



## EVALUATION OF CIRCUIT TRAINING WITH AND WITHOUT RESISTANCE IMPACT ON SELECTED PHYSICAL FITNESS COMPONENTS OF VOLLEYBALL PLAYERS

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### ABSTRACT :

The intention of the study was to evaluate the impact of circuit training with and without resistance on selected physical fitness components of volleyball players. To achieve this purpose, 36 male volleyball players from various colleges affiliated to Acharya Nagarjuna University, Andhra Pradesh were selected as subjects. They were divided into three equal groups and each group consisted of 12 subjects. Group-I performed circuit training, group-II performed circuit resistance training and group-III acted as control. The training period for both the experimental groups was twelve weeks and control group who did not participate any special training apart from the regular activities. The dependent variables tested were speed, muscular strength and Cardio respiratory endurance. The data collected from the three groups prior to and after the training period were statistically examined for significant difference if any, by applying Analysis of Covariance (ANCOVA). Since three groups were involved, Scheffe S test was used as post-hoc test to find out any difference between the groups. The result of the study shows that there was significant improvement on selected physical fitness components such as speed, muscular strength and cardio respiratory endurance of volleyball players due to the impact of circuit training with and without resistance.



**KEYWORDS :** Circuit training, circuit resistance training and physical fitness components.

### INTRODUCTION

Scientific training methods and application of basic principles of body mechanics in sports skill have been attributed to the higher level of performance in sports skills. Performance is the combined result of coordinated exertion and integration of a variety of functions. Moreover performance to a certain extent depends upon the physical and motor fitness qualities in which definite improvement can be achieved through appropriate training (Boucher & Malina, 1999). Singh (1991) reported that high sports performance is not merely the product of physical, psychic and physiological prerequisites possessed by an individual sportsman. High performances are achieved after prolonged periods of training.

Fitness and conditioning are important elements to success in the game of volleyball. The player's energy will be drained toward the end of a volleyball match if the fitness level is lacking. In games where two teams are evenly matched, the one with the best overall conditioning often prevails. Fatigue in a volleyball match can lead to mistakes, and mistakes can lead to a loss.

There are different types of training methods for the development of performance abilities of volleyball players. Understanding these training methods and the effectiveness of the training methods to suit a particular game and game situations is a challenging task for any coach or player. This helps coaches and athletes prevent injury and overtraining while trying to maximize their performance variables, and analyze the strengths and weaknesses related to their specific training programs.

Volleyball games typically have short bursts of play that require start and stop action. Cardio exercises to improve endurance should include volleyball drills that mimic the bursts of stamina needed in a volleyball game. Starting a workout routine that includes high intensity interval training with a variety of cardio equipment and resistance training will also help to improve endurance and fitness. Volleyball players can use interval training to condition them for quick volleyball maneuvers through bursts of intense exercises and drills (Balakrishnan, 2007).

Circuit training is best for beginners and those of average fitness looking to tone up and get in shape. Athletes and sports people would probably only want to use circuits early in the off-season as basic strength and conditioning work, or as an alternative anaerobic interval training method or during an injury rehabilitation period to help maintain aerobic fitness. Both aerobic fitness and strength are better improved by traditional methods. However, endurance athletes and games players may choose to use circuit resistance training routines to build and maintain moderate strength while at the same time benefiting from its interval type content, which develop anaerobic endurance.

Potential circuit training exercises that can be used to develop short-term muscular endurance. This type of strength endurance is important in many prolonged sports with **intermittent** bouts of activity. These circuit training exercises can also be used by non-athletes to develop general fitness. In this respect, circuit training is very time efficient helping to develop strength and stamina in a single session. Pure endurance athletes still require excellent strength endurance but the nature of their events requires a slightly different approach. Exercise selection is governed by the principle of **specificity**. The circuit training exercises selected must train movements that the athlete will perform during competition. A general circuit class might expect to see in a gym will develop muscular endurance but it won't be specific to any particular sport.

The circuit training and circuit resistance training programmes have become highly structured training for enhancement of physical fitness capacities. It has vastly different training effects depending upon the intensity and duration of the work and rest period. The applicability of these methods of training to improve the physical fitness components is not yet completely known. Consequently, the aim of the present study was to compare the circuit training and circuit resistance training for differences in their effectiveness on selected physical fitness components of volleyball players.

## METHODOLOGY

### Subjects and Variables

To achieve this purpose, 36 male volleyball players from various colleges affiliated to Acharya Nagarjuna University, Andhra Pradesh were selected as subjects. They were divided into three equal groups and each group consisted of 12 subjects. The selected dependent variables speed, muscular strength and cardio respiratory endurance were assessed by using the following test items.

**Table - I: Dependent Variables and Tests**

Sl.No	Variables	Test Items
1	Speed	50m run
2	Muscular strength	Leg press
3	Cardio respiratory endurance	Cooper's 12 minutes run/walk test

### Training Programme

The experimental group-I performed circuit training, group-II performed circuit resistance training programme for three days a week for 12 weeks. In the circuit training regimens, the subjects moved from one station to another for eight stations. The subjects performed the prescribed exercises

under the strict supervision of the investigator. The number of repetition for each exercises varied from eight to twelve. The number of circuits varied between two-and-three for 12 weeks. The work rest ratio of 1:1 between exercises and 1:3 between sets was given. The intensity of exercise was progressively increased once in two weeks. The subjects of group-I performed this training without any resistance and the subjects of group-II performed this training with resistance.

### Statistical Technique

The data were collected on selected dependent variables such as speed, muscular strength and cardio respiratory endurance at before and after the twelve weeks of training as pre and post test from both experimental and control groups. Analysis of covariance (ANCOVA) was applied to find out significant difference if any between the experimental and control group.

### RESULTS

The influences of circuit training and circuit resistance training on each of the selected dependent variables were analyzed and the obtained results are presented below.

**Table-II: Analysis of Covariance on Speed, Muscular Strength and Cardio Respiratory Endurance of Experimental and Control Groups**

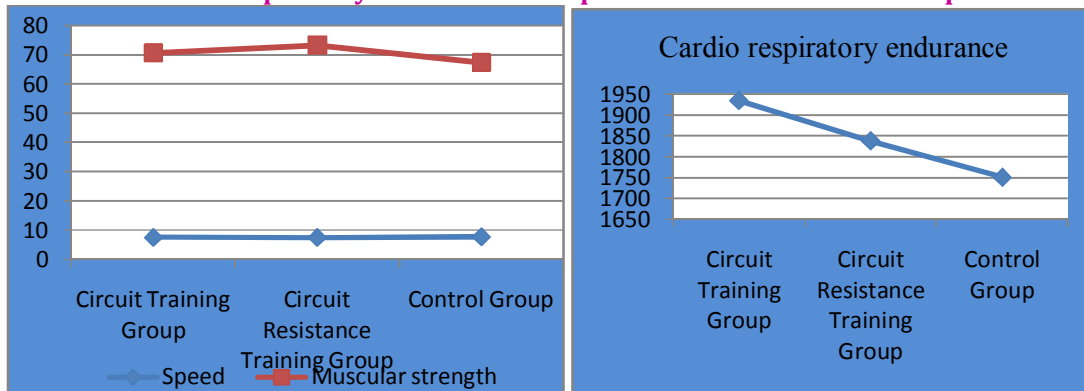
Variables	Circuit Training Group	Circuit Resistance Training Group	Control Group	S o v	Sum of Squares	df	Mean Squares	'F' ratio
Speed	7.62	7.55	7.83	B	0.165	2	0.825	34.38*
				W	0.77	32	0.024	
Muscular strength	70.51	73.16	67.23	B	137.357	2	68.68	45.79*
				W	47.975	32	1.50	
Cardio respiratory endurance	1934.10	1837.95	1750.95	B	645.79	2	322.90	5.92*
				W	1745.50	32	54.55	

(Required table value for significance at 0.05 level of confidence with degrees of freedom 2 and 32 is 3.29)  
\*Significant at .05 level of confidence

The obtained 'F' ratio values 34.38, 45.79 and 5.92 of speed, muscular strength and cardio respiratory endurance are greater than the required table value of 3.29 for the degrees of freedom 2 and 32 at 0.05 level of confidence. Hence, it was concluded that significant differences exist between the adjusted post test means of experimental and control groups on speed, muscular strength and cardio respiratory endurance.

The adjusted post test mean values on speed, muscular strength and cardio respiratory endurance of experimental and control groups are graphically represented in figure-I.

**Figure-I: Diagram Showing the Adjusted Post Test Mean Values on Speed, Muscular Strength and Cardio Respiratory Endurance of Experimental and Control Groups**



Since, the obtained 'F' ratio value in the adjusted post test means is found to be significant, the Scheffe'S test is applied as post hoc test to find out the paired mean difference, and it is presented in table-III.

**Table - III: Scheffès Test for the Difference between the Adjusted Post-Test Mean of Selected Physical Fitness Components**

V ariables	Adjusted Post-test Mean				
	Circuit Training Group	Circuit Resistance Training Group	Control Group	Mean Difference	Confidence Interval
Speed	7.62	7.55		0.07	0.16
	7.62		7.83	0.21*	0.16
		7.55	7.83	0.28*	0.16
Muscular strength	70.51	73.16		2.65*	1.28
	70.51		67.23	3.28*	1.28
		73.16	67.23	5.93*	1.28
Cardio respiratory endurance	1934.10	1837.95		96.15*	59.82
	1934.10		1750.95	183.15*	59.82
		1837.95	1750.95	87.00*	59.82

*\*Significant at .05 level*

The Scheffe's post hoc analysis proved that there were significant mean differences exist between experimental and control groups on speed, muscular strength and cardio respiratory endurance since, the mean differences are higher than the confident interval values at 0.05 level of confidence. When comparing the experimental groups significant differences exist between circuit training and circuit resistance training groups in improving muscular strength and cardio respiratory endurance however, no significant exist between experimental groups in improving speed.

Hence, it was concluded that due to the effect of circuit training and circuit resistance training the speed, muscular strength and cardio respiratory endurance of the volleyball players was significantly improved. It was also concluded that circuit resistance training was significantly better than circuit training in improving muscular strength and circuit training was significantly better than circuit resistance training in improving cardio respiratory endurance however, no significant differences were found between circuit training and circuit resistance training groups in improving speed.

## DISCUSSION

The results of the present study are also in line with the observation by Alcaraz et al., (2008) that heavy-resistance circuit training may be an effective training strategy for the promotion of both strength and cardiovascular adaptations. Dorgo et al., (2009) was observed significant improvements in muscular strength and muscular endurance of the manual resistance training and weight resistance training groups. Kass and Castriotta (1994) concluded from their studies that there would be mild improvement in aerobic capacity from participation in circuit weight training as compared to other aerobic modalities.

Studies have shown little to mild improvement in aerobic capacity from participation in circuit weight training (Kass & Castriotta, 1994; Peterson et al., 1988). Kaikkonen et al., (2000) observed significant improvement on cardiovascular and muscular fitness due to the effect of 12-week low resistance circuit weight training. Gettman et al., (1978) conducted a study to determine the changes elicited by circuit weight training and running (RN) programs conducted 3 days per week for 20 weeks. It was concluded that the circuit weight training program was most specific in improving strength.

## CONCLUSION

Due to the effect of circuit training and circuit resistance training the speed, muscular strength and cardio respiratory endurance of the volleyball players was significantly improved. It was also concluded that circuit resistance training was significantly better than circuit training in improving muscular strength and circuit training was significantly better than circuit resistance training in improving cardio respiratory endurance however, no significant differences were found between circuit training and circuit resistance training groups in improving speed.

## REFERENCES

- Alcaraz PE, et al., (2008), Physical performance and cardiovascular responses to an acute bout of heavy resistance circuit training versus traditional strength training, *Journal of Strength and Conditioning Research*, 22(3):667-71.
- Balakrishnan, M., (2007). The study on spotting success traits in volleyball players at camp. *SNIPES Journal*, 5(2): 24.
- Boucher, C. & Malina, R.M. (1999). "Genetics of Physical Fitness and Motor Performance", *Exercise and Sports Sciences Reviews*, 11, p. 3206.
- Dorgo S, et al (2009), "The effects of manual resistance training on improving muscular strength and endurance", *Journal of Strength and Conditioning Research*, 23(1):293-303.
- Gettman, LR., et al., (1978). "The effect of circuit weight training on strength, cardio respiratory function and body composition adult men, *Med Sci Sports*, 10:3 171-6.
- Kaikkonen, H., et.al., (2000). The Effect of Heart Rate Controlled Low Resistance Circuit Weight Training and Endurance Training on Maximal Aerobic Power in Sedentary Adults. *Scand Journal Med Sci Sports*, 10:4, 211-5.
- Kass, J.E., & Castriotta, R.J. (1994). The effect of circuit weight training on cardiovascular function in healthy sedentary males, *Journal of Cardiopulmonary Rehabilitation*, 14.
- Peterson, S.R., et al., (1988). The influence of high velocity resistance circuit training on aerobic power, *Journal of Orthopedic and Sports Physical Therapy*, 9.
- Singh, H. (1991). *Science of Sports Training*, New Delhi: D.V.S. Publications, p.58.



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