EFFECT OF PLYOMETRIC TRAINING GAME SPECIFIC CIRCUIT TRAINING AND ITS COMBINATION ON SPIKING ABILITY OF VOLLEYBALL PLAYERS

Mr. Rahul R Nair, *Ph.D-Research Scholar, Department of Physical Education, Annamalai University, Chidambaram, Tamil Nadu, India.*
Dr. S. Ponson, *(Research Guide), Associate Professor, Department of Physical Education, Annamalai University, Chidambaram, Tamil Nadu, India.*
Dr. Y. Wise Blessed Singh, *Associate Professor, Department of Physical Education, Annamalai University, Chidambaram, Tamil Nadu, India.*

ABSTRACT

The aim of this study was to assess the effect of plyometric training, game specific circuit training and its combination on spiking ability of volleyball players. To achieve the purpose of the study, 80 male volleyball players from various colleges affiliated to Mahatma Gandhi University, Kottyam, Kerala state, who had represented inter collegiate level volleyball competition were chosen as subjects. The age of the subjects ranged from 18 to 23 years and all the subjects were healthy and normal. The selected subjects (N=80) were classified into four groups of twenty subjects each (n = 20) at random. Group-I underwent plyometric training, group-II underwent game specific circuit training, group-III underwent combined plyometric and game specific circuit training and group-IV acted as control. The initial testing took place before the beginning of the training while the final testing was performed after 12 weeks of intervention on spiking ability. To find out the pre and post test mean differences paired 't' test was applied. Percentage of improvement was also calculated. Further, the data collected from the four groups prior to and post experimentation on spiking ability were statistically analyzed by applying the analysis of covariance (ANCOVA). The Scheffe's test was also applied as post hoc test. The volleyball player's spiking performance improved 6.33% due to plyometrics (PT), 35.21% due to game specific circuit (GSCT) and 25.64% due to combined plyometrics and game specific circuit (CT) training.

Key Words*: Plyometric training, Game specific circuit training, Spiking ability and volleyball players*

INTRODUCTION

Volleyball is currently considered to be a dynamic game, during which low intensity and high intensity movements alternate. The high intensity movements include jumps, shuffles and rapid changes in direction (Calleja-Gonzalez et al., 2019). The offensive and defensive skills in volleyball are characterized as double-leg take-off and double-leg or single-leg landings (Tillman et al., 2004a; Lobietti et al., 2010; Zahradnik et al., 2017). Therefore, a corresponding level of physical conditioning is required to effectively cope with the load in the long term. This physical conditioning is achieved with regular physical activity, which is performed during the training process. The long-term preparation should influence the development of specific physical skills as well as the somatic parameters of the volleyball players. In particular, on their body composition as it is a result of the level of adaptation of the organism to the load within the conditional preparation (Tota et al., 2019).

This adaptation is manifested not only in the motor performance of the athlete, but also on their physical fitness and health (Malá et al., 2015).

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. The circuit training helps to condition a volleyball player's technique to improve spiking, blocking and serving. Starting a workout routine that includes high intensity integral training with a variety of cardio equipment and strength training will also help to improve endurance and fitness. Volleyball players can use integral training to condition them for quick volleyball maneuvers through bursts of intense exercises and drills (Balakrishnan, 2007). Hence, the purpose of the present study was to assess the effect of plyometric training, game specific circuit training and its combination on spiking ability of volleyball players.

METHODOLOGY

Subject and Variable

To achieve the purpose of the study, 80 male volleyball players from various colleges affiliated to Mahatma Gandhi University, Kottyam, Kerala state, who had represented inter collegiate level volleyball competition were chosen as subjects. The age of the subjects ranged from 18 to 23 years and all the subjects were healthy and normal. The selected subjects (N=80) were classified into four groups of twenty subjects each (n = 20) at random. Group-I underwent plyometric training, group-II underwent game specific circuit training, group-III underwent combined plyometric and game specific circuit training and group-IV acted as control. The chosen dependent variable spiking ability was assessed by conducting AAHPERD wall spiking test.

Training Programme

The experimental group-I performed plyometric training and group-II performed game specific circuit training three days per week for twelve weeks. During the training period, various exercises were administered per session throughout the training duration of twelve weeks. Every day the work out lasted for about 60- 90 minutes including warming up and cool down exercises.

Twelve weeks of plyometric training program was developed using three training sessions per week. Training volume ranged from 90 foot contacts to 140 foot contacts per session. The intensity of training was tapered so that fatigue would not be a factor during post-testing. Rest interval of 1:1 between each exercise repetitions, 1:3 between sets and one day between plyometrics sessions was given in order to allow the neromuscular system to recover. Less intensive plyometric exercises was incorporated during the early stages of training to gradually condition the subjects and more demanding exercises was included when training progress.

The subjects of the experimental group-II performed game specific circuit training, three alternative days in a week for twelve weeks during the morning session. The following were the exercises performed at different stations such as Clock Drill, Cup Drill, W Drill, Sandwich Drill, Movement Patterns, Box Drill, Box Touches, Medicine Ball Wrist Sets, Depth Jump, Medicine Ball Overhead Pushes, Rolls, Velocity Builder Block Jumps, Block and Slides respectively. The duration of each exercise was thirty seconds. The training intensity was gradually increased as training progressed throughout the training period. The subject's training zone was computed using Karvonen formula and it was fixed at 80%HRmax to 95%HRmax. The rest - work ratio of 1:1 in-between repetitions and 1:3 between sets was given.

Statistical Technique

To find out the pre and post test mean differences paired't' test was applied. Percentage of improvement was also calculated. Further, the data collected from the four groups prior to and post experimentation on spiking ability was statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since four groups were involved, whenever an obtained 'F' ratio value was found to be significant for adjusted post test means, the Scheffe's test was applied as post hoc test to

determine the paired mean differences, if any. In all the cases the level of confidence was fixed at 0.05 level for significance.

RESULT

The chosen volleyball player's spiking data collected from experimental and CG group's are analyzed statistically by dependent''t' test and the discovered results are exhibited in table-I.

Table-I: Percentage(%) of Changes and 't' Test Results of Chosen Four Group's Volleyball Players on Spiking

Chosen Groups	Tests	No.	Mean Scores	S.D	D.M	Improvement in%	't' – test result
Plyometrics (PTG)	Pre	20	18.15	1.72	1.15	6.33	2.94*
	Final		19.30	1.59			
Game Specific Circuit Training	Pre	20	18.60	2.32	6.55	35.21	7.12*
	Final		25.15	3.18			
Combined Training	Pre	20	17.55	1.53	4.50	25.64	7.44*
	Final		22.05	2.28			
Control	Pre	20	17.90	1.86	0.20	1.11	0.32
	Final		18.10	1.74			

*df 19=2.09(Table value)(*significant)*

The volleyball player's spiking performance data (pre & post) collected from the PTG (18.15&19.30), GSCTG(18.60&25.15), CTG(17.50&22.05) group's differ noticeably since the 't' test results of PTG (2.94), GSCTG (7.12) as well as CTG (7.44) are higher (t value>2.09) than 2.09 (table value).

The volleyball player's spiking performance improved 6.33% due to plyometrics (PT), 35.21% due to game specific circuit (GSCT) and 25.64% due to combined plyometrics and game specific circuit (CT) training.

The chosen volleyball player's spiking data (pre&post) collected from PTG, GSCTG, CTG and CG group's are analyzed by ANCOVA and the discovered results are exhibited in table-II.

Table – II: Derived ANCOVA Results on Spiking Performance of Chosen Four Group's Volleyball Players

Mean	**PTG**	GSCTG	**CTG**	**CG**	**So V**	**SS**	**df**	**MS**	**'F' ratio**
Adjusted Post-test	19.31	25.21	21.98	17.21	B	594.84	3	198.28	37.82*
					W	393.20	75	5.24	

*(Table value for df 3 & 75= 2.74)*Significant (.05 level)*

The derived adjusted post test means (19.31, 25.21, 21.98 & 17.21) obtained through ANCOVA statistical technique resulted in 'F' value of 37.82 which is better (F>2.74) *to* 2.74

(*Table value for df 3&75*). It established that the chosen four groups (PTG, GSCTG, CTG & CG) differ from one another.

As the adjusted means of preferred four group's of players (volleyball) differ from one another, the Scheffe's statistics was utilized(table-III).

Table – III: Post Hoc Analysis on Spiking Performance of Chosen Four Group's Volleyball Players

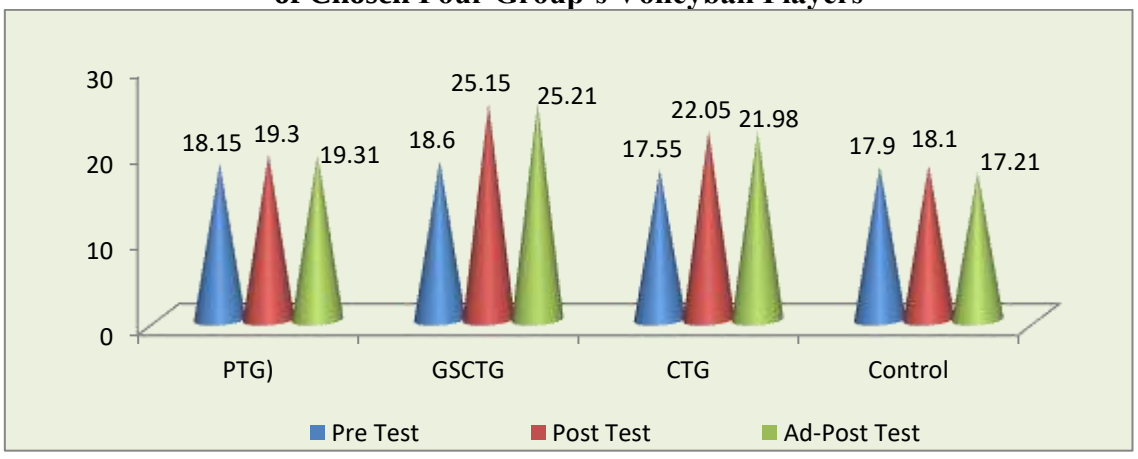
Plyometrics (PTG)	Game Specific Circuit Training	Combined Training	Control Group(CG)	M.D	C.I
19.31	25.21			5.90*	2.07
19.31		21.98		2.67*	2.07
19.31			17.21	2.10*	2.07
	25.21	21.98		3.23*	2.07
	25.21		17.21	8.00*	2.07
		21.98	17.21	4.77*	2.07

**Significant (.05)*

It established that due to plyometric (PT) (2.10) game specific circuit (GSCT) (8.00) and combined training (CT) (4.77) the volleyball player's spiking performance improved considerably. Although, combined training (CT) and plyometric (PT) are superior to game specific circuit training (GSCT) (5.90&3.23>2.07). While comparing combined training (CT) with game specific circuit training (GSCT) (2.67>2.07) groups significant difference was found between them.

The graphically represented volleyball player's spiking performance data (pre, post &adjusted) of the chosen four group's are in figure-I.

Figure – I: Figure Screening is the Spiking Performance of Chosen Four Group's Volleyball Players



DISCUSSION

The present study result reveals that isolated and combined effect of plyometric and game specific circuit training have significantly enhanced the spiking ability of volleyball players. In the study in which Gul et al., (2017) checked the effect of 8 weeks of plyometric exercises on service hit rates in tennis, it is expressed to have no effect. In the study of Olcucu (2012) it is found that plyometric exercises do have an effect on service hit rates. While the performed studies vary in results as per the branch of sports, it is observed that the limited amount of studies performed on volleyball shows that plyometric exercises have a greater effect. This fact is justified by coordination improvements through a great muscle unit firing, in the first, and by the required lengthening movement (eccentric), in the second.

Shafeeq et al., (2012) conducted this study to find out the effect of interval circuit training on selected motor fitness variables and volleyball skill performance of male volleyball players. The results indicated that the interval circuit training significantly helped to improve the explosive power, cardio respiratory endurance and muscular strength and also volleyball skill performance such as volleying ability and serving ability.

The isolated and combined exercises of resistance and plyometric training has beneficial positive impact to increase the performance of jump serving ability and volley ability of the female volleyball players Zabchi-Noreddine et al., (2016) suggested that contrastive training programme of weight and plyometric has significant positive impact to develop vertical jumping ability of volleyball players which contribute to develop smash skill of volleyball. Sudhirkumar et al., (2013) clearly indicated that volleyball ball training program is positively effective for improvement of spiking, blocking, digging and first pass and serving ability of volleyball players. Hence, Volleyball players can use plyometric and game specific circuit training to condition them for quick volleyball maneuvers through bursts of intense exercises and drills.

CONCLUSION

The volleyball player's spiking performance improved 6.33% due to plyometrics (PT), 35.21% due to game specific circuit (GSCT) and 25.64% due to combined plyometrics and game specific circuit (CT) training. Although, combined training (CT) and plyometric (PT) are superior to game specific circuit training (GSCT). While comparing combined training (CT) with game specific circuit training (GSCT) groups significant difference was found between them. Hence combined training exercises model may be recommended by the coaches and players in additional to technical training to develop spike speed, vertical jump height and peak performance of the lower extremities of volleyball players.

REFERENCE

Balakrishnan, M., (2007). The study on spotting success traits in volleyball players at camp. *SNIPES Journal*, 5(2): 24.

Calleja-Gonzalez et al., (2019). Recovery in Volleyball. *Journal of Sports Medicine and Physical Fitness,* 59: 982–993.

Gul, G. K., Konyali, M., & Gul, M. (2017). The Effect Of Plyometric Training On The Tennis Service Hits, *Journal of Physical Education and Sports Studies*, 9(1): 67-73.

Lobietti et al., (2010). Landing techniques in volleyball, *Journal of Sports Sciences,* 28:1469–1476.

Malá et al., (2015). Body composition of elite female players in five different sports games, *Journal of Human Kinetics.* 45: 207–215.

Olcucu, B. (2012). Investigation of the effect of plyometric trainings on arm and leg strenght, the strokes speed of service, forehand and bachand and the percentages of shot accuracy, Marmara University Health Sciences Institute, *Doctorate Thesis.*

Shafeeq, V.A., Kanniyan, AS., Hassan, M.A., and Singh, J.P.S (2012). Effect of interval circuit training on motor fitness and volleyball skill performance of male volleyball players, *Int. J Health Physical Edu. Computer Sci. Sports.*, 5(1): 52-54.

SudhirKumar, Jogiswar Goswami and Ajit Kumar (2013). Effect of Training Program on Volleyball Skills of Inter-University level Volleyball Players, *International Journal of Movement Education and Sports Sciences (IJMESS)*, 4(1).

Tillman et al., (2004a). Landing constraints influence ground reaction forces and lower extremity EMG in female volleyball players, *Journal of Applied Biomechanics,* 20:38–50.

Tota et al., (2019). Tota L, Pilch W, Piotrowska A, Maciejczyk M. The effects of conditioning training on body build, aerobic and anaerobic performance in elite mixed martial arts athletes, *Journal of Human Kinetics,* 70:223–231.

Zabchi-Noreddine et al., (2016) The Effect of the Contrastive Training Using Weights and Plyometrics on the Development of the Vertical Jump Ability to Improve the Performance of the Smash for Volleyball Players, *European Journal of Physical Education and Sport*, 11.

Zahradnik et al., (2017). Blocking landing techniques in volleyball and the possible association with anterior cruciate ligament injury, *Journal of Sports Sciences,* 36: 955–961.