effect of six weeks of squat, plyometric and squat-plyometric training on power production. J Appl Sport Sci Res. 1992;6(1):36-41.
6. Ebben WP, Watts PB. A review of combined weight training and plyometric training modes: complex training. Strength Cond J. 1998;20(5):18-27.
7. Jensen RL, Ebben WP. Kinetic analysis of complex training rest interval effect on vertical jump performance. J Strength Cond Res. 2003;17(2):345-349.
8. Ebben WP. Complex training: a brief review. J Sports Sci Med. 2002;1:42-46.
9. Ebben WD, Blackard DO. Complex training with medicine ball, explosive weight and plyometric exercises. Olympic Coach J Strength Cond Res. 1997;7(4):11-2.
10. Ebben WD, Watts PB. A review of combined weight training and plyometric training modes: complex training. Strength Cond J. 1998;20(5):19-27.