RELATIVE EFFECT OF TWO DIFFERENT FREQUENCIES OF PLYOMETRIC TRAINING ON EXPLOSIVE POWER OF MEN VOLLEYBALL PLAYERS

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ABSTRACT

The purpose of the present study was to evaluate the impact of two different frequencies of plyometric training on explosive power of the volleyball players. The influences of 2 independent variables that are 2days/week plyometric training as well as 4days/week plyometric training on chosen dependent variables were investigated. The study was delimited to forty-five (N=45) men volleyball players from various colleges affiliated to GITAM University (deemed to be university), Bengaluru. The players who participated in inter-collegiate volleyball tournament were only randomly selected as subjects. The age of the subjects were ranged from 18 to 24 years. They were divided at random in to three groups of fifteen in each (n=15). Group-I underwent plyometric training with 2 days per week, Group-II underwent plyometric training with 4 days per week and group-III not involved in any specific training. They (volleyball players) did these 2 trainings for 12 weeks. All 3 groups were assessed before and immediately after 12 weeks of training period on explosive power by using standardized test items. The data obtained were analyzed by paired 't' test to know the differences if any between two testing periods. Additionally, magnitude of variation was also calculated. In addition, ANCOVA wasalso applied. When the adjusted 'F' was greater, Scheffe's test was applied. To test the obtained results the significance level 0.05 was chosen. High frequency plyometric training (4days/week) was much better than low frequency (2days/week) plyometric training for the improvement of explosive power.

Key Words*: Different frequencies of plyometric training, Explosive power, Volleyball players*

INTRODUCTION

Volleyball is a sport that requires a multitude of athletic abilities, such as explosive, agility, muscular endurance and strength in the lower body, muscular balance and high levels of neuromuscular co-ordination, body awareness and stamina, the ability to know where the body is, and being able to move it, good flexibility to avoid injury and correct balance between the quadriceps and hamstrings, as well as strength imbalances between the left and right leg. Thus, every volleyball player is interested to improve their game performance.

Volleyball is an Olympic sport played professionally in many European countries. However, notwithstanding the professionalization, which is advancing in this sport, a lack of scientific information on its performance can be noticed. This can be due to many reasons, one of them is that most of the research which has been conducted in this field has been published in Eastern European countries and is not readily accessible to the sport science community. Another reason can be attributed to the conservative approach most coaches have towards physical conditioning for volleyball players. Physical conditioning in volleyball is extremely important for top performance, so the correct approach to training should be based on the

knowledge of the specific requirements of the performance and on the development of specific training means.

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 plyometric 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).

To attain peak performance in volleyball players, the plyometric training workouts are to be employed in different proportions. The main goal of this training is to teach the athlete how to quickly or in a "explosive" manner transition from a muscle extension to a contraction, such as by targeted, repeated jumping (chu, 1998). Plyometrics are mostly employed in the fitness industry and by athletes, particularly high jumpers, to enhance performance (Yessis, 2009; Starks, 2013). Therefore, there is a need to have ideal properties of plyometric training workouts for volleyball players and particularly in India.

Most of the studies reviewed were cross-sectional, and only a few reported data on physical, physiological and skill performance of volleyball players. There is a need for additional manipulative studies to determine the influence of specific conditioning programmes on volleyball game performance. More research is required concerning the variation in different methods of training and its effects. The applicability of these methods of training to develop physical fitness parameters of volleyball players is not yet completely known. Hence, there is a need to find out whether two different frequencies of plyometric training are the useful training methods in improving explosive power of volleyball players.

METHODOLOGY

Subjects and Variable

The study was delimited to forty-five (N=45) men volleyball players from various colleges affiliated to GITAM University (deemed to be university), Bengaluru. The players who participated in inter-collegiate volleyball tournament were only randomly selected as subjects. The age of the subjects were ranged from 18 to 23 years. The subjects were divided at random in to three groups of fifteen in each (n=15). Group-I underwent plyometric training with 2days per week, Group-II underwent plyometric training with 4 days per week and group-III not involved in any specific training. All the subjects selected for this study were subjected to medical evaluation and certification from a doctor ensuring their health capacities to undergo the training programme. The requirement of the project was explained to all the subjects and all of them agreed voluntarily to undergo the testing and training. The consent form for the proposed research study was collected from the participants The chosen dependent variable explosive power was assessed by Sarjent jump test.

Training Programme

The experimental groups underwent their respective training programmes for the duration of 12 weeks. The control group was not exposed to any specific training /conditioning. The experimental groups were subjected to field training schedule which specially designed to improve the explosive power of volleyball players. The experimental group-I performed plyometric training 2days/week and group-II performed plyometric training 4 days per week for twelve weeks. During the training period, various exercises were administered per session throughout the training duration of twelve weeks. Everyday the workout lasted for about 60 minutes including warming up and cool down exercises.

A 12-week plyometric training program was developed using three training sessions per week. The training program was based on recommendations of intensity and volume from Piper and Erdmann (1998), using similar drills, sets, and repetitions. Training volume vary from 70 foot contacts to 120 foot contacts per session for low frequency plyometric training whereas training volume for high frequency plyometric training vary from 35 foot contacts to 60 foot contacts per session. Even though the low and high frequency training groups performed plyometric training 2days and 4days per week respectively, the weekly training volume for both the groups remains the same. Since, it is a quality session with the emphasis on high speed of movement for every repetition, ample recovery was given between exercises, sets and sessions. Work rest ratio of 1:1 between each exercise 1:3 between sets and one day between plyometrics sessions was given in order to allow the neromuscular

system to recover. For plyometric training grass surfaces was used and the subjects are asked to wear well-cushioned shoes because that are secure and can absorb some of the inevitable impact. 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. Since, the subjects who lack a significant strength training back ground.

Collection of the Data

The initial testing took place before the beginning of the training period while the final testing was performed after 12 weeks of intervention on selected physical fitness, physiological and skill performance variables. To prevent unnecessary fatigue accumulation, participants were instructed to avoid intense exercise for a 24-hour period before each testing session. Immediately prior to testing participants performed a standard 15-minute warm-up consisting of light running, dynamic stretching and 5x30m of running exercises. Both pre and post tests were administered under identical conditions, with same apparatus, testing personal and testing procedures.

Experimental Design and Statistical Technique

The experimental design used in this study was pre and post test random group design involving 45 subjects, who were divided at random in to 3 equal groups of 15 subjects each. All 3 groups were chosen from the same population. No effort was made to equate the groups prior to the commencement of the experimental treatment. To find out the pre and post test mean differences paird ‘t’ test was applied.

In order to nullify the initial mean differences the data collected from the three groups prior to and post experimentation on explosive power were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). The pre test means of explosive power was used as a covariate. Since, three 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 .05 level for significance.

RESULT

The collected before and after experimental period data on explosive power of 2days/week as well as 4days/week plyometric training along with control groups are analyzed with appropriate statistics as in Table – I-III.

Table – I:Results of Paird't' Test and % of Improvement on Explosive Power of Volleyball Players belongs to Different Frequencies of Plyometric Training as well as Control Groups

Group	Test	Subjects	Obtained Mean	SD	DM	't'-ratio	Improvement (%)
2days/week Plyometric Training	Before Treatment	15	43.467	3.9255	2.93	44.00	6.74%
	After Treatment		46.400	4.1369			
4days/week Plyometric Training	Before Treatment	15	43.400	3.7187	4.87	53.57	11.22%
	After Treatment		48.267	3.9182			
Control	Before Treatment	15	43.200	4.8285	0.33	0.47	0.76%
	After Treatment		42.867	3.9073			

*Table value for df 14 is 2.15 (*significant)*

The collectedbefore and after experimental period data on explosivepower of the two chosen treatment (2days/week & 4days/week plyometric training) groups vary clearly as the calculated 't' values of 2days/week plyometric (44.00) as well as 4days/week plyometric training (53.57) groups are more than table (df14=2.15) value.

Performing plyometric training 2days/week leads to 6.74% of improvement in explosive power whereas performing plyometric training 4days/week leads to 11.22% of improvement in explosive power of volleyball players.

The collected before and after experimental period data on explosive power of 2days/week as well as 4days/week plyometric training along with control groups are analyzed statistically by ANCOVA statistics, and put on display in Table – II.

Table – II: ANCOVA Results on Explosive Power of Volleyball Players belongs to Different Frequencies of Plyometric Training & Control Groups

Explosive Power Mean	2days/week Plyometric Training	4days/week Plyometric Training	Control	SoV	SS	df	MS	'F' ratio
Adjusted	46.30	48.23	43.00	B	209.268	2	104.634	43.98*
				W	97.538	41	2.379	

*(Table value for df 2&41bis3.23)*Significant(.05 level)*

This applied ANCOVA computation established thatbthe ANCOVA adjusted (posttest) explosive power means of all three chosen groups (2days/week plyometric training group=46.30, 4days/week plyometric training group = 48.23 & CG=43.00) of volleyball

player's differs from one another, as the resultant ANCOVA adjusted (post test) mean's 'F' value (43.98) is greater than 3.23 (for df 2&41=3.23).

As the 2days/week as well as 4days/week plyometric training and Control group's ANCOVA adjusted (post test) explosive power mean's 'F' value is statistically significant, **Scheffe's**statistics (post hoc) as also used as in Table-III.

Table-III:Scheffe'sTest Final Result on Explosive Power of Volleyball Players belongs to Different Frequencies of Plyometric Training & Control Groups

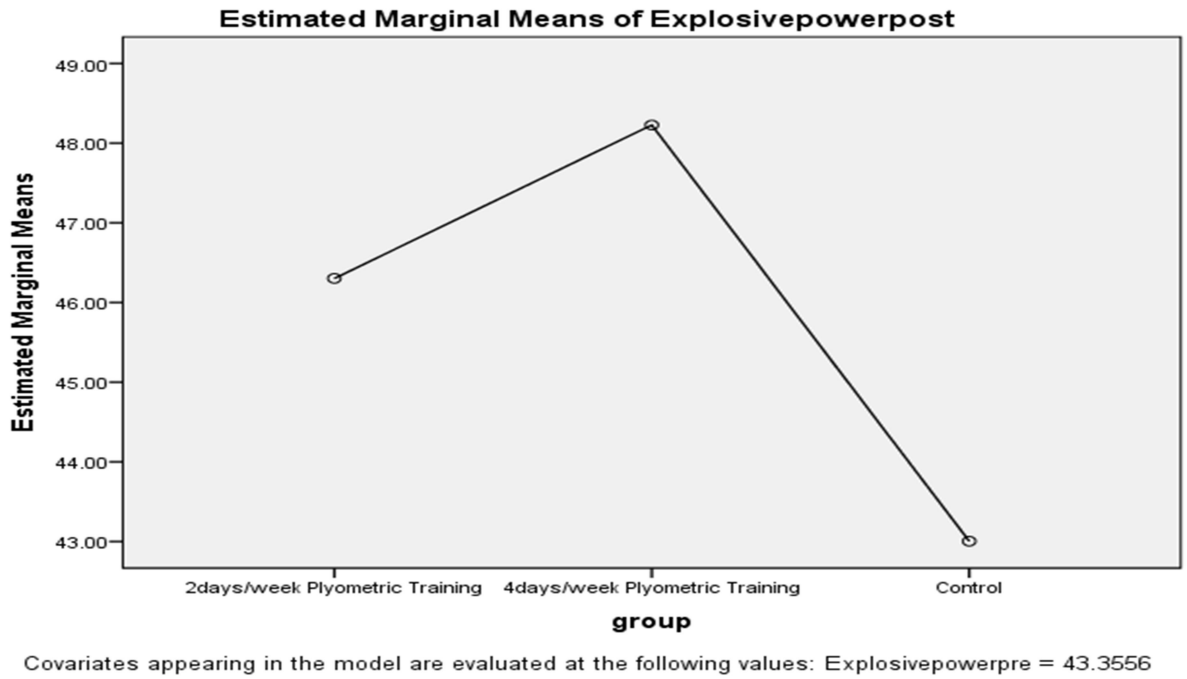
Variable	2days/week Plyometric Training	4days/week Plyometric Training	Control	M.Diff	CI
Explosive Power (EP)	46.30	48.23		1.93*	1.43
	46.30		43.00	3.30*	1.43
		48.23	43.00	5.22*	1.43

**Significant (.05level)*

The final results of Scheffe's statistics confirmed that due to 2days/week plyometric training (3.30), as well as 4days/week plyometric training (5.22) the volleyball player's explosive power was enhanced highly. Though, 4days/week plyometric training was much better than 2days/week plyometric training since the mean difference (1.93) is more than 1.43 (CI value).

The data on explosive power of 2days/week as well as 4days/week plyometric training along with control groups are graphically put on view in figure – I.

Figure – I: Figure Screening Shows the Explosive Power Data of Volleyball Players belongs to Different Frequencies of Plyometric Training & Control Groups



DISCUSSION

The effectiveness of plyometric training may also depend on the training design and length of intervention period (Cankaya et al., 2018). It was noted that the interventions implemented in the reviewed studies ranged from 4-16weeks (Idrizovic et al., 2018), with periods of 6 (Martel et al., 2005) and 12 weeks (Turgut et al., 2016) being the most common. In the reviewed studies, improvements of 8% (Martel et al., 2005) and 9.2% (Hewett et al., 1996) in the vertical jump were reported in two of the studies that used six-week plyometric training protocols. Mean while, improvements of 16.9% (Turgut et al., 2016) and 27.6% (Gjinovci et al., 2017) were observed in counter-movement jumps in two of the studies which included 12-week training period protocols. It is possible that plyometric training programs of longer than 10 weeks are more helpful in obtaining meaningful improvements (Cankaya et al., 2018; Markovic, 2007).

Plyometric training also utilizes the natural stored elastic recoil energy within the muscle to increase strength. An intricate elastic structure within and surrounding the muscles provided stability and integrity within each muscle fiber. During plyometric training these elastic elements act like a rubber band that has been stretched and suddenly released. The force generated during the eccentric muscle contraction is converted into an equal and opposite force during the concentric contraction. Gains in joint range of motion and flexibility are also seen as these elasticity properties develop.

CONCLUSION

Performing plyometric training 2days/week leads to 6.74% of improvement in explosive power whereas performing plyometric training 4days/week leads to 11.22% of improvement in explosive power of volleyball players.Though, high frequency plyometric training (4days/week) was much better than low frequency (2days/week) plyometric training for the improvement of explosive power. In conclusion, this study tends to show that high-frequency plyometric training four times per week, allows greater gains in explosive power of volleyball players compared to training at low-frequency, at equal volume. These findings may have important implications in the design of exercise programmes for the enhancement of volleyball game performance.

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