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INFLUENCE OF HIGH INTENSITY PLYOMETRIC TRAINING WITH DIFFERENT FREQUENCIES ON SPEED PERFORMNACES OF COLLEGE WOMEN VOLLEYBALL PLAYERS

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ABSTRACT :

The effect of different frequencies of high intensity plyometric training on speed performance was assessed on sixty college women players studying undergraduate course. Their age was ranged from 18 to 25 years. The subjects were divided into two groups of thirty each (n=30).Group I underwent high intensity plyometric training for 3 days a week, Group II underwent high intensity plyometric training for 5 days a week. The duration of the training period was restricted to twelve weeks. Speed performances were assessed by 9.1 m sprint test and 20m sprint test respectively. The data was collected from the experimental groups were statiscally analyzed with using t-test and Analysis of Covariance (ANCOVA).The analysis speculated that both 3 days high intensity plyometric training and 5 days high intensity plyometric training produced significant changes over speed performance of college women players.

KEYWORDS :*Plyometric training, speed, 9.1m sprint, 20m sprint.*

INTRODUCTION

All the coaches, trainers, physical education personnel and doctors are doing their best to improve the performance of the players of their country. Athlete/players of all the countries are also trying hard to bring laurels/medals for their countries in International competitions (Ghuman and Dhillon, 2000). Sports in the present world have become extremely competitive. It is not the mere participation or practice that brings out victory to an individual. Therefore, sports life is affected by various factors, like Physiology, Biomechanics, Sports Training, Sports Medicine, Sociology and Psychology etc.

Training involves constructing an exercise programme to develop an athlete for a particular event. This increasing skill and energy capacities are equal consideration (Singh, 1984). Physical training refers to the processes used in order to develop the components of physical fitness as for example, how to improve aerobic endurance, to stretch and relax muscles, to increase arm and shoulder strength to related exercise and programmes to specific requirements or individual sports (Dine, 1985).

Improving sprint performance is beneficial to many sports for a multitude of reasons from winning a race to providing an advantage during sprint duels that allow players to reach the ball before the opponent. (Stolen, 2005)The ability to achieve a high maximum sprinting velocity is an important determinant of success in sports such as athletics, soccer, rugby, and American football.(Bangbo et.al.,(1991) Hay et.al.,(1993) Majdell et al.,(1991) Power is defined an ability to do work per unit of time. In physical education, it refers to the maximal force that a muscle generates in the shortest possible time in order to confront the resistance, it is equal to muscular force or explosive power. Plyometric can be performed at various intensity levels ranging from low intensity hops to high unilateral intensity drills such as bounding (alternating single-leg-jumps for maximum horizontal

distance).

Nowadays all female players are facing at source some unique challenges to develop the required motor qualities like speed, strength, power, endurance, etc., to perform high level skills towards executing their motor sports skills. The skills of the games like Volleyball, Basketball and Handball with shot sprinting techniques. In which the speed with explosive power of lower body is one of the most important factor to perform this multi tasking skill. Though the plyometric training is not been conducted in exhaustive manner in India training with different frequencies and high intensity for the female players, we selected this as our research area for this study. In order to know the effect of different frequencies of plyometric training on sprinting performances of women players, the investigator has selected the study.

METHODOLGY

The study was conducted on sixty (N=60) female college Volleyball players who were studying in the Coimbatore city. Subjects were randomly divided into two groups of thirty each (n=30).Group-I Underwent high intensity plyometric training 3 days per week and Group II-Underwent high intensity plyometric training 5 days per week for a period of twelve weeks. Speed performance was assessed by 9.1 m sprint test and 20 m sprint test respectively. To analyze the significant improvement over speed performance due to 3 days high intensity plyometric training group and 5 days high intensity plyometric training group the one way analysis of covariance (ANCOVA) was computed. The level of confidence was fixed at 0.05 levels for all the cases.

TRAINING PROGRAM

Experimental group I & II underwent high intensity plyometric training with their respective frequency of 3 days and 5 days per week. The 3 days high intensity plyometric training group performed the exercises with 60 to 80% of low and moderate intensity. The 5 days high intensity plyometric training group performed the exercises with 50 to 70% of low and moderate intensity. While the intensity of exercise increase for 10 weeks before tapering off during 11th and 12th weeks as recommended by Piper and Erdmann (1998). The intensity of the training was tapered, so that fatigue would not be a factor during the post testing of the performances of the subjects.

In each training session, the training was imparted for a period between 45 and 50 minutes, which included 5 minutes warming up and 5 minutes warming down procedure before and after the training programme for a period of 12 weeks. The training schedule also content the recovery period in between the sets of the plyometric training exercises according to their intensity as per the assigned training schedule.

ANALYSIS OF THE STUDY

Table - 1

COMPUTATION OF't' RATIO OF 3 DAYS HIGH INTENSITY PLYOMETRIC TRAINING GROUP (3DHIPT) AND 5 DAYS HIGH INTENSITY PLYOMETRIC TRAINING GROUP (5DHIPT) ON 9.1 M SPRINT TEST AND 20M SPRINT TEST (Scores in seconds)

Variable	Groups	Pre – test mean ± S.D	Post – test mean ± S.D	MD	SE	't' ratio
9.1m sprint test	3 Days High Intensity Plyometric Training Group (3DHIPT)	3.07 ± 0.30	2.55 ± 0.18	0.53	0.05	10.38*
	5 Days High Intensity Plyometric Training Group (5DHIPT)	3.06 ± 0.30	2.79 ± 0.35	0.27	0.03	9.77*
20m sprint test	3 Days High Intensity Plyometric Training Group (3DHIPT)	3.89 ± 0.20	3.53 ± 0.25	0.36	0.03	11.25*
	5 Days High Intensity Plyometric Training Group (5DHIPT)	3.90 ±0.19	3.71 ± 0.24	0.20	0.03	6.55*

* Significant at 0.05 level for the degrees of freedom (1, 29), 2.05

The table - 1 reveals the computation of t- ratio of 3 days high Intensity plyometric training group (3DHIPT) and 5 days high Intensity plyometric training group (5DHIPT) on 9.1m sprint test and 20m sprint test. The obtained t ratios were found to be found to be higher than the required table value of 2.05 for the degrees of freedom 1 and 29, and it was significant at 0.05 level of confidence.

From the results of the study it was inferred that, twelve weeks of 3DHIPT and 5DHIPT had produced a significant improvements on 9.1m sprint test and 20m sprint test of college women players.

Table – 2

ANALYSIS OF COVARIANCE ON PRE, POST AND ADJUSTED POST TEST MEANS ON SPEED OF 3 DAYS HIGH INTENSITY PLYOMETRIC TRAINING GROUP (3DHIPT) AND 5 DAYS HIGH INTENSITY PLYOMETRIC TRAINING GROUP (5DHIPT)

Variable	Test	3 days high intensity plyometric training group	5 days high intensity plyometric training group	Source of variance	Sum of squares	df	Mean squares	F-ratio
9.1 m sprint test	Pre-test mean	3.07	3.06	B/S	0.005	1	0.005	0.05
				W/S	5.44	58	0.09	
	Post- test mean	2.55	2.79	B/S	0.89	1	0.89	11.45*
				W/S	4.50	58	0.08	
	Adjusted post- test mean	2.54	2.80	B/S	0.98	1	0.98	25.09*
				W/S	2.21	57	0.04	
20 m sprint test	Pre-test mean	3.89	3.90	B/S	0.001	1	0.001	0.02
				W/S	2.22	58	0.04	
	Post- test mean	3.53	3.70	B/S	0.46	1	0.46	7.61*
				W/S	3.49	58	0.06	
	Adjusted post- test mean	3.54	3.70	B/S	0.42	1	0.42	14.48*
				W/S	1.66	57	0.03	

* Significant at 0.05 level for the degrees of freedom (1, 58) and (1, 58), 4.00

Table – 2 reveals the computation of 'F' ratios on pre test, post test and adjusted post test means of 3 days high intensity Plyometric training group and 5 days high intensity Plyometric training group, on speed performance of college women players.

The obtained 'F' ratio for the pre test means of 3 days high intensity plyometric training group and 5 days high intensity plyometric training group, on 9.1meter speed was 0.05. Since, the 'F' value was less than the required table value of 4.00 for the degrees of freedom 1 and 58, it was found to be not significant at 0.05 level of confidence.

Further, the 'F' ratio for post test means of 3 days high intensity plyometric training group and 5 days high intensity plyometric training group, on 9.1 m speed was 11.45. Since, the 'F' value was higher than the required table value of 4.00 for the degrees of freedom 1 and 58, it was found to be statistically significant at 0.05 level of confidence.

The obtained 'F' ratio for the adjusted post test means of 3 days high intensity plyometric training group and 5 days high intensity plyometric training group, on 9.1 m speed was 25.09. Since the 'F' value was higher than the required table value of 4.00 for the degrees of freedom1 and 57, it was found to be statistically significant at 0.05 level of confidence.

From the results, it was inferred that there was significant difference in the improvement of speed between 3 days high intensity plyometric training group and 5 days high intensity plyometric training group.

Table – 2 reveals the computation of 'F' ratios on pre test, post test and adjusted post test means of

3DHIPT and 5DHIPT on speed performance of college women players.

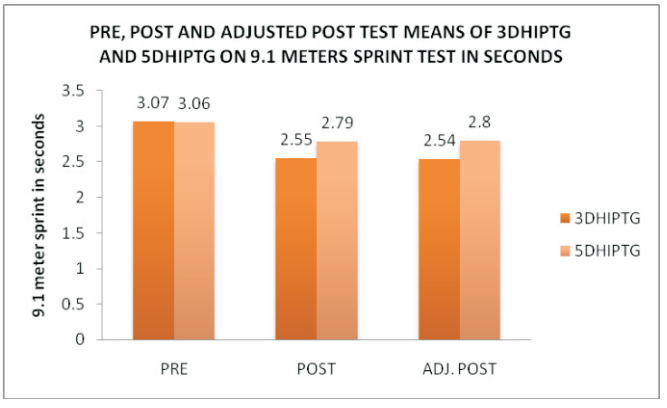
The obtained 'F' ratio for the pre test means of 3 days high intensity plyometric training group and 5 days high intensity plyometric training group, on 20 m sprint was 0.02. Since, the 'F' value was less than the required table value of 4.00 for the degrees of freedom 1 and 58, it was found to be not significant at 0.05 level of confidence.

Further, the 'F' ratio for post test means of 3 days high intensity plyometric training group and 5 days high intensity plyometric training group, on 20m sprint was 7.61. Since, the 'F' value was higher than the required table value of 4.00 for the degrees of freedom 1 and 58, it was found to be statistically significant at 0.05 level of confidence.

The obtained 'F' ratio for the adjusted post test means of 3 days high intensity plyometric training group and 5 days high intensity plyometric training group, on 20m sprint was 14.48. Since the 'F' value was higher than the required table value of 4.00 for the degrees of freedom1 and 57, it was found to be statistically significant at 0.05 level of confidence.

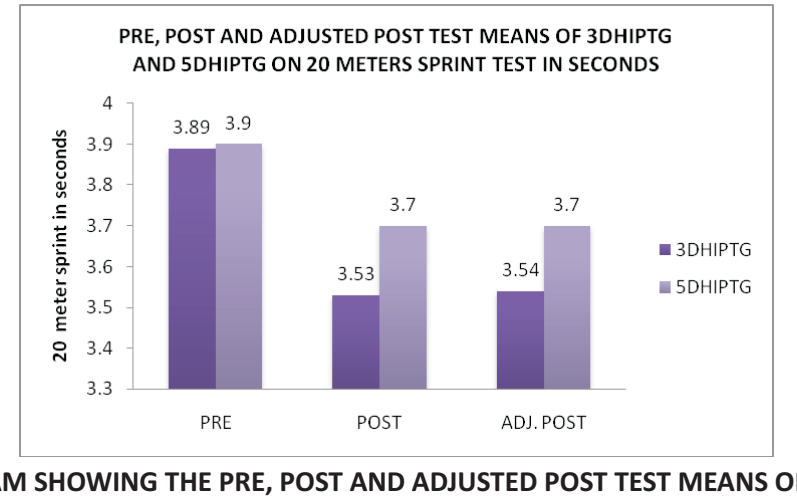
From the results, it was inferred that there was a significant difference in the improvement of speed between 3 days high intensity plyometric training group and 5 days high intensity plyometric training group.

Diagram-1



BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEANS OF 9.1 M SPRINT PERFORMANCE OF 3 DAYS HIGH INTENSITY PLYOMETRIC TRAINING GROUP AND 5 DAYS HIGH INTENSITY PLYOMETRIC TRAINING GROUP SCORES IN SECONDS.

Diagram-2



BAR DIAGRAM SHOWING THE PRE, POST AND ADJUSTED POST TEST MEANS OF 20M SPRINT PERFORMANCE OF 3 DAYS HIGH INTENSITY PLYOMETRIC TRAINING GROUP AND 5 DAYS HIGH INTENSITY PLYOMETRIC TRAINING GROUP SCORES IN SECONDS.

RESULTS AND DISCUSSION

In this study the subjects who underwent high intensity plyometric training were able to improve their speed performance on t – test. Therefore, it is found a positive relationship between high intensity plyometric training and speed.

The results from this study are very encouraging and demonstrate the benefits of plyometric training can have better speed. The results of the study also supports that the improvement in fitness can occur in as little as 12 weeks plyometric training which can be useful during the last preparatory phase before in season competition for athletes. The result of the present study indicates that the high intensity plyometric training program with two different frequencies (3days and 5 days) are effective methods to improve the speed.

The effects of high intensity plyometric training with different frequencies may actually be synergistic, with their effects being greater than each programme performed with progression. Plyometric training may also prime the neuromuscular system for the demands of motor fitness training by activating additional neural pathways and enhancing to a greater degree and readiness of the neuromuscular system (linnamo et al. 2000).

In the present study the 3 days high intensity plyometric training improved the speed parameters 16.94% and 9.25% respectively by finding significant differences in comparison from base line to post test. The speed parameters were improved by the 5 days high intensity plyometric training over 8.82% and 4.87% respectively by finding significant differences in comparison from base line to post test.

It is noted that the players of 3 days high intensity plyometric training group showed better improvement on their 9.1 meter speed and 20 meter sprint in seconds (16.94% vs. 8.82%) and (9.25% vs. 4.87%) respectively than 5days high intensity plyometric training group.

The results of the present study is relatively matched with the concepts and basis of Lenhart et al., (2009) investigated the effect of eight weeks of plyometric training on speed and explosive power of volleyball players and observed significant improvements in these variables. Rimmer and Sleivert (2000) found that 8 weeks of plyometric training improved 0 to 10m and 0 to 40m sprint times. De Villarreal et al., (2008) noted significant decreases in 20 m sprint time and jump height (CMJ and drop jump) if a 7-week plyometric training program was followed by 7 weeks of detraining.

Plyometric training is characterized by the operation of the stretch shortening cycle (SSC) that develops during the transition from a rapid eccentric muscle contraction (deceleration o a negative phase)to a rapid concentric muscle contraction (acceleration or a positive phase) (Bedoya et al.,2015; Makauk et al.,2014; Michailidis et al.,2013). SSC tasks take advantage of the elastic properties of connective tissue and muscle fibers by allowing the muscle to accumulate elastic energy through the deceleration/negative phase and release it later during the acceleration / positive phase to enhance muscle's force and power output (Michailidis et al., 2013; Padulo et al., 2013).Therefore, this regime of SSC muscle contractions is a typical part of muscle activity in a number of specific team spot activities including acceleration, changing of directions, vertical and horizontal jumps (Comie et al.(2011) clarified the interactions between the contractile and elastic elements and pointed out that their different length-shortening behavior was vital in SSC movements. Moreover, the power/strength produced during the initial phase of the stretch-shortening cycle positively influences neuromuscular control and joint stabilization (Markovic and Mikulic, 2010). Thus, Plyometric, also known as "Jump training" or "plyos", are exercises based on maximum muscle force production in shortest possible time to improve speed and power (Makovic,2007).

Speed is related to distance over time, and the rate at which an object moves (Luttgens&: Well, 1982).Speed is based on both an internal and external component. Internal speed refers to complex neuromuscular movement. Internal speed is the rate at which the nerve impulses are transmitted though the nervous system. External speed refers to the speed velocity of limb movement (O'Shea, 1985b).

Plyometric training of the lower extremities been shown to increase sprinting speed or velocity. Sprinting velocity is important for sports requiring quick bursts of speed or repetitive change of direction. This is valuable for sports like Soccer, Handball, Volleyball and tennis. These studies included various forms of plyometric training ranging from three to 12 weeks in duration. Weekly dosage ranged from once per week to four times per week at most. Volume of greater than 80 jumps per session seems to result in the greatest benefits

(Chelly M.S et al., 2014, Villeral E.S et al., 2008 and Makaruka. H et al., 2014).

It has been reported that plyometric training induces specific neural adaptations such as increased activation of motor units and less muscle hypertrophy than typically observed after heavy resistance strength training (Sale, 1991).

The Time Course for Elevated Muscle Protein Synthesis following Heavy Resistance Exercise, Canadian Journal of Applied Physiology (1955) recommending to bring out the best result in plyometric training on athletic performances the recovery period should be matched scientifically with training protocols. For example, an athlete might normally take 36 hours to fully recover from a particular interval workout. However, if two days prior to the interval session the athlete had undertaken an unusually tough training session, he/she might not be fully recovered at the outset of the interval workout.

As a result, recovery from the intervals would take longer than expected (because the muscles would have to repair problems not only from the intervals but from the previous hard exertion as well), and the athlete who confidently embarked on yet another quality session 36 hours after the intervals, believing that his/her muscles were in good shape, could in fact be training in a quality way much too soon, increasing the risk of injury and burn-out. Since determining optimal recovery time can be tough, it's very important to take specific steps to speed up recovery time. By doing so, you'll decrease the risk that you are piling up too many quality training sessions within one portion of your training cycle, and you'll enhance your chances of really adapting to your training.

CONCLUSIONS

It was very clear that, the twelve weeks of low frequency and high frequencies with high intensity plyometric training produced significant changes over the speed of women players. Further, it was inferred that both the high intensity plyometric training protocols (3days and 5 days) adopted for the study are capable of improving speed significantly. The high intensity plyometric training of 3 days protocol for a period of 12 weeks was found to be most appropriate protocol to produce significant changes over speed performances of women players, when compared with 5 days high intensity plyometric training, finally 3DHIPT may be inducted in to training programme for college women players to bring out desirable changes over speed parameters.

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