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## Effect of complex training on strength and power of male volleyball players

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### Abstract

The present study investigated the effect of complex training on strength and power of male volleyball players. The purpose of the study was to find out the effect of complex training on strength and power of male volleyball players. To achieve the purpose of the study thirty male volleyball players were selected from PSG College of Arts & Science, Coimbatore. Their age was ranged from 18 to 25 years. The purpose of the present study was explained to them clearly where by their consent to serve as samples were obtained. The present study is an experimental one and to test the effects of varied forms of intervening strategies, the care was taken in distributing the samples to each experimental group. The data was processed using Paired t-tests were used to test the effect of treatment groups individually between pre and post -tests of all the groups on variables used in the present study. The result of the study reveals that there was significant difference in 0.05 levels. Based on the findings of the research and the discussion, one could unfailingly conclude that the exercise model for the development of the vertical jump and medicine ball throw that had been used, as the fundamental factor of the experimental group, has contributed to the statistically relevant difference in the increase of the vertical jump and medicine ball throw in comparison to the control group, which had used technically tactical contents to develop the vertical jump and medicine ball throw.

**Keywords:** Complex training, strength, power, volleyball players, vertical jump, medicine ball throw

### Introduction

Complex training is a workout comprising of a resistance exercise followed by a matched plyometric exercise e.g. squats followed by squat jumps; bench press followed by plyometric press up. The logic behind these matched pair of exercise is that the resistance work gets the nervous system into full action so that more type IIb fibers are available for the explosive exercise, hence a better training benefit of complex training programme can be used in the general, specific and competitive phase of training. Ebbon (2002) <sup>[16]</sup> in his recent literature review has stated that complex training has investigated both the acute and long term effects of this conditioning approach. Complex training describes a power-developing workout that combines weights and plyometric exercises. About 10 years ago, these workouts were greeted with great acclaim as research indicated that they could significantly enhance fast twitch muscle fiber power and, therefore, dynamic sports performance. The two benefits from traditional strength work are increased neural activity and increased muscle mass (hypertrophy).

The answer is to combine plyometrics and weights into one session. This is known as "complex training." Not only does training save time, it also magnifies the effect of plyometrics. This is because lifting weights stimulates the nervous system to activate more muscle fibres for a couple of minutes following an exercise. And recruiting large numbers during plyometric exercise means great power generation. So by combining two in one workout time radically improves power. Quality of training is the key to gaining both strength and power. By combining weights and plyometrics into a single workout and limiting the number of exercises to only multi-joint movements that most closely simulate the movements of volleyball and swimming, one can dramatically improve both strength and power. Complex training is a workout comprising a resistance exercise followed by a matched plyometric

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exercise e.g. squats followed by squat jumps, bench press followed by plyometric press up. The logic behind these matched pair of exercises is that the resistance work gets the nervous system into full action so that more Type II b fibres are available for the explosive exercise, hence a better training benefit. During complex training one should not learn new exercises or work on technique since complex training is a very intense form of exercise, one must rest properly before, after and during the complex training workout one should rest at least 48 hours between complex training workouts and rest 2-5 minutes, or longer, between exercise pairs.

The strength exercise is performed first followed by the plyometric exercise for improving the training benefit by getting the nervous system and muscle fibers primed to perform the explosive plyometric exercise better.

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### Selection of subjects

The purpose of the study was to find out the effect of complex training on strength and power of male volleyball players. To achieve the purpose of the study thirty male volleyball players were selected from PSG College of Arts & Science, Coimbatore. Their age was ranged from 18 to 25 years. The purpose of the present study was explained to them clearly where by their consent to serve as samples were obtained. The present study is an experimental one and to test the effects of varied forms of intervening strategies, the care was taken in distributing the samples to each experimental group. For this, the selected samples (N=30) were divided into two equal groups. Group I was considered as complex training group (CTG) in which they underwent progressive volleyball practices. Group II was considered as control group they are doing the regular physical & skill practice under the control of investigator. The experimental group were given training for 3 days a week and for 6 weeks in total.

### Selection of Variables

The performance of volleyball players is mainly concerned with the strength and power. The earlier studies on volleyball substantiated clearly its nature and importance. Based on the earlier studies and the opinion of the experts, the variables of strength and power have been chosen as the variables for the

present study.

### Medicine ball Throw

The test is to measure the arm strength and explosive power. The subjects were asked to sit with their back to a wall on a mat facing the area to which the ball was to be thrown, and with the feet extended and slightly apart. The ball was held with the hands on the side and slightly behind the center. The ball was brought to the chest, then thrown vigorously out as far as possible. The back remained in contact with the wall at all times. The distance from the wall to the place where the ball landed was recorded. The measurement was recorded to the nearest 10 cm. The best result of the three throws was used.

### Vertical Jump

The explosive power was measured by the vertical jump with the help of the stand and reach test (Chu, 1996) [7]. The vertical jump test was completed from a 2-foot standing position without a step into the jump. The subject was asked to stand with side to the wall keeping both feet flat on the floor. He reached as high as possible with his middle finger touching the wall. This was his standing reach. Keeping color chalk powder on his middle finger he stood comfortable at a distance from the wall. On signal the subject swung both arms upward and jumped vertically extending his hand and touching the wall with the chalked finger. This jump must be taken without any preliminary feet movement such as hopping or stepping. The difference between standing hand reach and the jump reach were recorded. Out of three attempts the best reach was taken and recorded.

### Training Programme

Training schedule for the three treatment groups were given in the Table. The total training duration for each day was one and half hours (90 mints). It included 15 minutes for stretching and warming up, 15 minutes for instruction and cool down and 60 minutes for exclusive complex training. Group I was treated with complex training of resistance training followed by matched plyometric training in the same session. Load progression was adapted for every four weeks. The detailed training scheduled for complex training was given in the form of tables by indicating the intensity, repetitions, set, rest and duration. All the treatment group were treated with their respective treatment for weekly three days with a duration of 90 minutes for a period of 6 weeks.

**Table 1:** Training schedule

S. No		Complex Training	Resistance 1 RM		Repetitions	Sets	Rest in between exercise	Rest in between sets
			1 <sup>st</sup> to 3 <sup>rd</sup> week	4 <sup>th</sup> to 6 <sup>th</sup> week				
1	R	Squat	70%	75%	4-6	3	60 seconds	3-4 minutes
	P	Vertical Jump	--	--	8-10	3		3-4 minutes
2	R	Bench Press	70%	75%	4-6	3	60 seconds	3-4 minutes
	P	Medicine ball Chest pass	--	--	8-10	3		3-4 minutes
3	R	Barbell lunge	70%	75%	4-6	3	60 seconds	3-4 minutes
	P	Box Jump	--	--	8-10	3		3-4 minutes
4	R	Lat Pull Down	70%	75%	4-6	3	60 seconds	3-4 minutes
	P	Medicine ball overhead pass	--	--	8-10	3		3-4 minutes
5	R	Leg Press	70%	75%	4-6	3	60 seconds	3-4 minutes
	P	Burpee	--	--	8-10	3		3-4 minutes

R - Resistance Exercise, P - Plyometric exercise.

### The Methods of Data Processing

The following statistical techniques were used to find out the effect of complex training on strength and power of male

volleyball players. Paired t-tests were used to test the effect of treatment groups individually between pre and post -tests of all the groups on variables used in the present study.

## Results

The study was designed to find the effect of complex training on strength and power of male volleyball players. The test the objective framed in the present study the data collected on medicine ball throw and vertical jump. As one of the objectives of the present study was to test the effect of complex training on development of the vertical jump of volleyball players, the initial test means and final test means were tested treatment wise by using the paired sample t-test. The obtained 't' ratios of complex training were postulated in the following

**Tables 2:** The difference between the results of the initial and final measuring the Complex training group

Test	Measuring	Mean	Std.dev.	N	Diff.	t
Medicine Ball Throw	Initial	51.75	4.20	15	3.50	14.89*
	Final	55.25	4.30	15		
Vertical Jump	Initial	48.53	4.10	15	3.07	7.74*
	Final	51.60	4.22	15		

\*Significant at 0.05 level

Table - 2 indicates that the obtained 't' ratios were: 14.89 for Medicine Ball Throw and 7.74 for Vertical Jump. The obtained 't' ratios on complex training group. When compared with the critical value of 2.144 for degrees of freedom of 14 it was found that the mean gains and mean losses statistically significant. Resulting of these confirm that six-week practice of complex training produced a significant improvement in block jump (3.50;  $p < 0.05$ ), spike jump (3.07;  $p < 0.05$ ), statistically significant and explained its effect positively.

**Table 3:** The difference between the results of the initial and final measuring the Control group

Test	Measuring	Mean	Std.dev.	N	Diff.	t
Medicine Ball Throw	Initial	51.05	3.43	15	0.40	1.22
	Final	51.45	3.52	15		
Vertical Jump	Initial	42.67	5.14	15	0.80	1.35
	Final	43.47	4.55	15		

\*Significant at 0.05 level

Table - 3 indicates that the obtained 't' ratios were: 1.22 for Medicine Ball Throw and 1.35 for Vertical Jump. The obtained 't' ratios on control group. When compared with the critical value of 2.144 for degrees of freedom of 14 it was found that the mean gains and mean losses statistically no significant. Resulting of these confirm that six week practice of control group produced a significant did not improvement in Medicine Ball Throw (0.40;  $p < 0.05$ ) and Vertical Jump (0.80;  $p < 0.05$ ), statistically no significant.

## Discussion on findings

The purpose of the present investigation was to determine the effect of complex training on strength and power of male volleyball players. The complex training of resistance training and matched plyometric training preceded with resistance training is superior to the other two training methods of combination of resistance training and plyometric training, and complex training of resistance training and matched plyometric training for developing the Strength & power. Generally, complex training is a training programme that involves resistance training followed by plyometric training with high intensity [ $>80\%$ ] (Beachle and Earle). Besides, Ebban states that complex training is a training programme alternates bio-mechanically similar high load weight training

exercises with plyometric exercises set for set in the same workout as a set of sequence followed by a set of jump squads. Further from the literature review published by Ebben (2000) [10], it was observed that research in the effect of complex training on both the acute and long term effects of cited exercises that an appropriate high load weight training exercises performed minute before a power exercise increases the power specially for stronger individuals. As far as the effect of complex training is concerned the role of resistance exercise is remarkably higher in its outcome. It is confirmed by the research conducted using weight training exercises only, plyometric training only and combination of resistance exercises followed by plyometric training as he found that although all training methods improved vertical jump and squad performance, athletes combining plyometric with weights experienced the greatest performance enhancement. In deriving the complex training effect, the exercises used for resistance training should be in excess of 70% 1 repetition maximum (1RM) since higher loads are considered adequate for activating type IIb fibers and setting off the potentiation effect. Ebben and Watts (1998) [11] also strongly emphasized the role of high load resistance exercise as it increases motor neuron excitability and reflex potentiation which may create optimum training conditions for subsequent plyometric exercise. Also the fatigue associated with high load weight training may force motor units to be recruited during the plyometric phase, possibly enhancing the training state. In the present study high load 70% resistance was used by all the three treatment groups in performing the resistance training exercises. This may be the reason for the significant improvement of the selected parameters.

## Conclusion

From the results of the comparative effect among the complex training and control group on volleyball players were made. It has been proven experimentally that an six-week training model using the complex training method can have an effect on the statistically relevant increase in the explosive type strength of the leg muscles, which in turn leads to an increase in the vertical jump and strength. Due to this, the individual use of the complex training is recommended as more effective in the development of the strength and power.

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